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

The Society has a membership of about 600 earth scientists interested in Malaysia and other Southeast Asian regions. The membership is worldwide in distribution.
The photogeology of the Bukit Tunjung area, Chuping, Perlis

LAI KOK HOONG
Geological Survey of Malaysia
Ipoh, Perak

Abstract: Photo-interpretation has delineated an apparent fault, the 'Beseri Lineament', occurring between a western belt of Permian limestones and an eastern belt of predominantly Triassic limestones. This is a dip-slip fault which has uplifted the western belt. Triassic limestones may be present in the top portions of the limestone hills of the western belt.

INTRODUCTION

The limestone hills in the Chuping area, Central Perlis, occur in two roughly aligned NNE linear belts. The western belt is made up of Bt. Chabang, Bt. Manek, Bt. Wang Pisang, Bt. Chondong and Bt. Tunjung. The eastern belt consists of Bt. Guar Sami, Bt. Jerneh, Bt. Keteri and some unnamed hills. Bukit Keteri and Bukit Chuping which are just south of the map area, also fall into this belt.

According to Fr. H. Fontaine (personal communication) most of the limestones on the east are Triassic but some range from Permian to Triassic. On the other hand, the limestones on the west are Permian, except at one locality (Bt. Tunjung) where Triassic fossils have been found. The nature of the Permian/Triassic boundary is not clear because of the poor access to the upper parts of the limestone cliffs and hills. A structural study by the remote sensing (aerial photography) method was done to obtain more information on the relationship between the Permian and Triassic limestones in this area.

PHOTOGEOMORPHOLOGY

The limestone hills form two parallel lines of mogate (tower) karsts, that rise abruptly from the surrounding flat to gently undulating pediplain which is underlain by argillaceous rocks (Kubang Pasu Formation, Jones, 1978). Generally, the limestone hills being elongated on a NNE trend, have concordant heights, like those of the limestone hills in the Kinta Valley. Very steep to vertical cliffs, some overhanging, are common, and the cliffs are invariably aligned NS to NW. A few smaller ridges of argillaceous rocks, occur in the pediplain between these two belts of limestone hills and they are also aligned NNE.

PHOTOGEOLGY

Three photolithological units are apparent in the Chuping area. They are mogote karst limestones, the pediplain underlain mainly by argillaceous rocks, and alluvium along the main rivers to the southwest and southeast corners of the map area (Fig. 1). In addition, Bukit Tunjung appears to consist of two limestone
Figure 1. Photogeological map of Bukit Tunjong area, Perlis
units, namely a massive type sitting on a layer which shows a more hummocky surface. The contact between the two apparently conformably units appears to be around the 160-meter contour.

Bedding trends are not very prominent from the photographs of this area. The few dips inferred, mainly from the argillaceous unit, are at about 20-40 degree east with a general strike of NNE.

Fracture lineaments are more easily demarcated, especially in the limestone hills. Most of these are probably joints and appear to control the occurrence of cliffs and hill slopes. Two major parallel trending NNE lineaments, albeit weak in topographic expression, could be traced over 10 km in the argillaceous rocks. One of them separates the two limestone belts and can be traced through the village of Berseri in the south to Bt. Chabang in the north.

These two major lineaments probably represent two faults but their actual nature cannot be directly determined from the aerial photographs. However, the Bt. Arang Tertiary basin which lies only 5 km east of these hills is an elongated deposit whose long axis is also trending NNE. In nearby Thailand, Chaodumrong et al. (1983) reported that the Tertiary basins are mainly fault-bounded grabens and/or half grabens. Thus a system of parallel dip slip faults trending NNE may be present in this area, and the ‘Beseri’ lineament might be one of them.

CONCLUSIONS

The most significant finding of this interpretation is the delineation of the Beseri lineament. If it is a dip-slip fault, the western limestone belt might have been uplifted relative to the eastern limestone belt. It could explain why Triassic limestones are dominant to the east of the fault, and on the other hand, Permian limestones are dominant to the west. Thus, Triassic limestone might be present on top of the Permian in the limestone hills of the western belt. Therefore, the upper portion of Bt. Tunjung, perhaps above the 160-meter contour, might be Triassic and the lower portion Permian. Palaeontological studies should be carried out on the top portions of the limestone hills in the western belt, especially on Bt. Tunjung.

REMARKS

It may be of interest to note that the Permian limestone and the Triassic limestones in this area and the Kodiang area were formally grouped by Jones (1978) as the Chuping Limestones. The type locality is Bukit Chuping which was shown by Jones (1966 & 1978), and Fontaine (1986) to contain only Triassic fossils. Permian fossils, have not been discovered. The Triassic limestones in the Kodiang area, however, has been formalized as the Kodiang Limestone by DeCoo and Smit (1975). But it also was shown by Metcalfe (1981) that the Kodiang Limestone ranges in age from Permian to Triassic.

REFERENCES


Manuscript received 24 September, 1993

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Joint characteristics in granitic rocks of eastern Kuala Lumpur, Peninsular Malaysia

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59100 Kuala Lumpur

Abstract: This study presents some observations on the characteristics of joints in granitic rocks belonging to the Kuala Lumpur Granite and Genting Sempah Microgranite in the eastern part of Kuala Lumpur. Joint parameters determined in the field include orientation, number of sets, set spacing, length (persistence), termination, roughness, aperture, filling and seepage. The general joint spacings were obtained from photo-interpretation.

Four major or systematic joint sets are identified. They have steep to vertical dip, and strike approximately NW-SE, N-S, E-W and NE-SW. Both the set and general spacings are not uniformly distributed. There is a higher concentration of joints at the lower spacing values (< 50 cm). Most of the joints have lengths of less than 3 m and they often terminate against other joints. The joint surfaces are commonly smooth and slightly undulating, and coated with chlorite.

INTRODUCTION

Joints are ubiquitous in granitic rocks of eastern Kuala Lumpur. They occur in all outcrops investigated. The characteristics of joints and other discontinuities play an important role in controlling the mechanical properties of a rock mass. The strength and deformability of a rock mass, rock slope stability, as well as the ability of a rock mass to transmit and hold fluids depend more on the discontinuity systems within the rock mass than on the rock mass itself (Hoek and Bray, 1974; Jaeger and Cook, 1979). Thus, joints or discontinuity survey is an essential part of site investigations for almost all geological engineering projects. The International Society of Rock Mechanics (ISRM, 1978) has listed 11 parameters for the quantitative description of discontinuities. Some of these parameters, including orientation, spacing and persistence, were determined for some quarry faces and road-cuts in the eastern part of Kuala Lumpur.

GEOLOGY

The area of study is located to the east of Kuala Lumpur (Fig. 1). This area is underlain by granitic rocks of the Main Range batholith which intruded into Paleozoic clastic and calcareous metasediments. The granitic rocks comprises three main bodies: the Kuala Lumpur Granite, the Genting Sempah Microgranite and the Bukit Tinggi Granite. The Kuala Lumpur Granite is the main granitic body and it is separated from the Genting Sempah Microgranite by a metasedimentary screen at its eastern margin. It is predominantly megacrystic consisting of K-feldspar megacrysts set in a medium to coarse grained allotriomorphic to hypidiomorphic groundmass. The Genting Sempah Microgranite is made up of subvolcanic (microgranodiorite) and volcanic rocks (Liew, 1983; Cobbing and Mallick, 1987). The Bukit Tinggi Granite comprises very coarse grained megacrystic biotite granite. Geochronological studies by Bignell and Snelling (1977), Liew
Metasedimentary Rocks
- Kenny Hill Formation
- Kuala Lumpur Limestone
- Hawthornden Schist
- Dinding Schist
- Bentong Group

Igneous Rocks
- Kuala Lumpur Granite
- Genting Sempah Microgranite
- Bukit Tinggi Granite
- Kuala Kelawang Granite
- Quartz dyke

Major Fault
Area of Study

Figure 1. Sketch geological map of the Kuala Lumpur and adjacent areas. Modified after Gobbett (1964) and Cobbing and Mallick (1987).

(1983) and Darbyshire (1988) suggest a Late Triassic age of emplacement for the above granitic rocks.

The study area is cut by two major fault zones — the Bukit Tinggi Fault Zone and the Kuala Lumpur Fault Zone. Mesoscopic faults and shear zones are commonly observed. They are steeply dipping and strike mainly NW-SE, N-S and NE-SW. Faulting have given rise to a diverse assemblage of deformed rocks including fault breccias, cataclasites and mylonites. Joints are the most conspicuous structural features in the granites. Systematic relationships between the joints and the geometry of the granite plutons, the flow structures and dikes are not observed. However, the orientation of the major joint sets and the mesoscopic faults are similar. The spacings of joints are observed to decrease towards the faults. Thus, the joints and faults are likely to be cogenetic.
JOINT CHARACTERISTICS IN GRANITIC ROCKS OF EASTERN KUALA LUMPUR

ORIENTATION OF THE JOINTS

Joints mainly occur as sets of discontinuities, each set having similar orientations. There are some individual joints which are randomly orientated. At the various exposures, the orientations of the joints were measured with a Brunton compass. Large inhomogeneous exposures of the granitic rock were divided into several domains in each of which discontinuity features are more or less homogeneous. To avoid biasness, all joints within a fixed area of the rock exposures were measured. However, bias and errors do occur as the measurements were made on near vertical man-made exposures. These quarry faces and slope cuts are furthermore, somewhat disturbed by excavation and blasting works. Radial cracks were evident near the blast-holes, and measurements near the blast-holes were thus not attempted. Further away from the blast-holes, most of the dilated cracks developed due to blasting are by and large parallel to the existing joint systems. This supports Pevzner's (1974) conclusion that a new system of cracks are seldom formed during an explosion, though cracks may develop along the existing discontinuities.

Lower hemisphere equal area projections of the poles to the joint planes were made for every domain, and the results of all the domains from the same exposure were also combined to give the generalized (composite) distribution of joint orientation for the entire exposure. The pole densities were contoured using the Schmidt method (Phillips, 1971). The density maxima is taken as the modal (most common) orientation for a given joint set. A total of 26 granite exposures, 23 from within the Kuala Lumpur Granite and 3 from the Genting Sempah Microgranite, were studied. Projection of poles to joint planes for the various exposures are shown in Figure 2, and the composite plot of all the exposures in Figure 3. The pole maxima are summarized in Table 1.

Up to 8 joint sets are present in the study area, though most exposures show between 3 to 5 joint sets. In addition to these sets, randomly orientated joints and sheet structures are also present. Two or 3 joint sets are generally common and form prominent maxima in the projection of poles to joint planes.

Four joint sets are common to almost all the exposures and these can be considered to be the major (or systematic) joint sets which occur regionally. They are more prominent and persistent than the other more localized joints (minor or non-systematic joint sets). The four major joint sets are steeply dipping to vertical and strike approximately NW-SE, N-S, E-W and NE-SW (Figs. 2 and 3).

NW-SE striking joint set

This sub-vertical joint set is most conspicuous and forms a distinct maxima in the projection of poles to joint planes in 21 of the 26 granite exposures studied. It is the dominant joint set in more than half of the exposures. It is more prominent in the southern part of the study area (Ampang-Cheras-Kajang area). The orientation of this joint set may vary up to 20° (both in dip and strike) between different localities. The modal orientations for different localities vary from 318°/83°NE to 326°/78°SW and the mode of all exposures corresponds to 322°/vertical (Fig. 3). The spacing of joints of this set is typically less than 1 m and chlorite coating is ubiquitous on the joint surfaces.

N-S striking joint set

This joint set is also steeply dipping. The strike of the pole maxima of the projection of poles to joint planes vary between 008° and 025°, and dip angles from 70°E to 85°E. The maxima of the composite plots of all the granite exposures corresponds to 014°/76°E (Fig. 3). This joint set is conspicuous along the Karak Highway, particularly between km 23 and 29. In the southern part of the study area (Ampang to Kajang), it is usually less prominent than the NW-SE and E-W sets, though it is the dominant joint set in the Dayapi Quarry. This N-S set forms a distinct maxima in the projection of poles to joint planes of 17 exposures, and is the dominant maxima in 8 of them.

E-W striking joint set

This joint set exists in all the exposures studied, and it forms the prominent set of 12 localities. In general, it is the second most
Figure 2. Orientation of joints in the eastern Kuala Lumpur area. Lower hemisphere equal area projection of poles to joint planes contoured at 1, 3, 5 and 7 percent per 1 percent area. C = country rock; G = Kuala Lumpur Granite; GS = Genting Sempah Microgranite and n = number of readings.

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prominent set, after the NW-SE set in the Ampang-Cheras-Kajang area and after the N-S set along the Karak Highway. The strike of the pole maxima vary between 080° and 100°, with the dip being more variable, between 74°N and 72°S. The modal orientation of this joint set in the composite plots is 088°/78°S (Fig. 3).

**NE-SW striking joint set**

In comparison with the previous major joint sets, this NE-SW joint set is less prominent. It forms a distinct joint set in about two-thirds of all the granite exposures studied, mainly along the Karak Highway. The strike of the pole maxima vary between 052° to 060°, and the dips between 70°NW and 72°SE. The modal orientation of this joint set in all the granite exposures corresponds to 52°/74°SE (Fig. 3).

**Minor joint set**

Minor joints seldom form distinct maxima in the projection to poles to joint planes. Typically, the length of the minor joints is less than 3 m with spacing of mainly between 30 cm and 1 m. They often terminate against the major joints.

**Sheet structures**

Sheet structures or sheeting joints are observed in most exposures. They are sub-parallel to ground surfaces and may be gently curved. In the projection of poles to joint planes, sheet structures rarely form a maxima, probably due to their inconsistent orientations, which may deviate as much as 40° from one end of the joint to the other. They also have wide spacings, ranging from 50 cm to more than 2 m.

**Set joint spacing**

The joint spacings were measured directly in the field and also determined from photographic prints of representative rock faces. Field measurements were made along several linear scanlines to obtain the *set joint spacing* (S) which is the perpendicular distance between two adjacent joints of the same set. The apparent set joint spacing was measured with a measuring tape and was later converted to true spacing using the equation $S = S' \cos \theta$; where $S$ is the spacing, $S'$ is the apparent spacing, and $\theta$ is the smallest angle between the scanline and the pole to the joint plane (Hudson and Priest, 1983).

The set spacings of the major joint sets were determined from 5 localities (Fig. 4). The minimum spacing ($S_{\text{min}}$), maximum spacing ($S_{\text{max}}$), modal spacing ($S_{\text{mod}}$ = spacings having the highest frequency of occurrence), mean spacing ($S = \text{sum of spacings divided by the number of measurements}$) and standard deviation ($s$) were determined. These parameters are shown together with the joint spacing distribution bar charts in Figure 4. From the results, it is obvious that the joints are not uniformly spaced, and the differences between the spacing parameters of various joint sets are not significant. The majority of the joint spacings are less than 50 cm. The modal spacing ranges from 5 to 45 cm, but more than half of
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Table 1: Summary of the orientation of joint sets in granitic rocks of eastern Kuala Lumpur. The density maxima are considered as the modal orientation of the joint sets. n is the number of measurements.
the joint sets have a modal spacing of about 15 cm. The mean spacing ranges from 35 to 63 cm (75% between 35 and 45 cm). The minimum spacing is between 1 and 5 cm while the maximum spacing is between 2.25 to 3.54 m.

General joint spacing

Photographic prints were used to obtain the general joint spacing \( x \). General joint spacing refers to the distance between points where two adjacent joints intersect a scanline. The orientations of the joints are disregarded for this measurement (procedure outlined in Ng, in press). The distribution of the general joint spacings is shown in Figure 5. The differences in general joint spacing distributions between various exposures are not significant. A majority of the general joint spacings are less than 1 m (more than 90% are less than 1 m; more than 50% less than 30 cm), with a higher concentration at the lower spacings. All the mean spacings are between 20 cm to 43 cm, except for two localities adjacent to fault zones. Modal spacings generally lie between 10 to 30 cm.

Priest and Hudson (1976) suggested that for randomly positioned discontinuities, the frequency distribution of discontinuity spacings along a straight line through a rock mass is of negative exponential form with the probability density \( f(x) = \lambda e^{-\lambda x} \); where \( f(x) \) is the frequency of occurrence of spacing value \( x \), \( \lambda \) is the average number of discontinuities per metre or discontinuity frequency.

