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Majlis (Council) 1980/81

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CATITAN GEOLOGI
(GEOLOGICAL NOTES)

COLLAPSED PUMICE PHENOCLASTS IN A META-BRECCIA OF PULAU TIOMAN

H.D. TJIA*, Department of Geology, Universiti Kebangsaan Malaysia, Kuala Lumpur

Medium to large seized clasts of unusual shapes occur in a meta-sediment at Tanjung (or cape) Keramat near the northern tip of Tioman Island. The cape and surrounding area consist of pyroxene hornfelsic rock with interbeds of quartzite according to the geological map by Bean (1973, published in 1977 together with Map bulletin 5). Khoo (1977) includes the same rocks into a map unit that is composed mainly of acid to intermediate volcanics, that on the east coast of Tioman also contain lava. A detailed stratigraphic column of Tanjung Keramat is shown in Fig. 1. The rocks are principally well-banded metamorphic clastics with one metabasaltic sill. On the southern and eastern (or landward) sides these rocks are bordered by granitoids. The metaclastics strike between SSE and S with very steep dips toward west or are sometimes somewhat overturned. Facing was determined by the presence of cross lamination (especially in unit 1 in Fig. 1), graded bedding of coarse- to fine-grained sand-size particles (units 2 and 8), small scour marks with infillings (unit 1), load sags (unit 3), and concentration of sharpstone conglomerate (unit 9). The sedimentary features indicate that unit 1 through unit 8 up to the gap of exposure are progressively older. On the other hand, in the field the sharpstone conglomerate of unit 9 is located on the west side of the north-south striking and very steeply dipping beds. The situation of unit 9 suggests top towards east or opposite to that indicated by the sedimentary structures of unit 1 through part of unit 8. An isoclinal anticline with nearly vertical, north-south trending axial plane is therefore suggested. The axial plane is probably located at or near the gap of outcrop of unit 8.

Within the metaclastics of unit 7, which is less than a metre thick, are found very light-coloured blebs and weakly undulating shards concentrated in a few decimetre-thick zones. This view is obtained in cross section. These clasts strongly contrast with the general dark grey and dark greenish colours of the unit. In cross-section, the length-width ratios of the pale fragments are generally 5:1 to 7:1; their lengths ranging from a few millimetres to 8 or 9 centimetres. In planes parallel to compositional banding, the pale clasts have more equant shapes, but may show some elongation up to ratios of less than 2:1. The clasts in this plane do not exhibit apparent orientation. Fig. 2 is a plan view, which is also a cross-section of lithologic unit 7. The graded sequences in layers m and p indicate that top is toward layer k, which in the field

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*With the participation of Abu Bakar Abu Samah, Ismail Che Mat Zin, Jaybee Buayie @ Jaebeh Buayeh, Kawan @ Thomas Kuud Nyanat, Markonah Kusnin, Mohd. Ariffin Abd. Kadir, Mohd. Zaidi Mohd. Hassan, Sahura Abu Samah, Uyop Said, Wan Ismail Wan Mamat and Zainol Hj. Husin.