In this study, a negative exponential function is fitted to the joint spacing data in the form of \( f(x) = ae^{-bx} \). This negative exponential function is transformed to the form of \( \ln f(x) = \ln(a) - bx \); which is a straight line. A best fit line is calculated using the least squares method, and it is superimposed onto the bar charts (Fig. 5). The parameters \( a \) and \( b \), and the coefficient of correlation \( r \) for the best fit lines are shown together with the bar charts.

The results show that the frequency of joint spacing values can be fitted on to the negative exponential distribution, implying that the joints are randomly positioned in the granitic rock masses investigated. The calculated parameter \(-b\) (slope of best fit line) is very close to the measured joint frequencies, \( \lambda \), \((-b = \lambda \pm 15\%)\). The coefficient of correlation \( r \) of the best fit lines ranges from -0.87 to -0.99, implying a strong negative correlation between the frequency of joint spacing and joint spacing values.

PERSISTENCE AND TERMINATION

The persistence of a joint with reference to a plane through the rock mass is defined as the fraction of the area within the plane that is actually discontinuous (Einstein et al., 1983). Joint persistence is among the most important rock mass parameters which has a major effect on the rock mass strength. As it is impossible to map the joints inside a rock mass, joint persistence is often very difficult to quantify.

Joint persistence can be crudely quantified by measuring the length of joints at the exposures. Measurements of joint lengths are, however, subject to a considerable degree of uncertainty as many joints extend outside the rock exposures. The joints can also be disturbed by blasting as in the exposures studied. Ambiguity also arises because a large proportion of joints which appear to be persistent are actually made up of numerous, very closely spaced, en echelon segments.

The lengths of major and minor joints were measured from 8 near vertical exposures. Due to lack of the horizontal exposures, the length of joints along their strike is not known. In their investigations of joints in granitic rocks, Segall and Pollard (1983) observed that joint morphology appears to be similar in vertical and horizontal exposures. It is thus likely that the joints in the study area also have the same length vertically and horizontally.

Results of the joint length studies are displayed in the form of stacked bar charts for easy visualization (Fig. 6). The major (or systematic) joints appear to be more persistent (longer) than the minor joints. Most (>90%) of the major joints have lengths between 0.1 to 3 m, while the minor joints are mainly between 0.1 to 2 m. The percentage of joints decreases as the joint length increases. The measurements, however, may not represent the typical joint lengths as about half (54% in Perkut quarry)
Figure 4. Set spacings of the major joints in Dayapi Quarry, Perkut Quarry, Kajang Quarry, km 23 and km 27.2 Karak highway. The set spacing parameters are: $S$=mean spacing; $S_{min}$=minimum spacing; $S_{max}$=maximum spacing; $S_{mod}$=modal spacing; $\sigma$=standard deviation and $n$=number of readings.
Figure 5. Bar-charts showing the distribution of general joint spacings. The best fit negative exponential distribution is superimposed onto the bar charts.

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lengths as about half (54% in Perkuat Quarry) of the measured joints have at least one end which continues beyond the exposure.

The type of joint terminations in Perkuat Quarry has also been noted. Most of the joints terminate against another joint, or extend outside the exposure. Joints with both ends terminating in the rock mass are scarce (Fig. 7). About 77% of the joints have at least one end which terminating against another joint. This value is likely to be over-estimated, as the exposures have been disturbed by blasting. During blasting, cracks may propagate from the tips of joints which terminate in the rock, until they meet another joint. The fractures developed during blasting may, however, be differentiated from the joints by careful examination. The fracture due to blasting is generally fresh, devoid of mineral coating, and rougher compared to the joints.

ROUGHNESS OF JOINT SURFACES

The surface roughness is an important factor that influences the shear resistance of the joint surfaces, particularly if the joint is closed, unweathered and unfilled. According to ISRM (1978), the roughness of joint surfaces can be described in two scales: small scale (several centimetres); and intermediate scale (several metres). The small scale roughness is divided into three categories: slickensided; smooth; and rough. The intermediate scale roughness is also divided into three categories: planar; undulating; and stepped.

In the study area, the roughness of the joint surfaces ranges from smooth planar (minimum roughness) to rough undulating (maximum roughness). The most frequently observed degree of roughness in all the exposures appears to be similar, which is smooth and slightly undulating. The joint surfaces coated with minerals such as chlorite and calcite are smoother than those devoid of mineral coating. Rough undulating joint surfaces are uncommon, and rough stepped joint surfaces are not observed. However, stair-stepped failure planes formed by breaking of intact rock bridges between en echelon joint segments are common.

APERTURE

Aperture is the perpendicular distance separating the adjacent wall rock of an open joint, in which the intervening space is air or water filled (ISRM, 1978). The aperture has a major influence on the fluid conductivity of a rock mass. Most of the studied exposures have been disturbed by excavation and blasting and hence render the measurements of the apertures unreliable. The steep exposure surfaces may also have permitted adequate expansion for the opening of joints. The aperture of the joints is thus likely to have enlarged.

Fine joint apertures were estimated with a gauge, and the larger apertures were measured with a metal ruler. Strongly disturbed exposures were not investigated. The joint aperture mainly ranges from a fraction of a millimetre (about 0.1 mm) to 3 mm, with modal values of about 0.25 to 0.5 mm. Larger aperture values up to 3 cm occur subordinately. Sheet structures generally have wider apertures (0.5 mm to 1 cm) than the other joint sets.

FILLING

A large proportion of the joints and other fractures are filled with fluid during or after their formation. These fluids deposited quartz, tourmaline, chlorite, fluorite, muscovite and other minerals. It was observed that these minerals, particularly chlorite, carbonate, quartz and fluorite often do not fill the joints completely to form veins, but develop a thin layer on the joint surfaces. These mineral layers are referred to as mineral coating. The most common mineral coating is chlorite, followed by quartz and carbonate. Other minerals such as fluorite, epidote and pyrolusite are also observed, though they are less common. Joint and fault surfaces are also often stained by iron oxide. The types of mineral coatings and their abundances recorded at 13 exposures are shown in Figure 8.

The percentage of joints coated by chlorite ranges from 30% to 69% (mean 48%). The exposures with high percentages of chlorite-coated joints are associated with sheared granites (for example, Taman Bt. Cheras C; Cheras Quarry). Usually, almost the entire joint surface
Figure 6. Stacked bar-charts showing the distribution of joint lengths.

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is coated by chlorite, though the thicknesses of the chlorite is not consistent, varying from a fraction of a millimetre to 2 mm. Chlorite also forms irregular and sub-circular patches.

About 2% to 20% (mean 11%) of the joints are coated by quartz. Quartz usually forms very thin and irregular patches on the joint surfaces, covering up to 75% of the surface area. It also often coexists with chlorite. Carbonate coatings occur subordinately (0-8%) and form irregular patches, of up to a few millimetres thick. A considerable amount of the joints (18-63%, mean = 34%) are clean (devoid of any mineral coating).

The presence of mineral coatings on the joint surfaces influence the behaviour of the joints. The permeability of the rock mass will be reduced by the presence of filling and coating materials which decrease the effective aperture of the joints. Coated joints are also usually smoother than joints devoid of coating. All the mineral coatings, except for quartz, are weaker than the fresh wall rock, and thus reduce the shear resistance of the joints.

**SEEPAGE**

The seepage of water through granite bedrock masses mainly results from flow through joints and faults. The rate of seepage is influenced by rainfall. During the dry seasons, a majority of the joints are dry, though some faults, sheet structures and persistent major joints show slight seepage. Continuous flow of water is uncommon during the dry seasons. Most of the joint surfaces are, however, damp during the wet seasons. Free water is observed in the more persistent open joints, sheet structures and faults. Discontinuities which give occasional slight seepage during the dry seasons, may during the wet seasons show continuous water seepage.

**CONCLUSION**

Joints are the most prominent structure in the granitic rocks in the eastern part of Kuala Lumpur and occur in all exposures investigated. They have the following characteristics:

1. A majority of the joints occurs as sets of discontinuities, each set having similar orientation; though some joints are randomly oriented. Most exposures have between 3 to 5 joint sets.

2. They form four major or systematic sets which have regional distribution and are more prominent and persistent than the other minor or non-systematic joints. These major joints are steeply dipping to vertical, and strike approximately NW-SE, N-S, E-W and NE-SW. The NW-SE set dominates in the southern part of the study area.

*Jan-Feb 1994*
3. The joints are not uniformly spaced. The set joint spacings ($S$) of the major joints range from 1 to 350 cm, but are mainly less than 50 cm. The mean values largely lie between 35 cm and 45 cm. Generally, there is no significant difference in the distribution of set joint spacing between the various major joints sets.

4. More than 90% of the general joint spacings ($x$) obtained from photo-interpretation are less than 100 cm, and more than 50% are less than 30 cm. The mean values vary mainly between 20 cm and 43 cm. The joints are more closely spaced in and around fault zones. The general joint spacings display a negative exponential distribution, implying that the joints are randomly positioned in the granite.

5. The length of joints are mostly less than 3 m, however, these values are limited by the size of the exposures.

6. Most of the joints terminate against other joints, while joints with both ends that terminate in the rock mass is scarce.

7. The joint surfaces are mainly smooth and slightly undulating.

8. The joint surfaces are often coated with chlorite (30 to 69%, mean 48%) and 18 to 63% (mean 34%) are clean. Other common mineral coatings are quartz and carbonate.

9. Most of the joints are dry in the dry seasons. In the wet seasons, they are damp, though free water is found in some persistent open joints and sheet structures.
ACKNOWLEDGEMENTS

This paper forms part of a M.Phil dissertation at the Institute for Advanced Studies (IPT), University of Malaya and I would like to thank Dr. K.R. Chakraborty and Dr. J.K. Raj for their supervision. This study is financed in part by research grants F169/88 and PJP280/90 from University of Malaya.

REFERENCES


NG, T.F. (IN PRESS). Joint spacings in granitic rocks of the eastern Kuala Lumpur area, Peninsular Malaysia.


Manuscript received 17 January 1994
Letter to the Editor

James A. Richardson
19 Acacia Road
Maida Vale
Western Australia 6057


The Editor,
Warta Geologi
Geological Society of Malaysia.

Dear Sir,

Warta Geologi Vol. 19 No. 2 pp. 35-41
Warta Geologi Vol. 19 No. 3 pp. 55-58; Abstract p. 137

Selinsing: I have read with much interest the paper by J.J. Pereira on renewed mining of eluvial and more recently of hardrock at the old Selinsing Gold Mine. Several deep lobang Siam had been dug around Selinsing during the 19th Century and perhaps earlier. Underground mining was in progress between 1889 and 1901. When underground mining ceased the mine closed down. My last memories of Selinsing were in 1938 when the old shaft had been dewatered down to the 100 foot level (No. 1 level) during renewed investigations of its gold potential. I sampled along the 100 foot level but failed to discover anything of promise.

It is good to know that renewed exploration carried out during the past few years has led to renewed profitable mining at Selinsing.

Congratulations to the operators and to J.J. Pereira in her further researches.

Raub Gold Mine: I made the first detailed underground geological survey of the Raub Mine between 1937-1939: mapping starting at Level 3 (300 foot) because Levels 1 and 2 were considered by the Mine Management to be too dangerous for even a Government geologist to be allowed in! Very interested to read Ian Metcalfe's report on the recently discovered Permian Conodonts providing additional data in detailing age of the sedimentary units around Raub and environs.

Bukit Koman (Raub): Very interested in the paper by Yeap Ee Beng and J.J. Pereira concerning the new developments over the defunct Raub Australian Gold Mine (RAGM). The new mining presumably overlies the underground stockwork gold mineralization lying between the main Raub mineralization (the Eastern Reef System) and the much less prolific Western Reef System. The stockwork mineralization comprises gold, scheelite and stibnite with pyrite and quartz in phyllites.

All success with the many activities of Persatuan Geologi Malaysia.

Sincerely,

Signed
Dr. James A. Richardson
Professional Member 1967

ISSN 0126-5539
Annotated bibliography of the geology of the South China Sea and adjacent parts of Borneo

Emphasis on publications relevant to Petroleum Geology

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Edited by
G.H. Teh

APRIL 1992

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Cheques, Money Orders or Bank Drafts must accompany all orders. Orders will be invoiced for postage and bank charges. Orders should be addressed to: The Hon. Assistant Secretary GEOLOGICAL SOCIETY OF MALAYSIA c/o Dept. of Geology University of Malaya 59100 Kuala Lumpur MALAYSIA
The Forum on "Groundwater" was held at the Dept. of Geology, University of Malaya, on 11th January '94. This forum was the 4th in the series of such forums organised by the Working Group on Engineering Geology & Hydrogeology, following three previous forums as follows:

i) Dam Geology (Sept '92)

ii) Highway Geology (Jan '93)

iii) Urban Geology & Geotechnical Engineering in Construction (July '93) – this 3rd Forum was organised jointly with the Geotechnical Engineering Division of the Institution of Engineers Malaysia (with published proceedings).

Seven papers were scheduled for presentation at the ½-day Forum (see List of Papers attached). Unfortunately, one speaker did not show up (guess who?), and only six papers were presented. Fortunately, all the seven papers have been published in the Proceedings, so participants could still refer to the paper that was not presented. The papers covered topics ranging from groundwater resource exploration and utilisation, to pollution and environmental impacts, with case studies covering Peninsular Malaysia, Sabah and Sarawak.

Speakers hailed from the Geological Survey Dept. (Ipoh & Kuching), DID, local universities and private consultants. In spite of the heavy rain, the Forum had a fair-size audience (~50), and ample time was allocated for the numerous lively discussions, questions & comments.

* Limited copies of the proceedings are available for sale at a nominal price of RM20.00 – please contact Anna for your personal copy.

Once again, we thank all authors, co-authors and the participants for yet another successful forum.

Tan Boon Kong,
Chairman,
Working Group on Engineering Geology & Hydrogeology

12th January 1994

Warta Geologi, Vol. 20, No. 1
LECTURE 1
Hydrogeological framework and groundwater resources utilisation in Peninsular Malaysia
by Mr. Ang Num Kiat

LECTURE 2
Groundwater investigations at Teluk Dalam, Pulau Perhentian Besar, Besut, Terengganu – A case study on the application of resistivity survey
by Mr. Ng Chak Ngoon & Mr. Lim Chee Kheong

LECTURE 3
Assessment of hydrogeological setting of Pulau Burong for municipal landfill
by Dr. Nasiman Sapari, Dr. Shaharin Ibrahim & R. Zainariah A.

LECTURE 4
Groundwater – a neglected resource which need to be protected
by Ir. Azuhan bin Mohamed

LECTURE 5
Hydrogeological evaluation of the Sahabat area, Sabah
by Dr. Tan Teong Hing

LECTURE 6
Soil and water investigations for an aquaculture project in Johor by Mr.
by Tan Boon Kong & Dr. Lim W.H.

LECTURE 7
Potential impacts of land development activities on the shallow fresh groundwater sources in the coastal lowlands of Sarawak
by Mr. Yogeswaran Mailvaganam

Jan-Feb 1994
Captions to Photos – Smile

1. Mr. Ang N.K. kicking off with an overview of the hydrogeology of Peninsular Malaysia.
2. Mr. Ng C.N. on a case study in Pulau Perhentian, Terengganu.
3. Dr. Naiman, obviously very happy with his assessment of Pulau Burong for municipal landfill.
4. Ir. Azuhan, looking around and asking: "Where are the geologists?"
5. Mr. Tan, B.K., pointing and talking to the blank screen!
7. A view of the fair-size audience.
8. This must be the "kopi-O" that the Speaker from Sarawak was referring to when describing groundwater from peat!
Behaviour of gold and other heavy minerals in streams — Implications for exploration geochemistry

W.K. Fletcher

Laporan (Report)

Professor W.K. Fletcher gave the above talk at the Geological Survey Office in Kota Kinabalu on 3 February, 1994.

The talk was attended by an audience of 28 from the Geological Survey, Sabah Operations Centre and from exploration companies currently active in Sabah. The talk was lively and lucid and attracted some good questions from the floor.

Abstrak (Abstract)

Geochemical anomalies for gold in drainage sediments are typically erratic, both locally on the bed of the stream and seasonally. In part, this is a consequence of the rarity of gold particles leading to the so called nugget effect. However, even when care is taken to collect samples of sufficient size to be representative gold concentrations may still show considerable variability as a result of the variable transport and deposition of sediment and gold in response to local hydraulic conditions.

Field studies in Harris Creek, a small gravel bed stream in British Columbia, Canada, have shown that gold is preferentially accumulated at high energy bar-head sites as the annual flood, caused by melting snow, passes. The gold anomaly at such sites may remain constant or even show increasing concentrations downstream away from the source of the gold. In contrast, there is no preferential enrichment of gold at low energy bar-tail sites. Gold anomalies at such sites therefore have lower concentration of gold with values that decrease going downstream. The degree of enrichment of gold concentrations between high and low energy sites decreases as the size of the gold particles decreases.

Similar observations have been made for distribution of gold in a small stream in northern Thailand and for other heavy minerals elsewhere, for example cassiterite in Malaysia. Furthermore it has been shown that the field observations of the distribution of gold and other heavy minerals on the stream bed are consistent with the theoretical predictions of bed load transport models. Such models predict that preferential accumulation of gold will be favoured by high bed roughness and decreasing stream gradient.

The field observations and theory have important implications for the design and interpretation of stream sediment surveys for gold.

1. Because gold concentrations are greatest and anomalous dispersion trains longest in the high energy environment, such sites are to be preferred for low density reconnaissance surveys. However, care must be taken to obtain samples from sufficient depth in the bed of the stream to obtain gold-rich sediments deposited during flood events. Also concentrations of gold at such site may decrease (rather than increase) toward the bedrock source of the gold. Care is therefore required for interpretation and follow-up.

2. Gold concentrations at low energy sites are relatively low and the anomalous dispersions trains short. However, because concentrations of gold are more likely to increase upstream towards the source, they may provide a more suitable medium for follow-up or detailed surveys.

3. Whatever medium is sampled it is important that:

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(a) the same hydraulic environment be sampled as consistently as possible.

(b) at all stages of sampling and analysis, samples are of sufficient size to be representative – ideally samples and subsamples should be of sufficient size to contain at least 20 particles of gold if sampling errors are to be better than ±45% at the 95% confidence level.

(c) For a given concentration of gold, the number of gold particles will increase as particle size decreases. More consistent results are therefore usually obtained with finer grain sizes (e.g. -200 mesh). Use of finer sizes also decreases the effects of hydraulic variability on gold concentrations.

4. In interpreting results it is important to remember that gold concentrations on the stream bed are a function of hydraulic conditions and can increase, downstream away from the primary source. Hydraulic ("mini-placer") gold anomalies can be identified by their association with accumulation of other heavy minerals (e.g. magnetite) and by correlation of gold concentrations with stream width, velocity and bed roughness.

P.S. Lim
The Euramerian Carboniferous Floras — Main characteristics and their interest from a geological viewpoint

J.P. LAVEINE

Laporan (Report)

Prof. Jean-Pierre Laveine gave the above talk on the 31st January 1994 at the Geology Department, University of Malaya. Prof. Laveine is presently the Director of the Laboratory of Paleobotany with the Geological Department, University of Lille I., France. Prof. Laveine split his talk into 2 parts, the earlier part was a systematic presentation of the Euramerian Carboniferous plants with excellent diagrams and slides from museum collections. After a coffee break, Prof. Laveine demonstrated to the audience of about 50, the importance of controlled worldwide paleobotanical data in global Carboniferous paleogeographic reconstruction and some of the evolutionary problems.

Summary

Owing to more than one and a half century of the extensive coal industry directly linked with the industrial revolution, the Carboniferous floras of Western Europe were actively studied. Underground coal mining involved the digging of many pits (connected by numerous and long underground galleries) and the drilling of numerous deep boreholes. The intense activity brought out numerous data for paleobotanical investigations. The tectonic complexity of the Western European coal deposits, resulting from the Variscan orogeny, involved the necessary cooperation of all the Carboniferous scientists. These long lasting and complementary studies have led to a precise deciphering of the normal succession of the Western European coal deposits. Even though a paleontological study can never be considered as definitively (and numerous examples will be given showing that some important information is still missing), and despite the fact that many Western European coal mines are more or less closed or closing, the knowledge of the distribution of the Carboniferous floras from Western Europe has reached a level of precision which settle them as a basic, standard reference for comparison with all the other areas.

The main taxa of the major groups (Lepidophytes, Arthrophytes, Filicophytes, Pieridospermaphytes, Cordaitophytes) or Carboniferous plants characterising the Euramerian floras will be quickly presented at a systematic point of view. Their vertical distribution, which is of course the basis for the establishment of biostratigraphic charts, will be examined. Many studies have demonstrated that the biostratigraphic subdivisions founded on the floral assemblages are valid for the whole Western Europe area. However recent paleogeographic comparisons extended to North America, East and South East Asia, have revealed some anomalies (as compared to the European standards!) which raise very interesting questions in all fields of paleobotany. Some suggestive examples will be presented, which will demonstrate that the recovering of controlled paleobotanical data from all parts of the world is of fundamental importance not only for global Carboniferous paleogeographic reconstructions (with the allied paleoclimatic consequences), but also for the understanding of some evolutionary problems as well. These examples will also help to demonstrate the necessity of a cooperation between all Geologists for a better understanding of the past history of our planet.
The trend of seismotectonic studies for engineering projects

WASIF AHMAD SIDDQUI

Laporan (Report)

The above talk by Wasif Ahmad Siddqui was held in collaboration with the Drainage and Irrigation Department Malaysia (DID) at the Geology Department, University of Malaya on 19th February 1994. Mr. Wasif Ahmad Siddqui is the Technical Director and In-charge of the Engineering Geology Division, Associated Consulting Engineers, Lehore, Pakistan. There was a good turnout of about 30 for the talk which was followed by some lively discussions.

Abstrak (Abstract)

The engineering practices for evaluating earthquake risk its application in the design of dams have become more stringent owing to the demands of the society for greater safety. The evaluation of earthquake risk largely depends on the earthquake history and geologic and tectonic setting which defines and control the seismicity.

The task of risk evaluation in Malaysia becomes more difficult because of the paucity of detail record of historical seismicity and instrumental data for both macro and micro events.

Malaysian Peninsula is considered to be a stable peninsula and generally ASEISMIC by many. Though not exactly identical however, the same term was used for Deccan Trap of India but now active faults have been detected when in depth studies were made after Koyna earthquake. Under the circumstances, it is high time that scientists prove for disprove the stable peninsular theory for Peninsular Malaysia.

How to go about it?

The answer lies in the study of quaternary tectonics for recent movements. With example at other places, this question has been addressed.

G.H. Teh
Weardale granite and its mineralisation

M.H.P. Bott

Laporan (Report)

Professor M.H.P. Bott gave the above talk at 5 pm on the 25 February 1994 at the Geology Department, University of Malaya. Prof. Bott was last here in March-April 1992 as External Examiner (Applied Geology), University of Malaya where he gave 2 talks (Warta Geologi Vol. 18 No. 2). Presently Prof. Bott is Professor Emeritus at the University of Durham and is on his way home after attending a Seismological Symposium in New Zealand.

What follows is a write-up of the talk by Prof. Bott himself for the benefit of members.

Abstrak (Abstract)

The lecture described the interpretation of gravity anomalies in northern England which concern the relationship of the buried Weardale granite, the lead-zinc mineralisation and to the later structural history of the region. This contrasts with the tin mineralisation in Malaysia where a different type of relationship with the granites applies.

A local negative gravity anomaly of -35 Mbal amplitude occurs over the gently dipping Carboniferous rocks of the Alston Block (northern Pennines). The anomaly closely corresponds with the mineral zonation. The characteristics of the anomaly indicate the anomaly is caused by a granite penetrating the underlying Lower Palaeozoic basement, rather than a sedimentary basin. Limiting depth considerations placed a maximum depth of about 400 m to the top of the granite, justifying a borehole, which proved a Devonian granite unconformably underlying the Lower Carboniferous. Thus the granite did not give rise to the mineralization because it was earlier, but probably acted as a channel for the upward flow of the mineralizing fluids.

To the north and south of the granite there are gravity gradients of opposite polarity which must be attributed to substantial thickening of the Lower Carboniferous succession away from the granite, corresponding to Lower Carboniferous hinge lines which correlate with later fault lines seen at the surface. It appears that the region underlain by granite (the Alston Block) was much more stable than the adjacent regions, suffering much less subsidence during the Lower Carboniferous than the adjacent troughs. The gentle faulting and folding is also less intense above the granite. It is thus suggested that the Weardale granite has exerted an important and persistent structural influence on the later rocks of the regions as well as acting as an upward channel for the mineralizing fluids.

G.H. Teh

Jan-Feb 1994
An election was held this year for the Vice-President (2 nominations), Vice President (3 nominations) and four 2-year Councillors (8 nominations).

In announcing the election results, the Election Officer, Dr. S. Paramananthan, reported that 145 ballots were received and there were 2 spoilt votes. The other posts are filled by candidates nominated by the Nominations Committee comprising Choo Mun Keong (Chairman), Azhar Haji Hussin and Chong Foo Shin. The new line-up is as follows

**GSM Council 1994/95**

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- Abd. Ghani Mohd Rafek
- Abdul Rahim Samsudin
- Effendy Cheng Abdullah
- Tan Boon Kong

1994-95

- Ali Mohd. Sharif
- Choo Mun Keong
- Idris Mohamad
- Jimmy Khoo Khay Khean

G.H. Teh
1994
AAPG International Conference & Exhibition
Southeast Asian Basins: Oil and Gas for the 21st Century

August 21–24, 1994
Putra World Trade Centre
Kuala Lumpur, Malaysia

Sponsor:
The American Association of Petroleum Geologists (AAPG)
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Host Society:
Geological Society of Malaysia
Welcome to Kuala Lumpur!

The 1994 International Conference and Exhibition of the AAPG will be hosted by the Geological Society of Malaysia at the Putra World Trade Centre in Kuala Lumpur August 21-24, 1994. This conference and exhibition is one of the many attractions of Visit Malaysia Year '94, a national effort to attract tourists to visit this beautiful and friendly country.

Kuala Lumpur, the federal capital of Malaysia and site of the conference, came about in the 1860's as a tin mining outpost at the confluence of the Klang and Gombak rivers. Its founders called this outpost "Muddy Estuary," which is the literal translation of Kuala Lumpur. When oil was first produced in the country in 1910, Kuala Lumpur was the colonial capital of the then-federated Malay States, and in 1946, Malaya. Today, Kuala Lumpur is the seat of the Malaysian government, with its administration headed by a prime minister. Over the past few years, Kuala Lumpur has developed further with high-rise buildings and modern highways and is today a bustling city.

The conference's theme, "Southeast Asian Basins: Oil and Gas for the 21st Century," was chosen to reflect the growing importance of this region to the petroleum industry that will carry into the next century. The application of the best geoscience technologies to find and develop hydrocarbon resources will be the catalyst for this growth. This conference and exhibition therefore provides an excellent opportunity to share our experiences for the advancement of the necessary technologies to ensure success in our objectives.

The Technical Programme Committee has designed an outstanding program covering most aspects of exploration and development geosciences. We believe you will find the oral and poster presentations very interesting, informative, and educational. Even more educational are two selected technical short courses on application of sequence stratigraphy in exploration for subsea traps and field development and reservoir management and one management forum on how to conduct oil business in Southeast Asia. Four field trips planned for you are equally interesting, informative, and educational. The field trip around Kuala Lumpur will take you to see placer mining for tin, and the field trips to Sarawak in Malaysia, Phuket in Thailand, and Northern Sumatra in Indonesia will expose you to new geology of this growing petroleum province, while at the same time permitting you to discover an exciting world of contrasting cultures.

The Organising Committee is confident that you will find the 1994 AAPG International Conference and Exhibition in Kuala Lumpur an extremely rewarding experience, and because your presence in hospitable Kuala Lumpur coincides with the peak of Visit Malaysia Year '94, you will take home a lot of fond memories. Please join us in discussions with both local and international experts in a wide range of technical topics in one of the fastest-growing petroleum provinces in the world.

Dr. Khalid Ngah
General Chairman
Conference Highlights

All events will be held at the Putra World Trade Centre unless otherwise noted.

Wednesday, August 17

Field Trip #1 departs

Saturday, August 20

08:00-17:00 Short Course #1

Sunday, August 21

08:00-20:00 Registration
08:00-17:00 Field Trip #2
08:00-17:00 Short Course #1 continues
17:00-20:00 Exhibition opens
17:00-20:00 "Icebreaker" Welcome Reception

Monday, August 22

08:00-18:00 Registration
06:00-12:30 Opening Session
12:30-18:30 Exhibition
12:30-14:00 Exhibits Hall Buffet Luncheon
14:00-17:35 Oral and Poster Sessions
17:30-19:30 Student Reception (Hotel Istana)
20:00-24:00 Malaysian Cultural Evening

Tuesday, August 23

08:00-18:00 Registration
09:00-18:00 Exhibition
09:00-12:30 Oral and Poster Sessions
12:00-14:00 House of Delegates' Luncheon (Hotel Istana;
by invitation only)
12:30-14:00 Exhibits Hall Buffet Luncheon
14:00-17:35 Oral and Poster Sessions

Wednesday, August 24

08:00-14:00 Registration
09:00-16:00 Exhibition
09:00-12:30 Oral and Poster Sessions
12:30-14:00 Exhibits Hall Buffet Luncheon
14:00-17:35 Oral and Poster Sessions
18:15 Field Trip #3 departs

Thursday, August 25

Field Trip #4 departs
08:00-17:00 Short Course #2

Friday, August 26

08:00-17:00 Short Course #2 continues
Conference Activities

All events will be held at the Putra World Trade Centre unless otherwise noted.

“Icebreaker” Welcome Reception
Sunday, August 21
17:00–20:00

Join other conference attendees and their guests in the exhibits hall for the traditional AAPG “Icebreaker.” Known by AAPG members throughout the world as the best way to open a conference or convention, it is a great way to socialize with exhibitors, meet new friends, find your business acquaintances, and get a sneak preview of the exhibits on display. Exhibitors will be on hand to greet and encourage you to stop by their stands later in the week. Refreshments will be located throughout the hall. Admittance will be by badge only. Due to liability restrictions, no one under the age of 13 will be permitted in the exhibits hall.

Exhibits Hall Buffet Luncheons
Monday, August 22 through Wednesday, August 24
12:30–14:00

Enjoy a different international menu each day with colleagues from around the world as you discuss the morning’s talks. Eat early, then investigate the exhibits without missing a paper. Or explore the exhibits hall first in order to decide which stands will require more time to visit. Whether you’re accustomed to eating early or late in the day, there will always be something you’ll enjoy. The cost is included in the professional’s and student’s registration fee. Spouse or guest tickets will be available on site.

House of Delegates’ Luncheon
Monday, August 22
12:30–14:00
Hotel Istana

The chairman of the House of Delegates invites all delegates of AAPG-affiliated societies who are attending the conference to join him and other AAPG officials for lunch. Agenda items from the House of Delegates’ meeting at the 1994 AAPG Annual Convention in Denver will be reviewed, and international delegates will have the opportunity to discuss their societies’ activities.

Student Reception
Monday, August 22
17:30–19:30
Hotel Istana

Join other students from all over the world at the AAPG Student Reception. If you are not presently a student member of AAPG, this is your chance to learn more about the benefits of student membership and the organization’s student chapter program. And if you are already a student member, come to meet members of the Student Chapter Committee as well as AAPG officers and staff. Learn more about starting a chapter at your local university.

Malaysian Cultural Evening
Monday, August 22
20:00–24:00

Experience the excitement of Malaysia! PETRONAS, the national petroleum company of Malaysia, will be hosting this lavish gala, which will feature a formal dinner and native Malaysian dancers in colorful costumes. This extravaganza is free for the first 1,500 attendees who present their tickets for redemption (excluding student registrants).

Speakers’ and Poster Presenters’ Information
All oral speakers, poster presenters, and session chairmen are reminded to attend a breakfast on the morning of their talk or presentation. All breakfasts begin at 08:00.