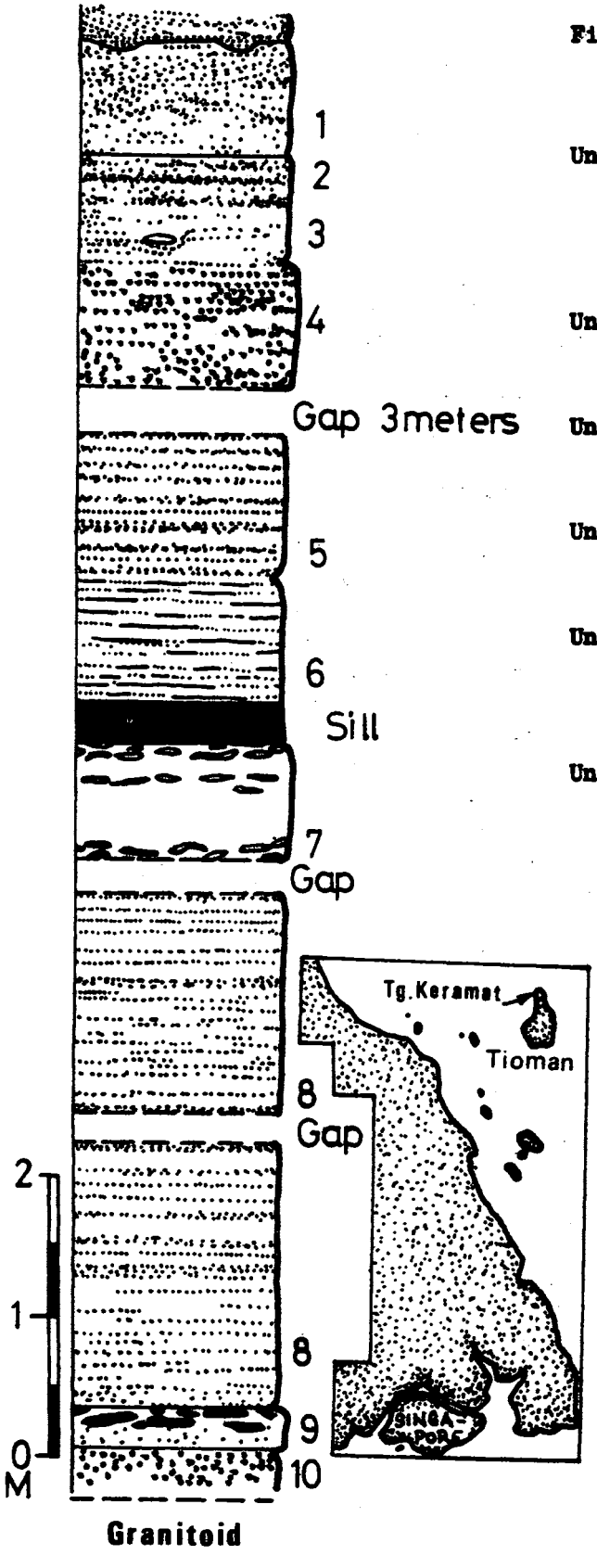

Fig. 1. Stratigraphic column at Tanjung Keramat, Pulau Tioman

Unit 1: meta-arenite, scour marks, small-scale cross laminations, medium grained with slightly larger particles in the scour fills.

Unit 2: meta-arenite, parallel laminae, fine to medium grained.

Unit 3: meta-arenite as unit 2, with occasional load-sag structures.

Unit 4: meta-arenite, coarse-grained. Exposure gap of circa 3 metres.

Unit 5: alternating bands of fine and coarse-grained meta-arenite with angular particles.

Unit 6: meta-arenite with laminations accentuated by green chlorite flakes. Sill, meta-basaltic rock, dark green to black.

Unit 7: meta-arenite groundmass with pale coloured blebs and shards interpreted as collapsed pumice fragments; a metamorphosed pumice-breccia.

Unit 8: alternating laminae of fine to medium-grained meta-arenite with graded sequences.

Unit 9: sharpstone metaconglomerate; angular slabs of dark coloured fine grained rock (slate-like) in meta-arenite of coarse to medium-grained texture.

Unit 10: meta-arenite, coarse-grained, pale coloured. Granitoid (contact concealed).

is toward west. Some of the pale clasts surround the darker coloured groundmass atoll-fashion (clasts n-1 and p-1). Other clasts have wedge-shaped contacts with the groundmass. In layer p a clast near the graded sequence suggests curling. In general, however, the light-coloured fragments are distinctly elongated with tapered ends and are weakly curved.

Under the microscope the groundmass shows up to consist of rather equant quartz grains with interlocking boundaries but rarely, as Bean (1977) has already remarked, of the sutured type. Strained quartz grains are very rare. Most interstices of the groundmass are filled by single-crystal diopside. Larger aggregates of diopside and hornblende crystals may contain poikilitic quartz grains. One or two small feldspar grains with albite twinning are also present. The pale coloured blebs consist of much smaller quartz grains with a scattering of also fine-grained diopside and tiny clear crystals (zircon?) with high refractive index. The quartz grains of the groundmass are at least 8 times larger than those of the blebs.

It is believed that the light-coloured clasts may be (a) shards ripped off a layer of fine-grained tuff such as layer l in Fig. 2, or (b) collapsed pumice lapilli and blocks. Deposition in water is indicated by the presence of graded sequences of sand-size particles and by well-defined banding. The second (b) interpretation is accepted on the following grounds:

(1) The irregular outlines (atoll-like, wedges, and embayed boundaries) of the clasts seem to represent part of the original, irregular scoriaceous surface of pumice fragments.
(2) The concentration of clasts in layer p (Fig. 2) suggest reverse grading as compared to the grading exhibited by the finer grains of the groundmass. In other words, the larger clasts are concentrated in the top portion of layer p. This is consistent with the usual explanation of reverse grading of pumice fragments; the smaller clasts becoming water-logged faster while the larger clasts settle later.
(3) Rock unit 7 looks very similar to an example of collapsed pumice fragments shown as Plate 168B by Green and Short (1971). The differences are that the particular plate shows darker coloured pumice clasts than the groundmass and that the rock is a welded tuff.

It is envisaged that the present shapes of the pale clasts were attained through ductile deformation. The almost vertical position of the beds at Tanjung Keramat precludes that this attitude represents initial dip. The flattening of the fragments parallel to compositional banding indicates that the shape was attained before the beds became tilted, presumably by tectonic deformation. As yet it cannot be explained how ductility was obtained by the clasts in their original position unless the sedimentary features are wrongly interpreted as being indicative of deposition in water. Initial ductility would be certain if rock unit 7 was an ignimbrite.

For the present rock unit 7 is called a metamorphosed pumice-breccia.