International Oral and Poster Awards Judges Needed
Judges are needed both for oral and poster sessions during the conference. If you are interested in judging, please mark the appropriate box on your registration form. Further information will be forwarded to you by the judging chairmen, as well as an invitation to attend a special breakfast on Monday morning, August 22. Get involved! Volunteer to be a judge!
GEOLOGICAL SOCIETY OF MALAYSIA PUBLICATIONS

BULLETIN OF THE GEOLOGICAL SOCIETY OF MALAYSIA

WARTA GEOLOGI - NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA

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Fullbore Micro Imager*

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

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

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

The tool's multiple logging modes allow wells site customization of results to satisfy client needs without compromising efficiency.
YOU WILL FIND no busier locale during the conference than the Putra World Trade Centre's Level 3, site of this year's associated scientific and trade fair. Nearly a hundred exhibitors will occupy wall-to-wall displays, showing off the technology that makes the exhibition the one place where you can explore the leading edge of our science through hands-on demonstrations and in-depth discussions with the knowledgeable staff assembled.

Products will range from mapping software to global positioning systems, well services to geologic area studies, and computer hardware to seismic data acquisition and interpretation. Government agencies, earth science organizations, and other non-profit publishers and information and data services are also being invited to exhibit. In addition, the exhibits hall will be the location of the conference's poster sessions throughout the three-day event.

The exhibits hall will be located a short escalator ride from the oral session halls, making it the perfect place to rendezvous with colleagues while enjoying a cup of coffee, courtesy of Schlumberger. The exhibition will also serve as the backdrop for Sunday evening's Icebreaker reception, thereby introducing you to all it has to offer.

The Technical Program Committee has built in extended breaks each morning and afternoon, allowing you to explore the displays in depth. And lunch will be served daily in the hall to all registrants, providing two hours over which to view the exhibition without missing a paper.

IMPORTANT: Due to liability restrictions, children under the age of 13 will not be allowed in the exhibits hall at any time. Please keep this in mind when making your arrangements to attend the conference.

The Exhibition

Exhibitors
The growing list of exhibitors includes, as of December 1993:

- Amoco Production Co.
- ARK Geophysics Ltd.
- Baker Hughes INTEQ
- BEICIP-FRANLAB
- CogniSeis Development
- Digi-Rule Inc.
- The Geocon Group
- Geophysical Micro Computer Applications Ltd.
- Hydrocarbon Data Systems
- IEDS Ltd.
- IES Integrated Exploration Systems GmbH
- Landmark Graphics Corp.
- NOPEC as
- Petroconsultants (Far East) Pte. Ltd.
- Petronas
- Petroleum Information Corp.
- Platte River Assoc. Inc.
- Schlumberger
- Silicon Graphics Singapore Pte. Ltd.
- Simon Petroleum Technology
- Sperry-Sun Drilling Services
- Stratamodel Inc.
- Western Atlas
- Wiltshire Geological Services Pty. Ltd.

If your company would like information on how to exhibit, as well as a floor plan showing what space is still available, please contact: Bruce Lemmon, AAPG Exhibits Manager, P.O. Box 979, Tulsa, OK 74101-0979 USA; telephone (918) 584-2555; fax (918) 584-2274.
## Technical Program at a Glance

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*Warta Geologi, Vol. 20, No. 1*
Monday Morning, August 22

Opening Session
Tun Dr. Ismail A/B
09:00 Official Opening
09:05 General Chairman's Welcome
09:10 GSM President's Welcome
09:20 AAPG President's Address
09:30 AAPG Awards Presentation
09:45 Welcome and Address by Prime Minister of Malaysia or a Senior Cabinet Minister
10:00 Coffee Break
10:30 Keynote Addresses
12:30 Adjourn

Monday Afternoon, August 22

Exploration History of Southeast Asian Basins
Tun Dr. Ismail A/B
PRESIDING: E. Cheng and S. Iamchul
14:00 Introduction
14:05 Tan Bee Seng: History of Hydrocarbon Exploration by Shell in East Malaysia
14:30 P.G. Rillera, E.F. Durkee: Visayan Basin - The Birthplace of Philippine Petroleum Exploration Revisited
14:55 W. Leslie, W.I. Ho, M. Abdul Ghani: Results and Implications of New Regional Seismic Lines in the Malay Basin
15:20 J.B. Blanche, J.D. Blanche: An Overview of the Hydrocarbon Potential of the Spratly Archipelago, South China Sea, and Its Regional Implications for Oil and Gas Development
15:45 Break
16:55 NG Tong San: The Role of Seismic in Exploration of Carbonate Buildups in Offshore Sarawak, Malaysia
17:20 N.T. Tin, N.D. Ty, L.T. Hung: Nam Con Son Basin

Reservoir Characteristics and Modelling, Part I
Tun Hussein Onn A
PRESIDING: L.K. Hoong and C. Mouret
14:00 Introduction
14:30 J.T. Kulha, R.M. Snelder: Low Resistivity, Low Contrast Puts: Part II - Comparison of Examples from Southeast Asia and the Gulf of Mexico
14:55 C.E. Schaaffna, S. Phuthithammakul: Reservoir Characterisation Helping to Sustain Oil Production in Thailand's Sirikit Field

Technical Program

All oral session halls will be located on Level 2 of the Putra World Trade Centre. Poster sessions will be located in the exhibits hall on Level 3.

Abstracts for the following papers will appear in the July issue of the AAPG Bulletin and in the conference program book.

Influence of 3-D Seismic in Exploration and Development
Tun Hussein Onn B
PRESIDING: D. Gilolf
14:00 Introduction
14:05 W. Nestvold: The 3-D Seismic Revolution: Impact on Exploration and Development
14:30 M.N. Mansor, K.W. Rudolph, F.B. Richards: Seismic Attribute Analysis for Reservoir and Fluid Prediction, Malay Basin
15:20 W.L. Alexander, M.B. Nellia*: 3-D Seismic Facies Analysis of a Reefal Buildup, Offshore North Sumatra
15:45 Break
16:30 M.E. Nacheecou: Amplitude Interpretation and Visualization of 3-D Reflection Data
16:55 K. Dickerman, E. Caniano, G. Roopa*: Spatial Distribution of Reservoir Properties Using Seismic Attributes Correlated to Log Properties
17:20 B. Magnier, É. Mercier: Reservoir Characterisation by Using 3-D Seismic Attributes with Log Properties

* Denotes speaker other than senior author.

Jan-Feb 1994
Tuesday Morning, August 23

Recognition of Hydrocarbon Using Geophysical Techniques
Tun Dr. Ismail A
PRESIDING: C. L. Yue and W. H. Boreland
9:00 Introduction
9:30 S.W. Leanex, W.E. Borland: AVO and Anisotropy from Logs and Walkways
10:20 Break
10:50 A.E. Wren: Seismic Amplitude: Its "True" Meaning and Benefit
12:05 J. Voon Wei Khin, K. Wong Ung Sing: Application of 3-D Seismic Amplitude Studies in Foreland Prediction, Baram South Field, offshore Sarawak, Malaysia

Southeast Asian Plate Tectonics/Stress Models, Part I
Tun Dr. Ismail B
PRESIDING: R.P. Koesoemadinata and C. Rangin
09:00 Introduction
09:05 C. Rangin: Tectonics of Cenozoic Sedimentary Basins in Southeast Asia
09:30 H.D. Tjia, K.E. Liew: Changes in Tectonic Stress Field in the Northern Sunda Shelf Basins
09:55 R.W. Murphy: Tertiary Tectonic Events, Southwestern South China Sea
10:20 Break
10:50 S. Harder, R. McCabe, M. Flower: A Rotating Stress Field and the Evolution of Basins in the Gulf of Thailand
11:40 S. Bada: Accretion Tectonics in Thailand Along the Nan-Uttaradit Sutures Zone
12:05 A. Samuel, N.A. Harbury, M.E. Jones: Basin Development and Inversion on an Oblique-Slip Convergent Margin: Nias Island, Western Indonesia

Malaysian Tertiary Basins
Tun Hussein Onn A
PRESIDING: D. Tan and K. A. Husin
9:00 Introduction
9:05 M.T. Ismail, S.A. Abdullah, K.W. Rudolph: Structural and Sedimentary Evolution of the Malay Basin
9:55 H. Hazhrook, D. Tan, P. Swinburn: Tectonic Evolution of the offshore Sarawak and Sabah Basins, Northwest Borneo
10:20 Break

10:50 M.I. Ismail, A.M. Mohamad, M.S. Ganesan, S.A. Aziz: Geology of Sarawak Deepwater and its Surroundings
11:15 P. Swinburn: Structural Styles in the Balingian Province, offshore Sarawak
11:40 A. Hussin, T.A. Nuraiten: Evolution of the Eocene-Miocene Carbonates of the North Sarawak Basin
12:05 M.R. Che Koh, M. Mohamed: Miocene Chronostratigraphy of Sabah Basin from Nannofossil Assemblages

Overpressure Zones in Southeast Asian Basins
Tun Hussein Onn B
PRESIDING: F.W. Yang
9:00 Introduction
9:05 W.I. Yusoff, R.E. Swarbrick: Thermal and Pressure Histories of the Malay Basin, offshore Malaysia
9:30 L. Warren, M.S. Kader*: Abnormal Pressure Study in the Malay-Penyu Basin
9:55 A.M. Mantaring, F. Matsuda*, M. Okamoto: Analysis of Overpressure Zones at the Southern Margin of the Baram Delta Province and Their Implications to Hydrocarbon Expulsion, Migration, and Entrapment
10:20 Break
10:50 C. Kho Siak, T. Ten Have, D. Hemmings: Overpressures in the Baram Field, offshore Sarawak, East Malaysia
11:15 Y. Grosjean, M. Bois, L. de Pazzis: Evaluation and Detection of Overpressures in a Deltaic Basin: The Sis Field Case Study
11:40 M.A. Herkommer: Geopressure Modelling from Petrophysical Data: An Example from East Kalimantan
12:05 J. Burvass, F. Schneelder, S. Wolf: Modelling Overpressures in Sedimentary Basins; Consequences for Permeability and Rheology of Shales, and Petroleum Expulsion Efficiency

Poster session from 09:00 to 12:30
Authors in booths from 10:00 to 11:00
Exhibits Hall, Level 3

Basin Development and Modelling
K.K. Liew: Timing of Cenozoic Basin Formation in Northern Sunda Land, Southeast Asia
S.S. Poland, K.J. Enzoer: Reinterpretation of the Northern Terminus of the San Andreas Transform System — Implications for Basin Development and Hydrocarbon Exploration
F. Tongkul: The Paleogene Basins of Sabah, East Malaysia
A. Marell, P.G. Buchanan: Development of a 3-D Validated Structural Model Using an Integrated Data Set — A Case Study from PNG
D.W. Waples, R. Mahadi*: A Comparison of Quality of Present-Day Heatflow Obtained from BHTs, Horner Plots, RPTs, and DSHs of Malay Basin
N. Hallik, C. Wu: Basin Modelling of Jambi Sub-Basin, South Sumatra, Indonesia
A.E. Cunningham, M.R. Prebish, M.O. Withjack: Late Compressional Features, East China Sea Shelf Basin
D. Johari, M.F. Abdullah: Geology of the Merit-Pila Coal Basin, Sarawak, Malaysia
J. Ting, T. Lee: Lower Miocene Sequence Stratigraphy of Taishi Basin, offshore Western Taiwan

* Denotes speaker other than senior author.

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Sequence Stratigraphy of Southeast Asian Basins

Tuesday Afternoon, August 23

Southeast Asian Plate Tectonics/Stress Models, Part II

Workstations/Geoscience Database Applications, Etc.

Tuesday Afternoon, August 23

Sequence Stratigraphy of Southeast Asian Basins

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Southeast Asian Plate Tectonics/Stress Models, Part II

Workstations/Geoscience Database Applications, Etc.
Basin Development and Modelling, Part I

Tun Dr. Ismail B
PRESIDING: H.D. Tija and S. T. Sandal

09:00 Introduction
09:05 N. Azim-Ibrahim, N. White: Subsidence Modelling of the Sabah Basin, a Foreland Basin, Northwest Borneo, Malaysia
09:30 D.C. Ginger, J. Pothecary, R.J. Hedley: New Insights into the Inversion History of the West Natuna Basin
10:20 Break
11:15 A. Backman: Study of Thermal Maturity in the Thrust-Belt Area of the Kutai Basin
12:05 J. Milisom: Basin Formation in the Nias Area of the Sumatra Forearc, Western Indonesia

Reservoir, Seal, and Source Rock Distribution in Hydrocarbon, Part I

Tun Hussein Onn A
PRESIDING: C. Kluth and M. Heyman

09:00 Introduction
09:05 J.J. Tiercelin, J.P. Richert, K.E. Lezzar: Sediment Infill Within Rift Basins: Facies Distribution and Effects of Deformation: Examples from the Kenya and Tanganjika Rifts, East Africa
09:30 A. Ali Salem: Reservoir, Seal, and Source-Rock Distribution in Esassouri Rift Basin
09:55 H. Doust: The East Hydrocarbon Habitat — The Charge Perspective
10:20 Break
10:50 Geng Zaixiong, Zhu Weilin, Zheng Baoming: Reservoir, Seal Rock Distribution and Control Factors in Hydrocarbon-Bearing Rift Basins of China
11:15 Qiao Hansheng: Sedimentary Style and Oil-Gas Field Distribution in Western Bohai Sea
12:05 P.T. Dien: Some Cenozoic Hydrocarbon Basins on the Continental Shelf of Vietnam

Reservoir Characteristics and Modelling, Part II

Tun Hussein Onn B
PRESIDING: L. K. Hoong and C. Mourtet

09:00 Introduction
09:30 M.S. Ahmed, B.D. Wiggins: Geoscience Technology Application to Optimize Field Development: Seligi Field, Malay Basin
09:55 U. Singh, D. Van Der Baan: FMS/FMI Borehole Imaging of Carbonate Gas Reservoirs, Central Luconia Province, Offshore Sarawak, Malaysia
10:20 Break

Wednesday Morning, August 24

Borehole Geophysics and Gravity

Tun Dr. Ismail A
PRESIDING: H. Shin-Tai and W. H. Borland

09:00 Introduction
09:05 R. Berger, D. Fermon: An Update on the Array Induction Imager Tool (AIT) in the Gulf of Thailand
09:30 A. Manzur, J. Meyer: Using Seismic-While-Drilling (SWD) Data to Assist in Selecting Casing Depths: Case Histories
10:20 Break
10:50 C. Foos, M. Parker: Gravity Delineation of the Setting and Deep Structure of Southeast Asian Sedimentary Basins
11:15 C.C. Hu: The Integrated Interpretation of Airborne Gravity, Magnetic Data, and Other Geophysical Data of Block SK-12 Onshore Sarawak, Malaysia
11:40 D. Santoso, S. Sukmono, H. Setyadi: The Characteristics of Neogen Sediments and Structures in Siberuan Area (Central Sumatra Indonesia) Based on Gravity Data

* Denotes speaker other than senior author.
Reservoir, Seal, and Source Rock Distribution in Hydrocarbon, Part II

Tun Hussein Onn A
PRESIDING: C. Khith and M. Heyman

14:00 Introduction
14:05 A. Chonchawalit, R.M. Bustin: Basin Analysis of Tertiary Strata in the Pattani Basin, Gulf of Thailand
14:30 J.D. Prang, B. Rogers: Depositional Facies Variation in the Sediments of the Rhmer Trough, Offshore Cambodia
14:55 S. Creaney, A.H. Hussein, D.J. Curry, K.M. Bohacs, R. Hassan: Source Facies and Oil Families of the Malay Basin, Malaysia
15:20 R.J. Katz: Stratigraphic and Lateral Variations of Source Rock Attributes of the Pematang Formation, Central Sumatra
15:45 Break
16:00 P.G. Swinburn, H. Burgisser, J. Yassin: Hydrocarbon Habitat of the Balingian Province
16:55 D.J. Curry: Variations in the Geochemistry of Closely Interbedded Oil-Prone Coals and Shales
17:20 C.P. Schiefelbein, H.L. Ten Haven: Geochemical Typing of Crude Oils from the Gulf of Thailand and the Natuna Sea