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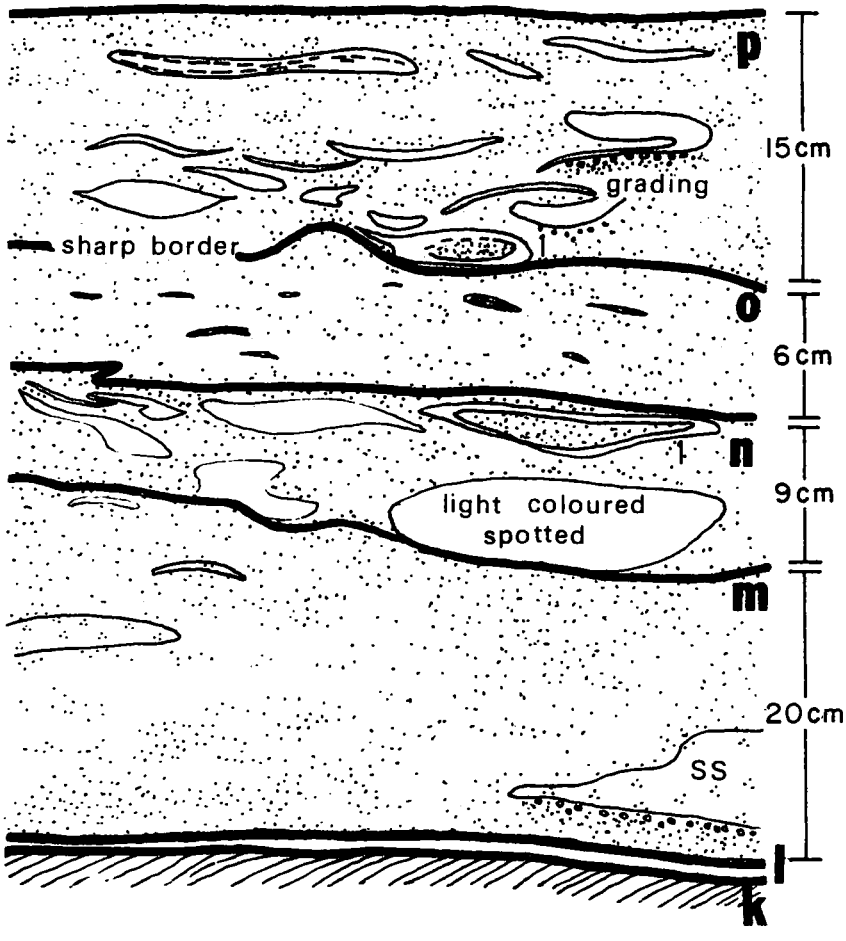

Fig. 2. Detail of rock unit 7. Layer k is top and consists of cross-laminated meta-arenite. Layer l is light-coloured meta-tuff. Clasts are interpreted pumice fragments and some other rock types.

MAGNETIC AND TECTONIC TRENDS, SOUTHERN PENINSULAR MALAYSIA

G. VAN KLINKEN, School of Physics, Universiti Sains Malaysia, Minden, Pulau Pinang

Abstract

Trends on old aeromagnetic maps of south Pahang and Johore suggest that the area is even more intensely fractured than indicated by the Kuala Lumpur-Endau faults marked on the Geological Map of West Malaysia. This could have implications for mineralization.

Magnetic trends

An aeromagnetic map typically has a distinctive grain in the pattern of its anomalies. What strikes the eye as "grain", are the shapes of the dominant anomalies, their amplitude and spacing density. Many anomalies have a semi-linear appearance and may be called magnetic lineaments or trends. Affleck (1963) and Hall (1964), amongst others, have shown that a study of anomaly trends can lead to understanding of tectonic structure. This is so because many geological features which generate a linear magnetic anomaly, are tectonically determined. We can think, for example, of dolerite dykes, strike-slip faulted rock boundaries, narrow sedimentary basins whose subsidence was controlled tectonically, and regional zones of metamorphism corresponding to the axes of deformation. It is not always possible to know the origin of each magnetic trend. Suffice to say that on average a good proportion of them are related to tectonic structure. (As exceptions we could mention basalt flows along ancient valleys, abnormally high magnetite in river sediments, and some others).

Over 20 years ago an aeromagnetic survey, crude by today's standards, was flown over various parts of the Peninsula, as shown in Fig. 1 (Agocs, 1958-1965). The area chosen shows the strongest grain. It overlaps with the Kuala Lumpur-Endau fault zone as shown on the Geological Map of West Malaysia (1973). If the magnetic trend pattern could be related to the tectonic structure, we would have an independent source of information, to supplement airphoto and ground geological studies.

Method

Over the last 15 years the tendency in magnetic trend analysis has been to use the computer (e.g. Agarwal and Kanasewich, 1971). On the other hand manual trend-picking can give very adequate results at very little expense of time and money. No more equipment is needed than a ruler, a protractor and a pencil. The few simple rules for picking trends off the aeromagnetic map:

(1) A trend is any linearity in the contours which can be approximated by a straight line. (So a trend does not have to be a closed anomaly).
(2) A trend must be common to at least 5 adjacent contour-lines. For a contour interval of 5 nanoteslas (gammas), this means the minimum amplitude of the anomaly is 10-25 ntes.
(3) A trend must cross at least 3 flight lines to be counted. At a

flight-line spacing of ½ mile, this means all trends persist at least 1 mile (1½ km).

(4) A closely parallel pair of positive and negative anomalies probably have only one source, and are counted once only.

(5) No distinction is made between strong and weak anomalies, for simplicity.

We must note two important limitations in the data:

(1) East-west trends will not show up, because this is the direction parallel to the flight-lines. Although some strong east-west trends can actually be seen on the maps, they have not been included in the analysis because of the strong possibility that they are caused simply by inaccurate surveying along that particular flight-line.

(2) North-south trends will be rare, because this is the direction of the earth's magnetic field, and the field here is only 4° or 5° off being horizontal. Under these circumstances a two-dimensional geological body striking north-south produces no anomaly.

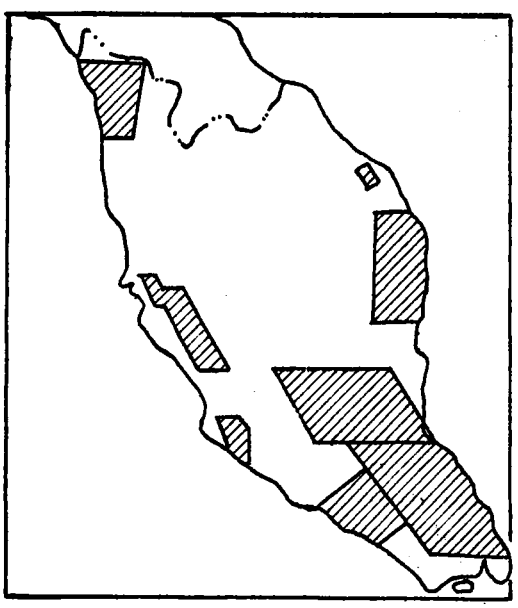

Fig. 1.

Aeromagnetic survey flown in 1956-57 (Agocs, 1958-1965)

Results

The original aeromagnetic maps (on a scale of 1 inch to 1 mile) do not reduce well to a small size, but the trends taken off them are shown in Fig. 2, superimposed on a simplified tracing of the Geological Map of West Malaysia. In all, 517 km of trend lines are noted in an area roughly 110 x 165 km in size. Their directions are analyzed in Fig. 3.

The results fall clearly into two broad sets:

(1) A major set in the range 100° - 130°, which accounts for over 60% of the trends. They occur over the entire area, but especially south of latitude 3°N.

(2) A smaller set in the range 40° - 80°, which is restricted to the area north of 3°N, where it complements the first set.

Trends occur over all rock types, including Triassic-Jurassic sedi-

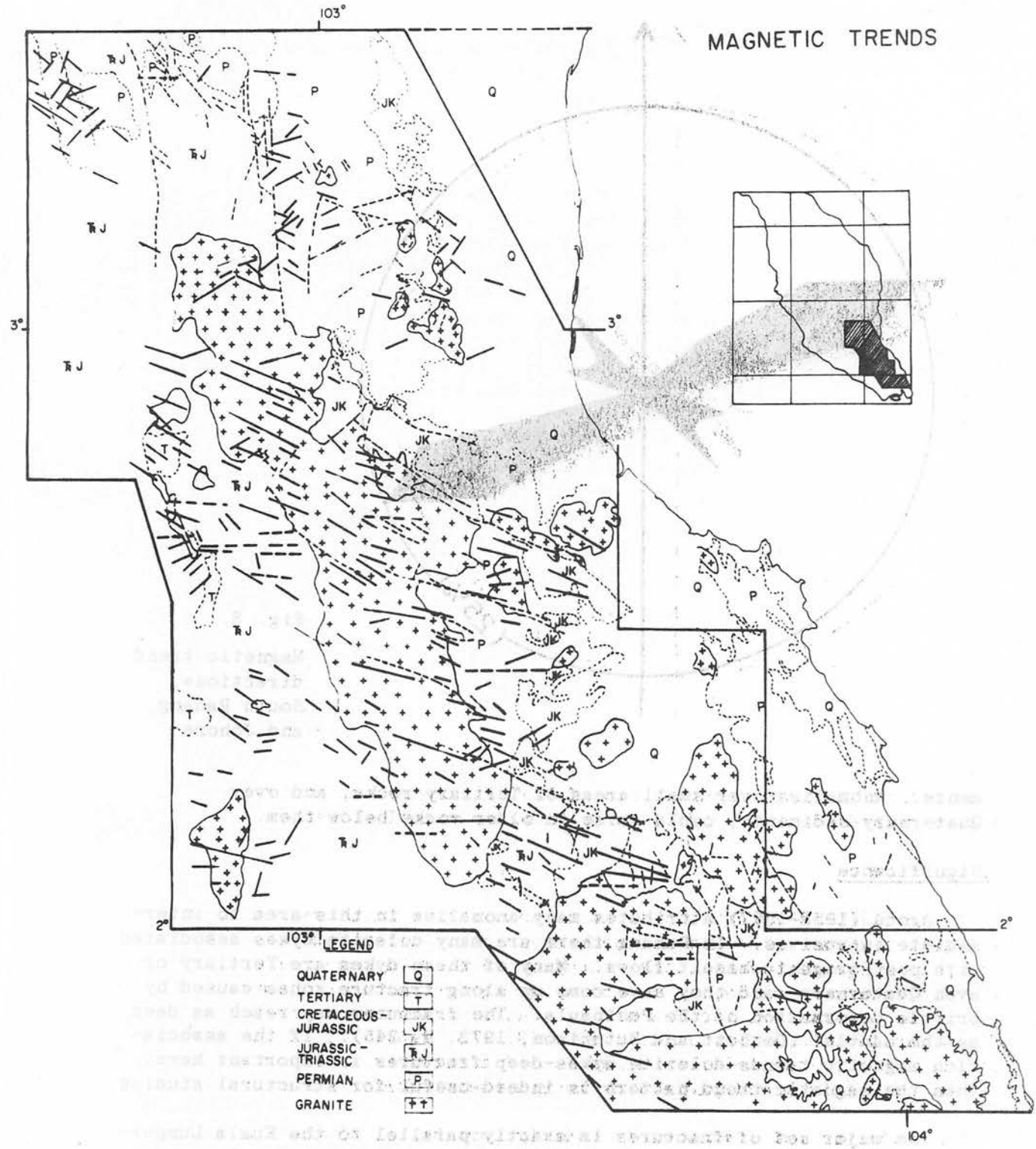

FIG. 2: Magnetic Trends and Superimposed on simplified tracing from the Geological Map of West Malaysia (1973), for an area in South Pahang and Johore.