Structural and Stratigraphic Analysis of HC Traps

Tun Hussein Onn B
PRESIDING: R. Phoa and B. Jasin

14:00 Introduction
14:05 F. Hanno, P. Cunmin, S. Guoying, C. Sizhang: Alteration of Fault Development on the Accumulated Oil Geochemical Features
14:30 T.L. Burnett: New Directions in Geoscience Technology for Petroleum Exploration
14:55 S. Mitra: Geometry and Evolution of Structural Traps Formed by Inversion Structures
15:20 H. Xiao: Rollover Development and Resulting Geometry with Applications to Rapid Stratigraphic Correlation Across Major Growth Faults
15:45 Break
17:45 E.A. Lorenzetti, P.A. Brennan, S.C. Hook: Structural Styles in Rift Basins: Methodology and Examples from Southeast Asia

Wednesday Afternoon, August 24

11:15 T. Teu Have, R. Abbas, A.G. Dunden*: Oil Development in the Structurally Complex West Bayan Field, Offshore Sarawak, East Malaysia
11:40 U. Ahmed: Optimization of Reservoir Development and Production Using Fullbore PFI Data
12:05 R.R. Carter, S. Salabudin, T.C. Ho: Geological Input to Reservoir Simulation, Champion Field, Offshore Brunei

Southeast Asian Plate Tectonics/Stress Models

Z. Zhou, R.J. Whittington: Tectonic Evolution of the Pearl River Mouth Basin, Northern South China Sea
P.D. Babineau, T.J.G. Francis, J.G. Baldau, J.P. Allam: Scientific Drill Results Bordering Southeast Asia
P. Fan: Tectonic Patterns and Cenozoic Basalts in the Western Margin of the South China Sea
K.A. Maher: A Cenozoic Tectonic Model for Southeast Asia — The Microplate Approach
D.S. Kusuma, H. Panggabean, S.A. Mangga: The Tertiary Geology of Bayah Area in Relation to the Evolution of West Java
T. Lee: Cenozoic Plate Reconstruction and Implied Stress Patterns in Southeast Asia
P. Hachon, X. Le Pichon, C. Rangin, P.T. Thi: New Marine Data from Vietnam Margin Limit the Amount of Extrusion of Indochina During the Opening of the South China Sea
H. Ahrendt, B. Hansen, K. Wemmer: Tertiary Nappe and Thrust Tectonics in Western Thailand Deduced from U/Pb, Rb/Sr, and K/Ar Age Determinations

Basin Development and Modelling, Part II

Tun Dr. Ismail B
PRESIDING: H. D. Tija and S. T. Sandai

14:00 Introduction
14:30 N. Mountford: Hydrocarbon Prospectivity Assessment of the Southern Pattani Trough, Gulf of Thailand
15:45 Break
16:55 M.F. Abdul Halim: Thermal Regimes of Malaysian Sedimentary Basins

* Denotes speaker other than senior author.
Short Courses

The 1994 AAPG conference offers two short courses (one pre-conference and one post-conference) dealing with highly topical and diversified subjects which stand in today's limelight of technical development and its application in the industry. These courses are considered to be of interest and benefit to a wide range of experienced petroleum professionals from research scientists and technological specialists to petroleum and contract managers.

Courses will be held in the Putra World Trade Centre. Prices are quoted and guaranteed in U.S. Dollars.

IMPORTANT: If any of these short courses are likely to meet your needs or those of your professional staff, you are strongly encouraged to register early.

All courses are limited in size, and undersubscribed courses will be cancelled. It would be a shame if one of these courses was cancelled because of late registrations. The longer you wait to register, the harder it is to change last-minute plans, such as airline and hotel reservations. We caution you about purchasing non-refundable airline tickets in order to attend a course.

Short Course 1. Development and Reservoir Management

Date/Location: Saturday, August 20 through Sunday, August 21, 08:00-17:00, Putra World Trade Centre
Instructor: Robert M. Sneider (R.M. Sneider Exploration, Houston, Texas, USA)
Fee: US$450
Limit: 50 persons
Content: 1.4 CEU

This two-day course summarizes the advances made in concepts and methodology for reservoir development, description, and management that can lead to improved hydrocarbon recovery. It will provide participants with knowledge on controls of reservoir pore space distribution and an understanding of the reservoir pore space distribution and an understanding of the petroleum engineers, and supervisors who are involved with field development and management. Participants should have three to 10 years' experience.

Short Course 2. Application of Sequence Stratigraphy to Hydrocarbon Systems

Date/Location: Thursday, August 25 through Friday, August 26, 08:00-17:00, Putra World Trade Centre
Instructor: John C. Van Wagoner (Exxon Production Research Co., Houston, Texas, USA)
Fee: US$450
Limit: 50 persons
Content: 1.4 CEU

This course will introduce the fundamentals of sequence stratigraphy and illustrate the methodology of how sequence stratigraphy is applied, primarily in a producing setting. Participants will understand sequence stratigraphy terminology, parasequences and parasequence sets, including how to identify these stratigraphic units in logs and cores and how to use these units to effectively zone reservoirs and locate bypassed oil; sequence boundaries, including an in-depth discussion of the criteria used to identify these boundaries and what these boundaries look like in well logs, cores, and outcrop; systems tracts, including the facies components of each systems tract, the parasequence stacking patterns within systems tracts, and the controls that systems tracts exert on reservoir and seal; how to recognize sequences in well logs and cores; and how sequence concepts are used to correlate reservoirs and how they are applied to producing fields to improve production performance and increase field reserves.

Topics include the philosophy of sequence stratigraphy; beds and bedsets and their importance for well-log correlation; parasequence concepts illustrated with examples from well logs and cores cut on the outcrop; the differences between parasequences and formation stratigraphy and the practical significance of these differences; parasequence set concepts and their application to reservoir correlation; an introduction to sequences and systems tracts along different types of basin margins; sequence and sequence boundary examples in outcrops and cores; incised valleys in outcrop and subsurface, including well-log correlation exercises; and application of sequences and sequence boundaries to producing fields.

Emphasis will be on the practical application of sequence stratigraphy, supported with excellent examples from outcrops in the western United States, cores cut on the outcrops, well-log cross section exercises, and examples from producing fields.

This course is designed for exploration and production geologists, reservoir engineers, geological supervisors, and seismic interpreters. Participants need a basic understanding of facies geology and well-log correlation.
Generating Successful Oil/Gas Business in Southeast Asia
(organized by the Institute for International Research)

Date/Location: Thursday, August 18 through Friday, August 19, 09:00-17:15, Hotel Istana
Chairman: Dr. Kenneth M. Knott (Director/CEO Permata, Petronas Management Training Sdn. Bhd., Malaysia)
Fee: US$995 AAPG conference participants
Limit: 250 persons
Who should attend: Managing directors, exploration & production managers, technical and business advisers, operations managers, business and oil analysts, contract managers, and decision-makers in the service/supply sectors

International Advisory Panel
- YB Dato' Mohamad Idris Mansor, EVP, PETRONAS and MD/CEO, PETRONAS Carigali Sdn. Bhd., Malaysia
- Viset Choopiban, President, PTI Exploration & Production Public Co. Ltd., Thailand
- Datuk C. J. Knight, Chairman, The Shell Companies, Malaysia
- Umar Qureshi, Vice President and General Manager, South & East Asia, Schlumberger Technical Services Inc., Indonesia
- David Melzer, Managing Director, Premier Oil Pacific Ltd., Singapore
- Dalip Pathak, Chief of Regional Mission, International Finance Corporation, Thailand
- G.A.S. Nayoan, Senior Vice President, Director Exploration and Production, Pertamina, Indonesia

This pre-conference forum is a unique venture for the AAPG's international conference. With a number of Southeast Asian states experiencing more than 8 percent annual GDP growth, the opportunities for business in the global oil/gas industry are such as to warrant closer analysis as the demand for energy fuel supplies increases.

Country focus: Malaysia, Indonesia, Singapore, Thailand, Philippines, Brunei, and the Mekong region (focus on Vietnam)

Forum structure: Each day will commence with a keynote address by a prominent Asian industrialist who will offer a broad overview of the issues involved in that day's papers and workshops.

Day One Address: The Prospectus for Profitability in Southeast Asia's Oil/Gas Sector: The Economics of Exploration
Day Two Address: The Requirements for Business Success in Southeast Asia: The New Asia, New Markets, New Business Opportunities

The forum will have four main sessions, each designated as "Geo-Business Issues" for the Southeast Asian region. Each session will have two or three main presentations, after which Forum delegates will have the chance for a more detailed examination and questioning of the issues presented in strategy workshops. These workshops will allow extra expert panelists to expand on the issues.

Day One: August 18
Focus is on two key issues:
1. Forecasts of oil/gas reserves and opportunities
2. Production-sharing contracts: a regional and national focus

Speakers will focus on the key areas affecting prospectivity. The morning session will highlight three central topics: gas opportunities in the region, small field developments, and deep-water exploration. Where are the areas of greatest potential? What are the national incentives for exploration and development? Which countries will be taking up deep-water exploration? And where are the small field developments in Southeast Asia?

The afternoon session will examine production-sharing contracts. How do PSCs affect the development of new energy sources? What are the present and foreseeable government incentives for PSCs in the region? Which states offer the best terms and conditions for E&P investment?

A panel discussion will allow delegates a full and open opportunity to question all the key speakers of the day.

Day Two: August 19
Three main topic areas are:
1. Southeast Asia's finance and banking structure (three main papers)
   - Investing in Southeast Asia's oil/gas industry: understanding the financial framework for foreign investors
   - Strategic structuring of joint ventures for oil/gas projects in the region
   - Project finance for oil/gas ventures

The morning session will give delegates the opportunity to hear the latest on the region's economic situation, options, and strategies for oil/gas investment and certifying oil/gas reserves.

The three topic areas will give delegates a full overview of oil/gas financing in the region with finance, banking, and legal experts within the Asian petroleum sector presenting and answering key issues you need to know about. What are the economics and risks by sector? What are the benefits and risks in Southeast Asian joint ventures?

The final afternoon session will examine:
2. Opportunities and effectiveness in service/supply contracts for Southeast Asia
3. Project management and corporate management issues

Here the focus turns to the supply sector and human resource issues that affect business in Southeast Asia. Issues such as maximizing service alliances, contractor-driven project management, national cultural and social factors, contracting methods and conditions, and quality assurance will be examined at these two sessions and in the strategy workshops. The workshops will allow for a more detailed country-by-country examination.
Field Trips

The 1994 International Conference also presents a diversified program of four regional field trips dealing with highly topical subjects. Links with selected short courses provide additional benefit to professionals who attend mutually related events.

Trips appropriate for spouses are indicated. Prices are guaranteed in U.S. Dollars. Trips returning on Sunday, August 21 will return in time for the conference's opening reception.

Field trip participants are advised to consult their physicians regarding malaria prevention and should check with their local embassies before traveling to any of these destinations.

If any of these field trips is likely to meet your needs or those of your professional staff, you are well advised to make early reservations. Trips will be cancelled if undersubscribed; it would be a shame to miss a great opportunity if the trip of your choosing would be sold out or cancelled due to low preregistration. Also, most field trips require participants to make their own flight arrangements. Therefore, we caution you about purchasing non-refundable airfares.

Once preregistration closes or a field trip sells out, participants will receive a letter of instructions via fax (be sure to include your fax number on your registration form) for their particular trip, notifying them of all details, including where to meet, hotel phone numbers, special equipment, etc.

Don't be left out! Register early! The preregistration deadline is July 15, 1994.

IMPORTANT!

Warta Geologi, Vol. 20, No. 1
Trip #1. Geology of the Petroliferous North Sumatra Basin

**Date:** Wednesday, August 17 through Sunday, August 21

**Leaders:** B. Situmorang, B. Yulihanto, S. Sofyan (LEMIGAS, Indonesia), C.A. Caughey (Asamer Oil Ltd., Indonesia), and R. Rory (Mobil Oil Indonesia, Indonesia)

**Fee:** US$700 (includes 4 nights’ lodging based on single occupancy, 4 breakfasts, 4 lunches, 4 dinners, refreshments, coach transportation, flight on August 20, 2 cultural shows, guidebook, hat, and T-shirt)

**Limit:** 40 participants maximum; 25 participants minimum

**Suitability:** Professionals and spouses

This trip will provide an insight into the geological setting of the North Sumatra basin and includes visits to the basement rocks, the petroliferous Tertiary clastic and carbonate sequences and the young volcanics.

**NOTE:** Participants are required to make their own flight arrangements to Medan and from Medan to Kuala Lumpur after the trip. They are to check in at a designated hotel in Medan on August 17, followed by an introductory briefing on the geology of the North Sumatra Basin after dinner.

**August 17**
Check in at designated hotel in Medan. Dinner, introductory briefing, and overnight stay in Medan.

**August 18**
Early flight to Lhok Sukon after breakfast. Transfer to Rantau Panjang. Discussion on the Perlak Field, followed by geological stops at Keutanang deltaic sequences, Baong turbidites, Peutu Limestones, and the Bampo formation. Lunch, dinner, and overnight stay at Rantau Panjang. Discussion on the Peutu and Baong facies at night.

**August 19**
Travel to Lhok Seumawe and visit the giant Arun Field. Discussion on the geology of the Arun Field and facilities followed by examination of continuous core of the Arun Field. Recap on the Peutu Reef, gas prospects, CO₂, etc. Lunch, dinner, Acehenese cultural show, and overnight stay in Mobil Camp.

**August 20**
Early flight to Medan after breakfast. Travel to Prapat via Brastagi. En route will be geological stops in Toba tuffs, Prapat Microdiorite, the Paleozoic Bohorok Formation, and Sibaganding limestone of the Kuala Formation. A visit to a traditional Batak village in Tomok, Samosir Island within Lake Toba will also be made. Dinner, Batak cultural show, and overnight stay in Parapat.

**August 21**
Travel from Parapat to Medan after breakfast. Afternoon flight on your own to Kuala Lumpur to arrive in KL in time for Icebreaker (suggested flight Malaysia Airlines 721 MH).

Trip #2. Geology of the Kuala Lumpur and Batu Arang

**Date:** Sunday, August 21, 08:00-17:00

**Leaders:** Ahmad Tajuddin, Azhar Hussin, Khoo Teng Tiong, and Mustaffa Kamal Shuib (University of Malaya)

**Fee:** US$50 (includes transportation, guidebook, hat, and lunch)

**Limit:** Two groups, each with 38 participants maximum and 25 participants minimum

**Suitability:** Professionals only

**Field Trip #2:** Interbeds of thin-graded beds of sandstone and siltstone with oil shales in the lacustrine sequence of the Tertiary Batu Arang basin, Malaysia. Photo by Azhar Hussin.

*Jan-Feb 1994*
This trip includes visits to several exposures of Paleozoic rocks, Triassic granites, and the Batu Arang Tertiary basin. The Tertiary basin fills are fluvial and lacustrine sediments in which coal beds and oil shales are found.

Participants will travel to the western foothills of the Main Range, where lower Paleozoic schists and marbles and the Triassic Main Range Granite are exposed. A visit to Batu Caves will also provide a panoramic view of the Klang Valley, where Kuala Lumpur is located.

The Batu Arang Tertiary basin is located about 30 km north of Kuala Lumpur. The basin fills include cross-bedded channel sands, coals, and carbonaceous shales, lacustrine oil shales, silisstones, and intraformational conglomerates, and a thick sequence of Quaternary Boulder Bed. This is the best-exposed Tertiary sequence in Peninsular Malaysia.

This trip departs from and returns to the Putra World Trade Centre.

**Trip #3. Geology and Geologic Resources of Phuket Island and Peninsular Thailand**

**Date:** Wednesday, August 24, 18:15, through Sunday, August 28

**Leaders:** Prinya Putthapiban, Thara Lekuthai and Raksaskulwong (Department of Mineral Resources, Thailand)

**Fee:** USS550 single occupancy; USS450 double occupancy (includes 4 nights’ lodging, transfer from conference venue to airport in Kuala Lumpur, coach transport, 3 meals per each of 4 days, and airport transfer in Phuket)

**Limit:** 40 participants maximum; 18 participants minimum

**Suitability:** Professionals and spouses

This trip will provide participants with an overview of the geology and geologic resources of Phuket Island and the adjacent part of Peninsular Thailand. Of special interest is the pebbly mudstones of the late Paleozoic Phuket Group, which many workers have used as a basis for the reconstruction of Gondwana paleogeography. In the Krabi Province, visits will be made to Mesozoic sequence, which has petroleum source rocks potential and the Tertiary lignite deposits. These deposits serve as important indicators to the hydrocarbon potential of the southern part of Peninsular Thailand and the offshore area.