- Heavy Straight Line Segments : Magnetic Trends.
- Heavy Dashed Straight Lines: Magnetic Trends in an east-west direction (neglected in the analysis).
- Light Dashed Lines: Faults as marked on the Geological Map.

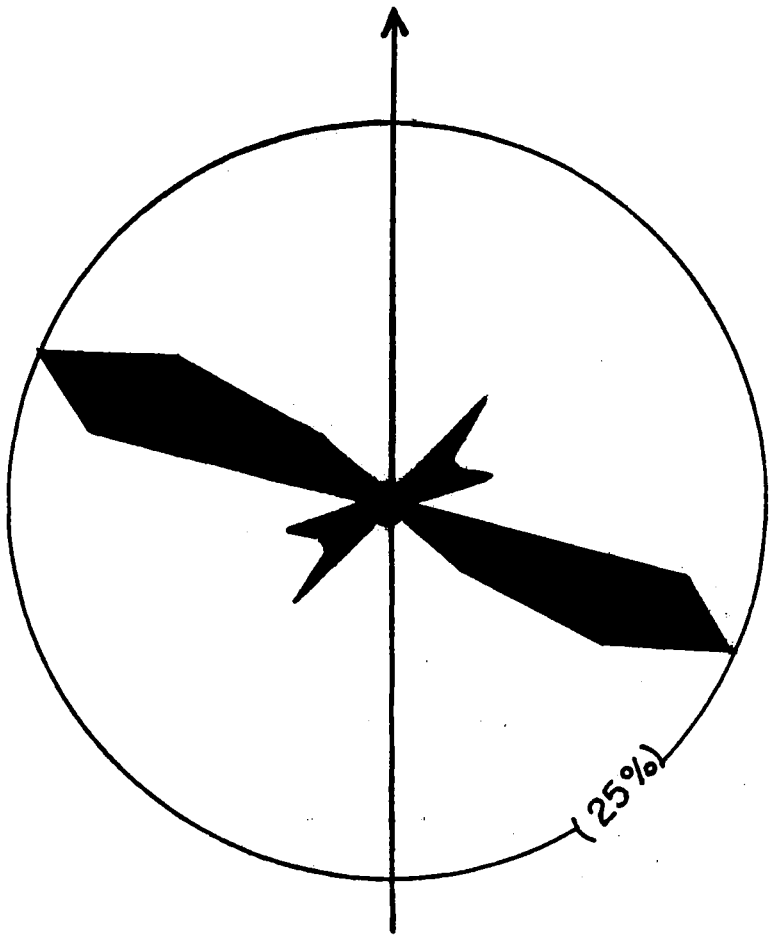

Fig. 3.

Magnetic trend directions, South Pahang and Johore

ments. Anomalies over small areas of Tertiary rocks, and over Quaternary sediments, could arise in older rocks below them.

Significance

Agocs (1958-1967) attributes many anomalies in this area to intermediate intrusives. In Pahang there are many dolerite dykes associated with post-orogenic basalt flows. Many of these dykes are Tertiary or even Quaternary, and they have come up along fracture zones caused by brittle deformation of the Peninsula. The fractures may reach as deep as the mantle (Gobbett and Hutchison, 1973, p. 245). If the association magnetic trends-dolerite dykes-deep fractures is important here, then the magnetic trend pattern is indeed useful for structural studies.

The major set of fractures is exactly parallel to the Kuala Lumpur-Endau fault zone, but the trends are much denser than the faults shown on the current geological map. Some faults have also been mapped in the 40° - 80° direction, corresponding to the minor set of trends. No trends are observed in a north-south direction, parallel to faults mapped in the northern part - but this does not mean no magnetic bodies trend in that direction, as discussed earlier.

The pattern of magnetic trends corresponds closely to, on the western end, the pattern of joints at the Klang Gates (GH Fig. 10.16) and, on the eastern end the pattern of tin-ore veining at Sg. Lembing (GH Fig. 10.18). The absence of data on north-south and east-west components, could be a limitation of the method.

Conclusion

An intense and consistent magnetic trend pattern in the south Pahang and Johore region correlates well with known fracture patterns. It underlines the importance of the Kuala Lumpur - Endau fault zone as an area of very widespread, deep fracturing at a post-orogenic stage.

If, as Gobbett and Hutchison (1973, p. 328) suggest, such crustal fracturing is a significant control on the deposition of tin (and other?) mineralization, then the extent of fracturing in this area could provide a stimulus to exploration on a broader scale.

For the same reason, a simple trend analysis such as this could also be applied to the data to be obtained from a new aeromagnetic survey being flown over the Central Belt area in 1980.

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MESYUARAT PERSATUAN
(MEETINGS OF THE SOCIETY)

R.L. STANTON: An alternative to the Barrovian interpretation? Evidence from stratiform ores.

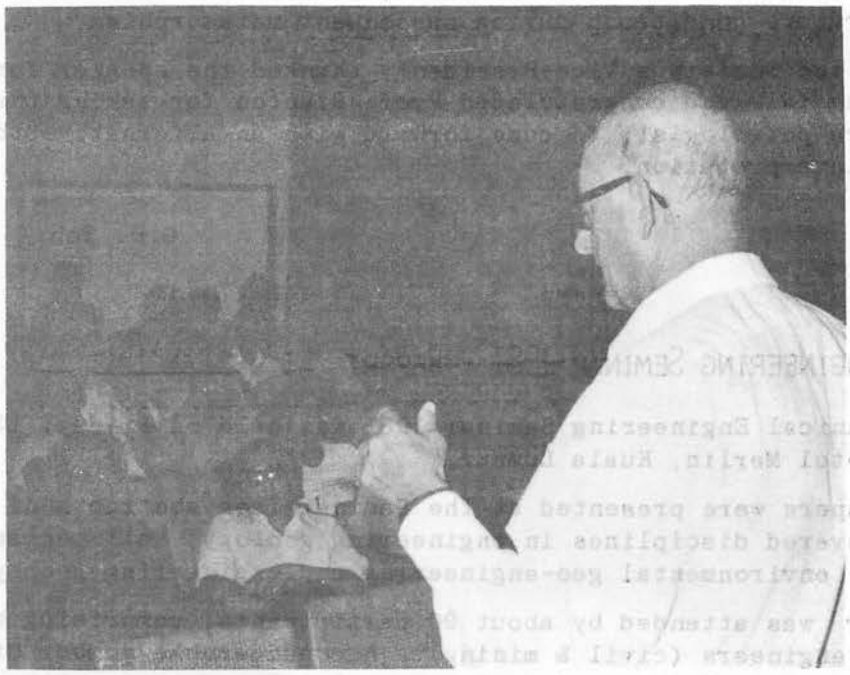
On the 16th Feb. 1981, about 60 members were present at the Lecture Hall, Dept. of Geology, University of Malaya, to listen to a talk by Prof. R.L. Stanton from the University of New England, Armidale, NSW, Australia, which featured the provocative title "An alternative to the Barrovian interpretation? Evidence from stratiform ores". This joint meeting of the Society with the Geology Dept., University of Malaya was chaired by Prof. P.H. Stauffer. Prof. Stanton, incidentally, is just completing his 3-year term as External Examiner in Applied Geology to the University of Malaya.

Prof. Stanton started off his talk by emphasising that recent work has shown that, in at least some instances of regional metamorphism, metamorphic diffusion has been restricted to relatively minute distances (of the order of 1.0 mm and much less), that there is no clear, direct, evidence of prograde metamorphic reactions, and that metamorphic equilibrium does not appear to have been attained through even very small domains.

He elaborated that more precise studies, on the scale of the microscope and particularly of the electron microprobe, are beginning to place severe limits on the distances involved in metamorphic diffusion. Limits on diffusion set limits to the extent to which minerals may react and this in turn limits the extent to which the metamorphic system can approach equilibrium. Indeed clear microscopical evidence of mineral reaction is hard to find and there is no single photograph available illustrating the destruction of ore mineral and the concomitant development of another.

He pointed out that the almost general absence of direct evidence of reaction has led some observers to suggest that metamorphic rocks may attain their mineral assemblages directly, rather than by a series of mineral reactions, and hence without passing through each successive grade. Coupled with doubts concerning the reality of many postulated metamorphic reactions are doubts on equilibrium. The preservation of zoning in garnets, revealed so spectacularly by the electron microprobe, has been an early indication that, even at high grades of metamorphism, equilibrium may remain unattained in a single crystal. Further, evidence of the preservation of compositional inhomogenieties in other minerals, including sulphides, is now mounting, indicating that compositional equilibrium may not have been attained even in the most sensitive crystal structures, and even where these are subjected to the highest grades of metamorphism.

Then Prof. Stanton went on to show that a number of stratiform ore bodies and their immediate metapelitic environments exhibit very large, seemingly "disequilibrium", assemblages of regional metamorphic index materials. Whole rock analyses of different lithological units and bands of Gorob (S.W. Africa), Mount Misery (N. Queensland), Broken Hill (New South Wales), and Pegmont (NW Queensland) show these to vary in composition from one to another very substantially over very short distances,



R. L. Stanton

even though the original rocks in all cases appear to have been pelitic. The significance of this is that differences between metamorphic mineral assemblages may be entirely a result of variation in bulk composition of the parent rock, and need not represent variation in temperature and pressure at all. It also indicates that the metamorphic zones described by Barrow and thought by him to reflect changing intensity of thermal metamorphism, could in fact quite easily result from subtle but systematic compositional changes in the pelitic rocks concerned.

He added that evidence of stratiform ores now suggests that metamorphic minerals in general might represent essentially in situ transformation of earlier sedimentary - diagenetic percursor materials. It is concluded that the fluctuating seafloor interplay between warm, acid, concentrated hydrothermal waters with cold, alkaline, dilute seawater associated with stratiform ore formation, together with diagenetic processes leads to the formation of a wide range of clay, chlorite, mixed-layer clay and clay/chlorite percursor materials and hence, later, to the broad spectra of metamorphic minerals associated with some stratiform ores. The environments of stratiform ores such as those described indicate that regional metamorphic zones in pelitic rocks may, in at least some cases, stem from variation in clay and related mineral assemblages consequent upon variation in the nature and conditions of sedimentation. It is suggested that such ore environments may thus provide a clue indicating that zones of regional metamorphic minerals such as those described by Barrow in the Daldadrian rocks of Scotland may, in at least some cases, reflect facies of clay and clay-chlorite

mineral sedimentation on the relevant shelf, rather than variations in pressure-temperature conditions during subsequent metamorphism.