**NOTE:** Participants are required to make their own flight arrangements from Kuala Lumpur to Phuket — Thai Airways flight 424 TG, arriving 18:25 Thai time — and their own return journey from Phuket.

**August 24** Transfer from convention venue to airport for flight Thai Airways flight 424 TG (departure time 18:15) from Kuala Lumpur to Phuket. Dinner and overnight stay in Patong Beach, Phuket.

**August 25** Visit to geological sites in Phuket: Paleozoic clastic and carbonate sequences, granites, and associated mineralizations. Breakfast, lunch, dinner, and overnight stay in Phuket.

**August 26** Travel overland to Krabi after breakfast. Study the Mesozoic sequence and the Tertiary lignite deposits in the Krabi Province. Lunch, dinner, and overnight stay in Krabi.

**August 27** Depart for the Phang Nga Bay. Board on boats to study the geology in the Bay area. Return to Phuket in the evening. Lunch in Panji Island. Dinner and overnight stay in Phuket.

**August 28** Breakfast in Phuket. Departure arranged on an individual basis.

Field Trip #3: Upper Paleozoic rocks of a lower sandstone and shale sequence overlain by thick-beded limestone, Krabi Province, Thailand. Photo by Azhar Hussn.
Trip #4. Tertiary Basin of North Sarawak

Date: Thursday, August 25 through Monday, August 29

Leaders: Boniface Bait (Sarawak Shell Berhad, Malaysia) and Richard Mani Banda (Geological Survey of Malaysia, Malaysia)

Fee: USS650 (includes 4 nights’ lodging based on single occupancy, coach transportation, guidebook, 4 breakfasts, 3 lunches, 1 dinner, 1 cultural show, and refreshments)

Limit: 28 participants maximum; 18 participants minimum

Suitability: Professionals only

This trip will provide an insight into the architecture of the North Sarawak basin and its sedimentary sequences. Both the clastic and carbonate sequences are the facies equivalent of hydrocarbon-bearing rocks in the onshore and offshore areas of Sarawak.

NOTE: Participants are required to make their own transportation arrangements from Kuala Lumpur to Bintulu on August 25 and their journey home from Miri on August 29.

August 25 Participants travel to Bintulu on their own for overnight stay at a hotel in Bintulu, to be specified later.

August 26 After breakfast, an excursion south of the Bintulu area, where the basement rocks and the older part of the Tertiary basin fills are superbly exposed. Lunch in Bintulu. Continue the study of the Tertiary sequences in the north Bintulu area. Overnight stay in Bintulu.

August 27 Depart for Miri after breakfast. En route, stops will be made at a few exposures of clastic facies and the Subis Limestone. Excursion and picnic lunch at the Niah National Park. Onward journey to Miri, with a few stops along the way. Overnight stay in Miri.

August 28 After breakfast, a full-day excursion around the Miri Field and the Lambir area. Lunch in the Lambir National Park. Dinner, cultural show, and overnight stay in Miri.

August 29 Breakfast in hotel and departure, arranged on an individual basis.

NOTE: You can make your own arrangements for additional visits to the Mulu Caves or other interesting areas. For tour package information, contact Holiday Tours, fax 03-2443006.
**Optional Sightseeing Tours**

An exciting array of sightseeing tours will be offered Sunday, August 21 through Wednesday, August 24. Prices are quoted and guaranteed in U.S. Dollars. Representatives will be available at the tour desk to answer questions and sell tickets for any available tours. All tours include transportation; pickup from conference hotels and the Putra World Trade Centre will begin 30-45 minutes prior to tour departure times listed and will return to the conference hotels. Tours depart daily; you may use your tour ticket for any day during the conference.

**Kuala Lumpur City Tour**

**Date:** Departs daily at 09:30 and 14:30 (tour lasts three hours)

**Fee:** US$10

View a fine range of Malaysian handicrafts at Karyaneka Handicraft Centre before proceeding toward the Royal Palace. Drive through Chinatown and view Jame Mosque, one of the oldest mosques in Kuala Lumpur. Afterward, visit the National Monument before stopping at the National Museum for insight into Malaysia as a whole. View KL's quaint Moorish architecture, including the railways station and Sultan Abdul Samad building, before returning to your hotel.

**Batu Caves and Countryside Tour**

**Date:** Departs daily at 09:30 and 14:30 (tour lasts three hours)

**Fee:** US$10

Tour the surrounding countryside while driving along "Ambassadors' Row" and viewing Rumah Malaysia. Visit a rubber plantation for a short explanation of how rubber is converted from latex to a rubber sheet ready for exportation. Visit a batik factory and observe how a length of plain white cotton is transformed into exotically patterned fabric, using skills passed down through generations. Then visit the Royal Selangor Pewter Factory and see how pure tin and antimony are fashioned into beautiful items. Climb up the steps of Batu Caves to pay respect to a Hindu deity set in a deep grotto framed with stalactites and stalagmites. Visit a scorpion farm where several tropical species are bred and see a wide range of tropical butterflies and insects.

**Pulau Ketam Rural Adventure**

**Date:** Departs daily at 08:30 (tour lasts nine hours)

**Fee:** US$32 (includes lunch)

Depart Kuala Lumpur for a one-hour ride to Port Klang, Malaysia's busiest port. Take a short "Tongkang" ride to the ferry for a 70-minute ferry ride through the busy harbor and the mangrove swamps of nearby islands. On arrival in Pulau Ketam, take a leisurely stroll to see how an entire fishing community lives in a village where even the roads are built on stilts. Lunch will be provided at a local restaurant. After lunch, catch the ferry for the return trip to Port Klang. View the fabulous palace of the Selangor Sultan, then proceed to Kuala Selangor, where you can immerse yourself in the serenity and tranquility of the countryside where miles of swaying coconut palms are punctuated by typical Malay villages and cast crop plantations of coffee and cocoa. On arrival, visit Fort Altingsburg in Bukit Melawati. This battleground for many a confrontation between the Malays and the Dutch has today become home to the long-tailed macaques and the silverleaf monkeys. After a short stop at the rest house here, we will proceed to Kuala Lumpur via a scenic road dotted by little villages, oil palms, and rubber plantations.

**Frasers Hill**

**Date:** Departs daily at 08:45 (tour lasts eight hours)

**Fee:** US$30 (includes lunch)

Drive northward up the north-south highway to the base town of Kuala Kubu Baru. From here we begin the uphill journey, reaching "The Gap" at about 10:45. Amidst the virgin tropical jungles and cool mountain air, we take a refreshment stop at the rest house and recover from the long winding drive. The road from here is one way, being open for ascending traffic at odd hours and for descending traffic at even hours. On arrival...
at the top, we will drive around the golf course and take a short stop for photographs before proceeding to a local restaurant for lunch. After lunch, we will head for the Jeriau Waterfalls, a journey which consists of a 20-minute drive followed by a short walk through dense tropical jungle. Take a cool refreshing swim at the waterfalls or just sit back and admire the awe-inspiring creations of mother nature.

**Malacca Tour**

*Date:* Departs daily at 09:30 (tour lasts eight hours)  
*Fee:* US$30 (includes lunch)

Arrive in historically exciting Malacca in a little over two hours. On arrival, visit St. Peter's Church. Then drive past the largest 17th-century Chinese cemetery outside of China, located at Bukit China or Chinese Hill. Stop at the foothills to view the Sultan's Well before driving through the Portuguese Settlement. Proceed to view the famous gateway, “Porta De Santiago,” and the ruins of St. Paul's Church, lined by 17th-century Dutch tombstones. Next on the list is “Red Square,” the salmon-pink Dutch administrative buildings which today house the Malacca Museum and other government offices. Visit Christchurch before proceeding for lunch at a local restaurant. After lunch, visit the “Abode of the Green Merciful Clouds” or the Cheng Hoon Teng Temple. Take a stroll along Malacca’s antique street, which ends by the banks of the Malacca River. Our drive back includes short stops for photographs of Malay villages and plantations.

**Genting Highlands**

*Date:* Departs daily at 09:30 (tour lasts eight hours)  
*Fee:* US$25 (does not include lunch)

A relaxing 90-minute drive through dense tropical vegetation brings us to the summit, which includes a short stop at the fascinating Chin Swee Caves Temple (the idea is to pray for a little luck before laying your chips on the table). Upon reaching the Highlands, visit the casino and join in the excitement. Also within the same complex are an amusement centre and a 16-lane bowling alley.

For a bird’s-eye view of the mountains, take a ride on the cable car. Outside the casino complex, the atmosphere is altogether different. Designed for family fun, a beautifully landscaped lake takes center stage. Enjoy a leisurely boat ride around the lake or take the kids on a minitrain ride. Or have fun on the antique and bumper cars. Depart for the return to Kuala Lumpur at 15:30.

*NOTE:* A long-sleeved batik shirt or a long-sleeved shirt with a tie is required for entrance into the casino. Children under 18 are not allowed into the casino.

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**KL by Night**

*Date:* Tuesday, August 23, departs 18:45  
*Fee:* US$28 (includes dinner)

Drive through the city at night to see lights ablaze. Visit the Seri Mahamariamman Temple, where the incessant chantings of Hindu priests and the mystical aura will give you an everlasting impression of this fascinating religion. Walk through Chinatown and see rows of food stalls, each with its own specialty, and taste the local delicacies at a full-course Chinese dinner at a popular restaurant.

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*Petak ng Street in Chinatown is famous for its exotic food, fresh fruits, medicine shops, funeral parlors, and printed fabrics. Locals and visitors alike look for anything from imitation watches to ethnic jewelry, wall hangings, and teapots, brought over from India and Burma by Nepalese traders. Photo courtesy of Holiday Tours.*

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*Jan-Feb 1994*
Post-Conference Tours

Special AAPG post-conference tours have been arranged by TRAVEL DESIGNS, AAPG's official travel agency. These fully escorted trips will be for AAPG members only and are based on a minimum number of participants. Brief itineraries follow for these trips; contact TRAVEL DESIGNS for more detailed information and payment procedures.

Custom-designed pre- or post-conference trips can be easily arranged by the specialists at TRAVEL DESIGNS.

Imagine a trip to the exotic island of Bali, a shopping excursion to Hong Kong, or an unforgettable train journey on the Eastern & Oriental Express. Custom-designed pre- or post-conference trips can be easily arranged by the specialists at TRAVEL DESIGNS.

Send payments and written inquiries to: TRAVEL DESIGNS, 6931 South 66th East Ave., Tulsa, OK 74133.

TRAVEL DESIGNS

Post-Conference Tour #1. An Adventure in Borneo

Date: Thursday, August 25 through Wednesday, August 31

Fee: US$725 per person, based on double occupancy (includes all meals [FAP], except during your stay at the Hyatt Saujana; does not include airfare — flight segments described below need to be included in your international itinerary)

The very name Borneo is enough to conjure up exotic images in the mind of even the most pragmatic traveler. Sarawak is the Malaysian state which occupies the northwest portion of the island of Borneo, and it is here, in Sarawak, where our adventure begins. The geological sights on this trip are spectacular!

August 25 You will be picked up at your hotel and transferred to the Kuala Lumpur airport for the flight to Kuching. Upon arrival, transfer to the Damai Beach Resort, situated on the South China Sea, with the rain forest-clad Mount Santubong as the backdrop. In the afternoon, visit the Sarawak Cultural Village, which showcases the myriad cultures and ethnic expressions of Malaysia’s largest state. In the evening, enjoy dinner at the hotel poolside.

August 26 Depart for Bako National Park, one of the best places in Sarawak to see wildlife in a natural setting. You can hike on jungle trails and swim in the sea by secluded beaches. Tonight, have a traditional welcome as a jungle feast is served in the Iban longhouse in the Sarawak Cultural Village.

August 27 Depart for the Semengok Orang Utan Center, where a walk through the rain forest brings us face-to-face with the “wild men of Borneo.” This center was established with the purpose of re-introducing the captive orang utan to the wild. Return to Kuching for lunch with a local art collector. After lunch, have a city tour of Kuching, including the famous Sarawak Museum. You’ll have time for shopping in Kuching, one of Asia’s most charming cities, with its riverwalk and wonderful handicraft shops, before our return to Damai. Dinner will be served at the hotel.

August 28 Depart by flight from Kuching to Mulu via Miri and transfer to the Royal Mulu Resort and the Mulu National Park, home of the world’s eighth wonder and oldest tropical rain forest. Hike to Lang’s Cave, with its beautiful stalactites, stalagmites, and cave curtains. Behold the Deer Cave, the world’s largest cave passage, which could hold London’s St. Paul’s Cathedral five times over. At the end of the Deer Cave is the Garden of Eden, open to the sky but completely encircled by the limestone massif. See the uncanny profile of Abraham Lincoln as you exit the cave. Weather permitting, wait for the bat exodus from the entrance.
of the cave and return by torch light to the resort, where dinner is served.

August 29 Visit the Clearwater Cave, holding Southeast Asia's longest cave system and the superb, aptly named Wind Cave. Today involves a degree of walking and stair climbing. Lunch will be served en route. Visit the Batu Bungan longhouse settlement before returning to the resort for dinner.

August 30 Depart for the airport for the flight from Mulu to Kuala Lumpur via Miri. Upon arrival, transfer to the elegant Mutiara Beach Resort, a five-star hotel located in the resort area of Malaysia, Penang. The rest of the day is at your leisure to relax by the beach or to try bargaining at bazaars for a wide array of local crafts. Dinner is served at The Catch Seafood Restaurant, a unique and exciting restaurant at the resort.

August 31 Transfer to the airport for the flight to Kuala Lumpur and an overnight stay at the Hyatt Saujana.

September 1 Transfer to the airport for your international flight home.

Post-Conference Tour #3. Exotic Thailand
Date: Thursday, August 25 through Thursday, September 1
Fee: US$835 per person, based on double occupancy (includes breakfast daily, some meals, and the flight from Bangkok to Phuket; does not include Kuala Lumpur/Bangkok and Phuket/Kuala Lumpur flights, which need to be included in your international itinerary)

August 25 Fly from Kuala Lumpur to Bangkok and transfer to the elegant Shangri La Hotel. Tonight, dinner will be held at Furama, a delightful local restaurant.

August 26 Following breakfast, we’ll have a full-day Phuket Island tour by King Cruiser, including a buffet lunch and dinner at Baitong.

August 27 Have the morning at your leisure before our flight to the beautiful and internationally renowned island of Phuket. You’ll stay at the exquisite Meridien Hotel and later dine at the Tungka Restaurant.

August 28 Following breakfast, we’ll have a full-day Pee Pee Island tour by King Cruiser, including a buffet lunch and dinner at Baitong.

August 29 Enjoy a full day at your leisure.

August 30 Enjoy a full day at your leisure.

August 31 Transfer to the airport for the flight to Kuala Lumpur and an overnight stay at the Hyatt Saujana.

September 1 Transfer to the airport for your international flight home.
Hotel Information

IMPORTANT! Hotel reservation deadline: July 1!

AAPG HAS SECURED special conference rates at several hotels in Kuala Lumpur. To obtain these rates, you must make your reservations through AAPG. Hotels are rated five- and four-star.

Each hotel requires one night's room deposit for each room booked. You may guarantee your room with a credit card or by check when paying for your registration and other fees. If you are using a credit card, mark the appropriate box on your registration/reservation form and be sure to provide your credit card information. Your deposit will be sent to the hotel with your reservation. If you are paying by check, you must include your hotel deposit in the amount you send to AAPG. Your room deposit will be credited to your hotel bill upon checkout.

Hotels will be filled on a first-come, first-served basis. If the hotel of your choice is not available, AAPG will place you in a hotel with a rate closest to the one you requested.

Hotel prices are guaranteed in Malaysian Ringgit — room deposits are to be paid in U.S. Dollars (approximate rate of exchange: US$1.00=RM2.5).

#1: Hotel Istana (Headquarters Hotel) *****

This elegant, world-class hotel is located in the heart of the banking, shopping, and commercial district. Rooms are air-conditioned and come with a minibar, TV/In-house movies, radio, IDD telephone, coffee/tea making facilities, personal safe, hairdryer, and bathrobes. Non-smoking rooms are available. The Hotel Istana also features extraordinary restaurants featuring international cuisine, as well as a pool, health center, gym, sauna, tennis, squash, business center, 24-hour brasserie/room service, safe deposit boxes, parking, shops, and a barber/beauty salon. Please allow 30-45 minutes by taxi to the Putra World Trade Centre, depending upon the time of day.