T.T. Khoo, the Society's Vice-President, thanked the speaker for a most stimulating talk and congratulated Prof. Stanton for taking the bold stand, as an ore petrologist, to come forward with an alternative to the Barrovian interpretation.

G.H. Teh

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Geotechnical Engineering Seminar 1981 - Report

The Geotechnical Engineering Seminar 1981 was held on Friday, 13th Feb. 1981 at Hotel Merlin, Kuala Lumpur.

Thirteen papers were presented at the Seminar (see abstracts of papers), and covered disciplines in engineering geology, soil mechanics, rock mechanics, environmental geo-engineering and engineering geophysics.

The Seminar was attended by about 90 participants, comprising both geologists and engineers (civil & mining). A considerable number of participants came from local engineering consulting and contracting firms, and this is a healthy sign since, among other things, on of the aims of this Seminar is to get the engineers and geologists together to foster closer and better working relationship between the two groups.

The organising committee and the Society would like to record its thanks to Pernas Charter Management, Sime Darby Malaysia Bhd., and Vallentine Laurie & Davies for their financial contributions to the Seminar.

Geotechnical Engineering Seminar 1981 - Programme, Feb. 13th 1981

8.30 - 8.50 a.m.	-	Late registration
8.50 - 9.00 a.m.	-	Opening address
Session 1		
9.00 - 9.20 a.m.	-	Review of Geotechnical Engineering practice (Miss K.H. Ong, Geosains Sdn. Bhd.)
9.20 - 9.40 a.m.	-	An overview of Engineering geologic problems in Malaysia (Tan Bock Kang, University of Malaya & Tan Boon Kong, Universiti Kebangsaan Malaysia)
9.40 - 10.00 a.m.	-	Soil density measurement by the thermal probe method (Siah Boon Seng, M.I.N.C.O.)
10.00 - 10.20 a.m.	-	Use of rice husk ash for soil stabilization (.M.S. Subrahmanyam, Lee Lih Cheran and Lee So Cheran, University of Malaya)
10.20 - 10.40 a.m.	-	Discussion
10.40 - 11.15 a.m.	-	Tea break
Session 11		
11.15 - 11.35 a.m.	-	Preliminary studies of the price, composition, type and index properties of common construction bricks from Selangor and Federal Territory

		(Aw Peck Chin & Tan Yee Nuo, Geological Survey of Malaysia)
11.35 - 11.55 a.m.	-	Discontinuity analysis in rock slope stability (Ibrahim Komoo, Universiti Kebangsaan Malaysia)
11.55 - 12.15 p.m.	-	Reconditioning the impregnated microbits - the way to study rock drillability on a laboratory scale (B. Sirimbumrungsukha, Prince of Songkhla University)
12.15 - 12.40 p.m.	-	Discussion
12.40 - 2.00 p.m.	-	Lunch
Session III		
2.00 - 2.20 p.m.	-	Kelantan groundwater computer model (Ismail M. Noor, Universiti Kebangsaan Malaysia)
2.20 - 2.40 p.m.	-	Selection of solid waste disposal sites - some geologic and hydrogeologic considerations (Tan Boon Kong, Universiti Kebangsaan Malaysia)
2.40 - 3.00 p.m.	-	Well-field design for aquifer near Bachok, Kelantan (Ismail M. Noor, Universiti Kebangsaan Malaysia)
3.00 - 3.20 p.m.	-	Discussion
3.20 - 3.40 p.m.	-	Tea break
Session IV		
3.40 - 4.00 p.m.	-	Problems and applications of the seismic refraction method in Civil Engineering projects in Malaysia (Lim Beng Kung, Geomex Surveys Sdn. Bhd.)
4.00 - 4.20 p.m.	-	Geophysical surveys in Civil Engineering site investigations (Stephen J. Jones, EG & G International Inc.)
4.20 - 4.40 p.m.	-	Offshore geophysical site investigations in the Malay Basin (D.F. Duncan & Khee Kok Kean, Esso Production Malaysia)
4.40 - 5.00 p.m.	-	Discussion Closing remarks

Tan Boon Kong

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GEOTECHNICAL ENGINEERING SEMINAR 1981 - ABSTRACTS OF PAPERS

AN OVERVIEW OF ENGINEERING GEOLOGIC PROBLEMS IN MALAYSIA

TAN BOCK KANG, Dept. of Geology, University of Malaya &
TAN BOON KONG, Dept. of Geology, National University of Malaysia

In line with the development of the country, Malaysia has implemented and planned numerous ambitious engineering projects since the past decade or so. Such activities are expected to continue with even greater pace in the immediate future.