#2: Concorde Hotel ****

Located a short distance from the Hotel Istana, the Concorde Hotel features rooms with a minibar, refrigerator, TV/in-house movies, radio, IDD telephone, and coffee/tea making facilities. The hotel has a pool, gym, business center, 24-hour cafe/room service, safe deposit boxes, parking, shops, and a barber/beauty salon. It is near shopping and entertainment facilities. Please allow 20-40 minutes by taxi to the Putra World Trade Centre, depending upon the time of day.

#3: Pan Pacific Hotel ****

This modern hotel is connected to the Putra World Trade Centre and is opposite one of the largest shopping malls in Southeast Asia. Rooms include a minibar, TV/In-house movies, radio, IDD telephone, hairdryer, and bathrobes. Non-smoking rooms are available. The hotel features a pool, health center, gym, sauna, tennis, squash, business center, 24-hour coffee house/room service, safe deposit boxes, shops, and a beauty salon.

#4: The Legend Hotel ****

The Legend Hotel is located across the street from the Putra World Trade Centre and right above The Mall, which offers the best in shopping, entertainment, and dining. Rooms are air-conditioned and include a minibar, refrigerator, TV/in-house movies, stereo, piped music, IDD telephone, coffee/tea making facilities, and hairdryers. Other features include interconnecting rooms, 24-hour room service, pool, sauna, gym, squash, business center, airport representative service, babysitting, laundry and valet service, florist, prayer room/prayer mat, parking, shine service, travel agent service, and a 24-hour on-call doctor. You can choose from several restaurants, including Chinese, Japanese, health food, a coffee shop, and a tea lounge.
### AAPG Hotel Rates

Hotel reservation deadline: July 1!

<table>
<thead>
<tr>
<th>Hotel</th>
<th>Map #</th>
<th>Single-RM</th>
<th>Double/Twin-RM</th>
<th>1 Night’s Deposit (US$1.00=RM2.50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel Istana (AAPG Headquarters)</td>
<td>1</td>
<td>RM299</td>
<td>RM322</td>
<td>US$150*</td>
</tr>
<tr>
<td>Concorde Hotel</td>
<td>2</td>
<td>RM225</td>
<td>RM225</td>
<td>US$105*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deluxe</td>
<td>RM242</td>
<td>US$115*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deluxe/Premier</td>
<td>RM242</td>
<td></td>
</tr>
<tr>
<td>Pan Pacific Hotel</td>
<td>3</td>
<td>RM322</td>
<td>RM368</td>
<td>US$175*</td>
</tr>
<tr>
<td>The Legend Hotel</td>
<td>4</td>
<td>RM230</td>
<td>RM230</td>
<td>US$110*</td>
</tr>
</tbody>
</table>

Above rates are subject to a 10 percent service charge plus a 5 percent government tax.

Deposit includes service charge and government tax.

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**CENTRAL MARKET**

**PUTA WORLD TRADE CENTRE**

**THE MALL**

**JALAN RAJA MUDA**

**JALAN RAJA LANT**

**JALAN TUNKU ABDUL RAHMAN**

**JALAN AMPANG**

**MALAYSIA TOURIST INFO COMPLEX**

**CENTRAL MARKET**

**JALAN RAJA CHULAN**

**BINTANG**

**JALAN TAMAN PERMAK**

**MALAYSIA TOURIST INFO COMPLEX**

**CENTRAL MARKET**

**JALAN MOHD. IBRAHIM**

**CHINATOWN**

**JALAN SULTAN ISMAIL**

**JALAN DANG WANGI**

**JALAN MELAKA**

**JALAN RAJA**

**JALAN JAPAN KIJANG**

**JALAN SULTAN ISMAIL**

**JALAN SULTAN ISMAIL**

**JALAN TUNKU PERMAK**

**MALAYSIA TOURIST INFO COMPLEX**

**CENTRAL MARKET**

**JALAN TAMAN PERMAK**

**MALAYSIA TOURIST INFO COMPLEX**

**CENTRAL MARKET**

**JALAN MOHD. IBRAHIM**

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**JALAN MELAKA**

**JALAN RAJA**

**JALAN TAMAN PERMAK**

**MALAYSIA TOURIST INFO COMPLEX**

**CENTRAL MARKET**

**JALAN MOHD. IBRAHIM**

**CHINATOWN**

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**Meeting Hotels**

1. Hotel Istana
2. Concorde Hotel
3. Pan Pacific Hotel
4. The Legend Hotel

Jan-Feb 1994
Registration Information

PREREGISTRATION DEADLINE:
July 15, 1994

Fastest Way to Register:
By Fax — 1-918-584-2274
Credit card use ONLY. Fax the registration form found in the back of this announcement directly to the AAPG convention department. Our fax line is open 24 hours. DO NOT SEND ANOTHER COPY BY MAIL.

Other Ways to Register:
By Phone — 1-918-584-2555
AAGP members using credit cards ONLY. Have your member number and complete information handy. DO NOT SEND ANOTHER COPY BY MAIL.

By Mail —
Mail the registration form found in the back of this announcement to either of the following addresses:

AAPG International Conference
P.O. Box 979
Tulsa, OK 74101-0979 USA

OR

AAPG International Conference
1444 S. Boulder
Tulsa, OK 74119-3604 USA

Refund Procedures
All changes and cancellations for registrations or events must be received in writing at AAPG by July 15. All total cancellations will be assessed a US$25 cancellation fee. Refunds will be made until July 15. After that date, no refunds will be issued.

Hotel cancellations can be made without penalty until July 1. If you cancel after July 1, you will lose your one night's room deposit.

Registration Fees

<table>
<thead>
<tr>
<th></th>
<th>Advance</th>
<th>On Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member AAPG/GSM*</td>
<td>US$390</td>
<td>US$440</td>
</tr>
<tr>
<td>Non-Member*</td>
<td>US$440</td>
<td>US$490</td>
</tr>
<tr>
<td>Student**</td>
<td>US$20</td>
<td>US$20</td>
</tr>
<tr>
<td>Spouse/Guest***</td>
<td>US$80</td>
<td>US$80</td>
</tr>
<tr>
<td>One-Day Fee****</td>
<td>N/A</td>
<td>US$160</td>
</tr>
</tbody>
</table>

* Includes Icebreaker, three buffet luncheons, and a formal dinner/cultural show
** Includes Icebreaker and three buffet luncheons
*** Includes Icebreaker and a formal dinner/cultural show
**** Can only register on the day you attend; includes buffet luncheon

Registration Hours

Level 2
Putra World Trade Centre

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturday, August 20</td>
<td>08:00-17:00</td>
</tr>
<tr>
<td>Sunday, August 21</td>
<td>08:00-20:00</td>
</tr>
<tr>
<td>Monday, August 22</td>
<td>08:00-16:00</td>
</tr>
<tr>
<td>Tuesday, August 23</td>
<td>08:00-18:00</td>
</tr>
<tr>
<td>Wednesday, August 24</td>
<td>08:00-14:30</td>
</tr>
</tbody>
</table>

Important Deadlines to Remember

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1</td>
<td>Hotel reservation deadline</td>
</tr>
<tr>
<td>July 15</td>
<td>Preregistration deadline</td>
</tr>
</tbody>
</table>

Attend the Conference While Making Your Application to Join AAPG!

Individuals who have a membership application in process at AAPG may register at the member rate. Non-member professional registrants who submit an application before September 30, 1994, will have their membership dues prepaid from the difference in registration fees.

For membership information, contact: AAPG Membership Department, P.O. Box 979, Tulsa, OK 74101-0979, (918) 584-2555, fax (918) 584-0469.
# Registration Form—1994 AAPG International Conference

## DEADLINE: JULY 15, 1994
MAIL TO: AAPG Convention Department
P.O. Box 979, Tulsa, OK 74101-0979 USA
Fax: 1-918-584-2274

### AAGC Member Number

### Name (Family Name, Given Names)

### Nickname for Badge (If Desired)

### Company (Name for Badge)

### Mailing Address

<table>
<thead>
<tr>
<th>City</th>
<th>State/Country</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ZIP/Postal Code</th>
<th>Telex Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Day Phone Number (include area/country code) Fax Number (IMPORTANT)

Please check position: O/Owner/Partner/O 2/Manager/0 3/Chief/Service Geologist/0 4/Geophysicist/0 5/Ventilgeologist/0 6/Paleontologist/0 7/Professor/0 8/Independent/Consultant/0 9/Student/0 10/Other/0 12/Retired/0 13/Press

### Category Number Fee per Person Total Cost

<table>
<thead>
<tr>
<th>Category Number</th>
<th>Fee per Person</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>US$390</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>US$440</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>US$80</td>
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<td>100</td>
<td>US$20</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>FREE</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### No. of Tickets Number Person Total Cost

<table>
<thead>
<tr>
<th>No. of Tickets Number Person Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Field Trips

- **Trip #1**, August 17-21
- **Trip #2**, August 21
- **Trip #3**, August 24-28
- **Trip #4**, August 25-29

### IMPORTANT: HOTEL RESERVATION DEADLINE JULY 1!

**NO REFUNDS WILL BE ISSUED AFTER JULY 1!**

**HOTEL DEPOSITS NONREFUNDABLE AFTER JULY 1!**

**PLEASE BE SURE TO INCLUDE YOUR FAX NUMBER!**

### Hotel Reservation

**NOTE:** Suites available only upon request. Prices will be quoted upon request.

Do you want us to guarantee your hotel reservation with the above credit card information?

- [ ] Yes
- [ ] No

Indicate hotel preference by map number: 1. 2. 3.

Please check one:

- [ ] Single (1 bed, 1 person) Rate Requested ___________ Arrival Date ___________
- [ ] Double (2 beds, 2 people) No. in Party ___________ Departure Date ___________
- [ ] Twin (2 beds, 2 people) Shared Occupancy with ___________

**Special needs:**

**Would you consider being a judge?**

- [ ] Yes
- [ ] No
- [ ] Oral Session
- [ ] Poster Session
The following applications for membership were approved:

**Full Members**

1. Keith Richards, Brig-Y-Don
   43 Ty Mawr Road, Deganwy, Gwynedd, United Kingdom LL31 9UD.

2. Wolfgang S. Fletcher
   3 Stewart Place, Panddington, New South Wales, Australia 2021.

3. Robert John Esmor Jones
   Korsveien 14, 1320 Stabekk, Norway.

4. John A.K. Temaga
   Lot 487, S/L 1040, Lutong Baru, 98100 Miri.

5. Mansor Ahmad
   34-1Jalan 5/5, Taman Melati, 53000 Kuala Lumpur.

6. Malcolm P.R. Light
   7 Beechwood Way, Aston Clinton Aylesbury, Buckinghamshire HP22 5JW, United Kingdom.

7. Yogeswaran Mailuaganam
   512 Taman Hui Sing, Kuching, Sarawak.

8. Shaharin Ibrahim
   Jabatan Fizik, Universiti Pertanian Malaysia, Serdang, 43400 Selangor.

9. Nurzaidi Abdullah
   No. 12 Jalan Geale, 18000 Kuala Kroi.

10. D. Jeffrey Over
    Dept. of Geological Sciences, SUNY - Geneseo, Geneseo, New York 14454.

11. Haron Abdul Ghani

12. Dominic Yap Kam Fai
    7 Jalan Koop Cuepecs 2E, Taman Cuepecs, Jalan Cheras, Bt. 9, 43200 Selangor.

13. Wong Chun Ken
    P.O. Box 13828, 88844 Kota Kinabalu.

**Student Members**

1. Senusi Mohamed Harsha
   Jabatan Geologi, Universiti Kebangsaan Malaysia, Bangi.

2. Abdurrazagh Ezzeddin
   Jabatan Geologi, Universiti Kebangsaan Malaysia, Bangi.
PETUKARAN ALAMAT (Change of Address)

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

1. Kamarudin Zakaria
   Geological Survey Malaysia, P.O. Box 11110, 50736 Kuala Lumpur.

2. Kong Ing Chung
   No. 23-24, Lor 8635-36 (3rd Floor), Section 64, Jalan Simpang Tiga, 93300 Kuching.

3. Abd. Hanan B. Ahmad Nadzeri
   7 Jalan 10C/6, Taman Setapak Indah, 53100 Kuala Lumpur.

4. Azuhan Mohamed
   School of Civil Engineering, University of Birmingham, Edgborton, Birmingham B15 2TT England.

5. C.K. Burton

PERTAMBAHAN BAHARU PERPUSTAKAAN
(New Library Additions)

The Society has received the following publications:

7. Geological map of Indonesia: West, Central and East Kalimantan.

Jan–Feb 1994
12th Australian Geological Convention
26-30 September, 1994
The University of Western Australia

OUTLINE OF PROGRAMME

MONDAY 26 SEPTEMBER

SYMPOSIUM: "PROTERozoIC OF AUSTRALIA"
Crustal evolution
Assembly of Proto-Gondwana
Mineral and hydrocarbon deposits
Stratigraphy and sedimentology
Tectonics and metamorphism

AUSTRALIAN SEDIMENTOLOGY,
PALAEOONTOLoGY AND STRATIGRAPHy
Lakes, evaporites and associated facies
Environments, biodiversity and mineral deposits of Devonian Reefs
Australian continental margin sedimentology

TUESDAY 27 SEPTEMBER

SYMPOSIUM: "THE WISDOM OF SOLOMON - THE CONJUNCTION OF FACTORS THAT RESULT IN LARGE OREBODIES"

HYDROLOGY AND ENVIRONMENTAL GEOLOGY
Geoscience and environment
Palaeomagnetism, and global and environmental change
Environmental geology and rehabilitation in arid and tropical terrains
Hydrology and economic development in Australia and SE Asia

WEDNESDAY 28 SEPTEMBER

AUSTRALIA'S GEOLOGICAL RELATIONS WITH ITS NEIGHBOURS
Accretion and breakup of Gondwana
Geology of areas adjacent to Australia
The Archaean of the Kaapvaal and Pilbara cratons

MINERAL & FOSSIL FUEL RESOURCES OF WA
Western Australian mining in a world context
Northwest Shelf resources and future prospects
Mineral resources and future prospects of WA

NEW DEVELOPMENTS IN DIGITAL TECHNIQUES: SIMULATION, INVERSION AND DESCRIPTION
3D computer modelling in mining environments
Geophysical modelling of geology
Data capture, storage and manipulation
THURSDAY 29 SEPTEMBER

CONTROLS ON ROCKS AND FLUIDS IN SEDIMENTARY BASINS
Pressure, temperature and fluid flow in basins
Eustacy, cycles and sequences
Pre-Cambrian sequence stratigraphy
Palaeoclimates and basin evolution
SYMPOSIUM: "THE NICK ROCK SYMPOSIUM"
Alkaline rocks and associated mineralisation

POLICY ASPECTS OF AUSTRALIAN GEOSCIENCE
Geoscience education
Government and political aspects of exploration

METAMORPHIC AND IGNEOUS GEOLOGY IN AUSTRALIA
Metamorphic fluids and mineral deposits
Fluid-rock interactions during metamorphism
Archaean-Palaeozoic and circum-Pacific andesites

FRIDAY 30 SEPTEMBER

FRACTALS, CHAOS AND GEOLOGICAL PREDICTION
Fractal geometry of geology
Fractal techniques in exploration, mining and resource extraction
Cyclicity in global geology
Geological prediction

AUSTRALIAN STRUCTURAL AND CRUSTAL STUDIES
Structure and evolution of Australian basins and terranes
Crustal-scale structure
Earthquakes and earthquake risk
Influence of the mantle on intraplate crust

MINERAL AND HYDROCARBON EXPLORATION IN AUSTRALIA
Regolith and exploration for concealed orebodies
Integrated geological-geophysical-remote sensing studies
Mineral economics and resource evaluation

Circulars and information:
The Secretary, 12th AGC, PO Box 119,
Cannington WA 6107, Australia
Telephone: 61-09-351 7968
Facsimile: 61-09-351 3153

Jan-Feb 1994
### KALENDAR (CALENDAR)

#### 1994

##### April 3-8
**PALEONTOLOGY AND BIOSTRATIGRAPHY**
(6th Congress), Trelew, Chubut, Patagonia, Argentina. (Dr. N.R. Cúneo, Museo Paleontológico Egidio Feruglio, Av. 9 de Julio 955, Trelew, Chubut, Argentina. Phone: (0965) 35464; telefax: (0985) 32658)

##### April 10-13
**TOXIC SUBSTANCES AND THE HYDROLOGIC SCIENCES** (Meeting), Austin, Texas. (American Institute of Hydrology, 3416 University Avenue, SE, Minneapolis, MN 55414-3326, USA Phone: (612) 379-1030; telefax: (612) 379-0169)

##### April 12-15
**GEOLOGY IN EUROPE AND BEYOND II**, United Kingdom (P.R. Simpson at BGS Keyworth, Nottingham, United Kingdom. Phone: +44 602 363532, Fax: +44 602 363200.

##### April 17-20

##### April 21-26
**EFFECTS OF TRIPLE JUNCTION INTERACTIONS AT CONVERGENT PLATE MARGINS** (GSA Penrose Conference), Eureka, California, USA. (Ms. Lois J. Elms, Penrose Conference Coordinator for GSA, 4881 Evening Sun Lane, Colorado Springs, CO 80917, USA. Phone: (719) 597-9201; telefax: (719) 591-4852)

##### April 24-25

### April 24-27
**NEAR-SURFACE EXPRESSIONS OF HYDROCARBON MIGRATION: AN AAPG HEDBERG RESEARCH CONFERENCE**, Vancouver, British Columbia. (American Association of Petroleum Geologists, Box 979, Continuing Education Department Tulsa, Okla. Phone: 918/584-2555. Fax: 918/584-0469)

### April 24-28
**EDITING, ETHICS, ELECTRONICS AND ECONOMICS** (5th General Assembly and Conference), Budapest, Hungary. (EASE Secretariat, 49 Rossendale Way, London NW1 OXB, UK. Phone: 44(0)71-828 9668; telefax: 383 3092)

### April 24-May 14
**XV CONGRESS OF THE COUNCIL OF MINING AND METALLURGICAL INSTITUTIONS**, South Africa. (Bill Emmett Congress Manager 15th CMMI Congress, P.O. Box 809 Johannesburg 2000 South Africa. Phone: (27)(11) 838-8211 (office), (27)(11) 788-2518 (home). Fax: (27)(11) 834-1884)

### April 25-30
**OBSERVATION OF THE CONTINENTAL CRUST THROUGH DRILLING** (7th International Symposium), Santa Fe, New Mexico, USA. (Earl Hoskins, DOSECC, College of Geosciences and Maritime Studies. Texas A&M University, College Station, TX 77843-3148, USA. Phone: (409) 845-3651; telefax: (409) 845-0056; E-mail: HOSKINS@PLUTO.TAMU.EDU)

### May 3-5
**INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN MATERIALS AND MINERAL RESOURCES (RAMM '94)**, Penang, Malaysia (The Secretariat of the International Conference on Recent Advances in Materials and Mineral Resources (RAMM '94), School of Materials and Mineral Resources Engineering, Universiti Sains Malaysia, Perak Branch Campus, 31750 Tronoh, Perak, Malaysia. Attn: Dr. Zainal Arifin Ahmad)
| May 9-12 | GEOLOGIC REMOTE SENSING, mtg., San Antonio, Texas. (Environmental Research Institute of Michigan, Box 134001, Ann Arbor, 48113-4001. Phone: 313/994-1200 ext. 3234. Fax: 313/994-5123) |
| May 10-14 | MINING LATIN AMERICA (Meeting), Santiago de Chile. (IMM, 44 Portland Place, London W1N 4BR, UK. Phone: 44 71 580 3802; telefax: 44 71 436 5388) |
| May 15-18 | GEOLOGICAL ASSOCIATION OF CANADA/ MINEROGICAL ASSOCIATION OF CANADA (Joint Annual Meeting), Waterloo, Ontario, Canada. (Alan V. Margin, Department of Earth Sciences, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada. Phone: (519) 885-1211, ext. 3231; telefax: (519) 746-7484) |
| May 16-18 | GEOLOGICAL ASSOCIATION OF CANADA/ MINEROGICAL ASSOCIATION OF CANADA, ann. mtg., Waterloo, Ontario. (Alan V. Morgan, Dept. of Earth Sciences, University of Waterloo, Waterloo, Ontario, N2L 3G1. Phone: 519/885-1211, ext. 3231. Fax: 519/746-7484) |
| May 29-June 1 | GLACIAL CYCLES AT HIGH LATITUDES – THEIR EFFECTS ON THE PHYSICAL ENVIRONMENT (International Symposium), Fjaerland, Norway. (Dr. Anders Elvetei. Project Administrator, Department of Geology, P.O. Box 1047 Blindern, 0316 Oslo, Norway. Phone: 47-22-85 66 56; telefax: 47-22-85 42 15) |
| May 23-28 | INTERNATIONAL ASSOCIATION OF COMPUTER METHODS AND ADVANCES IN GEOMECHANICS, mtg., Morgantown, W. Va. (Society of Petroleum Engineers, Box 833836, Richardson, Texas 75083-3836. Phone: 214/952-9435) |
| May 28-June 1 | SILICICLASTIC-CARBONATE FACIES, mtg., Veracruz, Mexico, by Society for Sedimentary Geology. (Julie Ball, SEPM, Box 4756, Tulsa, Okla, 74159-0756. Phone: 918/743-9765. Fax: 918/743-2498) |

**June 5-11**

GEochronology, Cosmochronology and Isotope Geochemistry (ICOG-8) (Meeting), Berkeley, California, USA. (Garniss H. Curtis, Institute of Human Origins – Geochronology Center, 2453 Ridge Road, Berkeley, CA 94709, USA. Phone: (415) 845-4003; telefax: (415) 845-9453)

**June 6-7**

Weddell Sea Tectonics and Gondwana Breakup (Meeting), Cambridge, UK. (Dr. Edward King, Weddell Sea Meeting, British Antarctic Survey, High Cross, Madingley Road, Cambridge, CB3 0ET, UK. Phone: (0223) 62616; telex: 817725 BASCAMG)

**June 6-10 (Correction)**

European Association of Exploration Geophysicists (56th Annual Meeting and Technical Exhibition), Vienna, Austria. (Evert van der Gaag, Business Manager EAEG, P.O. Box 298, 3700 AG Zeist, The Netherlands. Phone: +31 (0)3404 56997; telefax: +31 (0)3404 62640)

**June 12-15**

American Association of Petroleum Geologists and SEPM (Society for Sedimentary Geology) (Annual Meeting), Denver, Colorado, USA. (SEPM, P.O. Box 4756, Tulsa, OK 74159-0756, USA)

**June 14-18**


**June 15-20**

Fractured Unlithified Aquitards: Origins and Transport Processes (GSA-Penhose Conference), Racine, Wisconsin, USA. (Dr. John A. Cherry, Waterloo Centre for Groundwater Research, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada. Dr. David M. Mickelson, Department of Geology and Geophysics, University of Wisconsin, Madison)

Jan–Feb 1994
Wisconsin 53706, USA. Telefax: Cherry (519) 746-5644; Mickelson (608) 262-0693

June 16-19
DINOSAURS OF WYOMING, field mtg., Casper. (Walter R. Merschat, Box 356. Casper, 82602. Phone: 307/266-4409. Fax: 307/266-1113)

June 20-24
GEOSCIENCE INFORMATION (International Meeting), Prague, Czech Republic. (Jiri G. Hruska, Geofond of Czech Republic, Kostelní 26, 170 21 Praha 7-Letna. Phone: (0042) 2 379346; telefax: (0042) 2 370647)

July
INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS (21st General Assembly), Boulder, Colorado, USA.

July 1-5
HYDROMETALLURGY, int’l mtg., Cambridge, England, by Society of Chemical Industry, and Institution of Mining and Metallurgy. (SCI, 14/15 Belgrave Square, London SW1X 8PS. Phone: 071 235 3681. Fax: 071 823 1698) [December ’92]

July 4-8
HISTORY OF GEOLOGY IN THE PACIFIC REGION, int’l mtg., Sydney, Australia by International Commission on the History of the Geological Sciences. (INHIGEO, c/o Earth Resources Foundation, Dept. of Geology and Geophysics, University of Sydney, New South Wales, Australia 2006. Phone: (02) 552 6136. Fax: (02) 552 6058)

July 5-9
FORAMINIFERA (International Meeting), Berkeley, California, USA. (FORAMS ’94, Museum of Paleontology, University of California, Berkeley, CA 94720, USA. Phone: (510) 642-1821; telefax: (510) 642-1822)

July 10-14
EARTHQUAKE ENGINEERING (6th National Conference), Chicago, Illinois, USA. (EERI, 499 14th Street, Suite 320, Oakland, CA 94612-1902, USA. Phone: (510) 451-0905; telefax: (510) 451-5411)

July 10-14
CLASTIC DEPOSITS OF THE TRANSGRESSIVE SYSTEM TRACT, mtg., Long Beach, Wash., by Society for Sedimentary Geology. (SEPM, c/o Ed Clifton, Conoco, Box 2197, Houston, 77252. Phone: 713/293-2839)

July 10-15
ENVIRONMENTAL GEOTECHNICS (International Meeting), Edmonton, Alberta, Canada. (D.C. Sego, First International Congress on Environmental Geotechnics, Dept. of Civil Engineering, University of Alberta, Edmonton, Alberta T6G 2G7, Canada. Phone: (403) 492-7228; telefax: (403) 492-8198)

July 25-29
BASEMENT TECTONICS (11th International Meeting), Potsdam, Germany. (Prof. Dr. Onno Oncken, GeoForschung-Zentrum. Telegrafenberg, D-0-1561 Potsdam, Germany. Phone: 331-310306; telefax: 331-310601)

Aug 12-18
9TH IAGOD SYMPOSIUM OF THE INTERNATIONAL ASSOCIATION ON THE GENESIS OF ORE DEPOSITS (IAGOD 1994), Beijing, China. (Dr. Wang Zejiu, 9th IAGOD Symposium, Chinese Academy of Geological Sciences, 26 Baiwanzhuang Road, Beijing 100037, China)

August 14-19
PHYSICS AND CHEMISTRY OF THE UPPER MANTLE (International Symposium), São Paulo, Brazil. (Professor Wilson Teixeira, Instituto de Geociencias. Universidade de São Paulo, P.O. Box 20899, 01498-970 São Paulo, Brazil. Phone: 55-11-8138777 ext. 3987; telefax: 55-11-2104958; E-mail: BRENHA @ IAG.USP.BR)

August 20-26
SEDIMENTOLOGICAL CONGRESS (14th International), Recife, Brazil. (Margareth M. Alheiros, 14th ISC, Caixa Postal 7801, Cidade Universitaria, 50739-970 Recife (PE), Brazil)

August 21-24
AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (International Conference and Exhibition), Kuala Lumpur, Malaysia. (AAPG Convention Department, P.O. Box 979, Tulsa, OK 74101, USA. Phone: (918) 584-2555)

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<td><strong>PROTEROZOIC CRUSTAL &amp; METALLOGENIC EVOLUTION</strong> (International Conference), Windhoek, Namibia. (Dr. G.I.C. Schneider, Geological Society of Namibia, P.O. Box 699, Windhoek, Namibia. Phone: 264-61-37240; telefax: 264-61-228324)</td>
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<td><strong>INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY</strong> (7th Congress), Lisbon, Portugal. (Organizing Committee, 7th IAEG Congress, c/o LNEC, Av. do Brasil, 101, 1799 Lisboa Codex, Portugal. Phone: 351-1-8473822; telefax: 351-1-8497660; telex: 16760 LNEC P)</td>
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<td><strong>September 8-9</strong></td>
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<td><strong>ARCTIC MARGINS</strong> (International Meeting) Magadan, Russia. (Kirill V. Simakov, North East Scientific Centre, 16 Portovaga St., Magadan, Russia, 685000. Phone: (907) 474-7219, in the USA; (7-41) 3 233-0953 in Russia)</td>
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<td><strong>INTERNATIONAL VOLCANOLOGICAL CONGRESS</strong> (International Congress), Ankara, Turkey. Sponsored by the International Association of Volcanology and Chemistry of the Earth’s Interior. (Dr. Ayla Tankut, Organizing Secretary, Int. Volcanological Congress, Dept. Geological Engineering, Middle East Technical University, 06531 Ankara, Turkey. Phone: 90-4-210-1000, ext. 2682 or 2679; telefax: 90-4-210-1263)</td>
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<td><strong>BASIN FORMATION AND INVERSION IN EUROPE-ENDOGEOUS AND EXOGENOUS ASPECTS</strong> (Annual Meeting of German Geological Society), Heidelberg, Germany. (Professor Th. Bechstadt and Professor R.O. Greiling, Geologisch-Palaeontologisches Institut, Ruprecht-Karls-Universität, Im Neuenheimer Feld 234, D-6900 Heidelberg, Germany. Phone: (06221) 562831; telefax: (06221) 565503; telex: 461515 unihd)</td>
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<td><strong>JURASSIC STRATIGRAPHY</strong> (4th International Congress), Mendoza-Neuquen, Argentina. (Dr. A.C. Riccardi, C.C. 886, 1900 La Plata, Argentina. Phone: 54-21-39125; telefax: 54-21-530189)</td>
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Jan-Feb 1994
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February 20-25
SOUTH ASIA GEOLOGICAL CONGRESS, COLOMBO, SRI LANKA. (N.P. Wijayananda, GEOSASS II Secretariat, NARA, Crow Island, Mattakkuliya, Colombo 15, Sri Lanka. Phone: 941 555008. Fax: 941 522932)

March 5-8
AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS, ann. mtg., Houston. (AAPG, Box 979, Tulsa, Okla. 74101. Phone: 918/584-0469)

March 6-9
SOCIETY FOR MINING, METALLURGY, AND ENGINEERING, ann. mtg., Denver. (SME, Box 625002, Littleton, Colo. 80162-5002. Phone: 303/973-9550. Fax: 303/979-3461)

April 10-13
GEOLOGY AND ORE DEPOSITS OF THE AMERICAN CORDILLERA, mtg., Reno/sparks, Nev. (Bob Hatch, Geological Society of Nevada, Box 12021, Reno, 89510. Phone: 702/323-4569. Fax: 702/323-3599)

May 15-19
EXPLORING THE TROPICS, int'l mtg., Townsville, Queensland, Australia. (Russell Myers, 171GES, National Key Centre in Economic Geology, James Cook University, Townsville, 04814. Phone: 077-814486. Fax: 61-77-815522)

May 29-June 2
EUROPEAN ASSOCIATION OF EXPLORATION GEOPHYSICISTS (57th Annual Meeting and Exhibition), Glasgow, UK. (Evert van der Gaag, European Association of Exploration Geophysicists, Utrechseweg 62, NL-3704 HE Zeist, The Netherlands. Phone: (03404) 56997; telefax: (03404) 62640; telex: 33480)

June 11-16
AMERICAN NUCLEAR SOCIETY, ann. mtg., Atlantic City, N.J. (ANS, 555 N. Kensington Ave., La Grange Park, III. 60525. Phone: 312/352-6611)

June 12-16
ORDOVICIAN SYSTEM, int'l mtg., Las Vegas, Nev. (Margaret Rees, Dept. of Geosciences, University of Nevada, Las Vegas, 89154-4010. Phone: 702/739-3262. Fax: 702/597-4064)

June 18-22
RAPID EXCAVATION AND TUNNELING, mtg., San Francisco. (Society for Mining, Metallurgy, and Engineering, Box 625002, Littleton, Colo. 80162-5002. Phone: 303/973-9550. Fax: 303/979-3461)

July 2-14

August 28-September 2
ORIGIN OF GRANITES, Hutton Symposium, College Park, Md. (Michael Brown, Dept. of Geology, University of Maryland, College Park, 20742. Phone: 301/405-4082. Fax: 301/314-6661)

October 10-14
PALEOCEANOGRAPHY, int'l mtg., Halifax, Nova Scotia. (Larry Mayer, Ocean Mapping Group, Dept. of Surveying and Engineering, Box 4400, Fredericton, New Brunswick, Canada E3B 5A3)

November 6-9

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