Engineering projects implemented and planned for the future include various housing schemes in urban and suburban areas, highrise buildings especially in the Kuala Lumpur region, major highways and other infra-

GSM GEOTECHNICAL ENGINEERING SEMINAR 1981

GSMpix by A. A. Hussin

Captions to figures

Fig. 1. K.H. Ong starting off the Seminar with her review of geotechnical engineering practice.
Fig. 2. I. Komoo presenting his paper on rock slope stability.
Fig. 3. Ismail M. Noor bringing the attention of the audience to the slide projection during his paper on groundwater.
Fig. 4. B.K. Tan stressing a point on engineering geologic problems.
Fig. 5. Tan Boon Kong with his paper on waste disposal.
Fig. 6. Thai participant, B. Sirimbumrungsukha and his contribution on microbits.
Fig. 7. P.C. Aw, confidently presenting the joint paper on construction brick.
Fig. 8. M.S. Subrahmanyam on the use of rice husk ash for soil stablization.

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structures, dams for various purposes (water supply, hydro-electric and flood mitigation), airports, harbours, bridges, mining projects, etc.

This paper gives an overview of the engineering geologic problems that have surfaced from time to time during the implementation of the various engineering and construction works in Malaysia. Problems discussed include foundation problems in limestone bedrock, problem of residual granite corestones in relation to foundation and slope stability, settlement or subsidence problems in disused or abandoned mining lands and filled areas, landslides, construction materials and quarry works, as well as groundwater resource development problems. The nature of the problems are related mainly to the nature of soils, rocks and groundwater conditions that prevail in the country.

The discussions are made in the Malaysian context with local examples and case studies highlighting various features and problems unique to this country.

*****

Soil Density Measurement by the Thermal Probe Method

SIAH BOON SENG, M.I.N.C.O.

An indirect method for determing the "in situ" density of a small volume of soil is described. The technique is based on the fact that changes in soil density cause changes in thermal conductivity of the soil. The details and construction of miniature thermal probes employing transient heat flow principles are described. The performance of the thermal probe in measuring sand density has been found to be excellent. Results obtained indicate that there is a direct relationship between the density and thermal conductivity values of the sand. Calibration charts and equations relating density and thermal conductivity of the sand used are presented. The potential of the technique as a general quality control method and as an instrument for monitoring the behaviour of soil structure systems are discussed.

*****

Use of Rice Husk Ash for Soil Stabilization

M.S. SUBRAHMANYAM, LEE LIH CHERAN & LEE SO CHERAN, Faculty of Engineering, University of Malaya

Rice husk is one of the largest farm refuse in Malaysia. This is put into use as a fuel, building bricks, etc. A large quantity is being disposed by dumping or by burning which is becoming a menace. An attempt has been made in this investigation to make use of the rice husk ash to stabilize clayey soil along with lime. The effect of the quantity of admixture of lime and rice husk ash on the soil properties like index properties, compaction characteristics and strength characteristics has been studied. Also the influence of the ratio of the quantities of lime and rice husk ash for a given quantity of admixture on the soil behaviour has been investigated. The soil has been collected from Klang town which is classified as CH soil under unified classification system. The rice husk ash used in this investigation is from Kedah burner unit supplied by SIRIM. It has been found that there is a decrease of maximum dry density and an increase of optimum water content when the soil is treated with the admixture of lime and rice husk ash. The plasticity index of the soil is decreased by treating the soil with the admixture of lime and rice husk ash. The effect is more significant after a curing period of 28 days. Also, it has been found that there is an optimum quantity admixture at which the soil attains peak strength. The peak strength increases as the curing time increases.

*****

Preliminary Studies of Price, Composition, Type and Index Properties of Common Construction Bricks from Selangor and Federal Territory

AW PECK CHIN & TAN YEE NUO, Geological Survey of Malaysia

More than 260 million bricks were produced from 63 brickworks in 1979. The brick industry, basing on general apparent colour, grades the bricks qualitatively into red (first grade), black-head (second grade) and white (third grade). The price differential of the first (red) and the third (white) grade bricks in 1980 was about 20 percent.

In trying to determine the quantitative basis of the above classification, and also to study the variation in properties of the bricks produced, a few bricks from each of the 63 brickworks were collected for laboratory tests. The properties determined were Shore schleroscope hardness, cylinder strength, dry density, effective porosity, chemical composition, dimensions and weight. Results of 54 bricks from 30 brickworks were analysed.

The bricks show wide variation in properties. Definite correlations can be made among the cylinder strength, dry density, Shore schleroscope hardness and effective porosity. However, there is no conclusive quantitative basis to show that the red bricks are more superior in 'quality' than the white bricks.

Most of the white bricks are produced by brickworks in the Federal Territory, Ulu Langat, Petaling and Gombak districts. The raw clay material comes mainly from the surrounding tin mining areas. Most of

the red bricks, on the other hand, are produced by the brickworks in the Kuala Selangor, Kelang and Sepang districts.

*****

Discontinuity Analysis in Rock Slope Stability

IBRAHIM KOMOO, Jabatan Geologi, Universiti Kebangsaan Malaysia

It has been shown that there is a direct strength reduction effect due to the presence of discontinuities within the rock mass. Among other things, this strength reduction is due to the decrease of cohesion and friction of the rock, an increase in porewater pressure and a softening of the discontinuity surfaces. The discontinuity will also serve as a potential failure zone, in which along this zone, the slope is most likely to fail.

In order to assess rock slope stability, it is necessary to measure, record and hopefully classify the orientations, length, spacings and any other discontinuity characteristics in an organized manner.

This paper will highlight the discontinuity survey technique conducted along the Kuala Lumpur - Karak Highway and some of its uses in rock slope stability analysis.

*****

Reconditioning the Impregnated Microbits - the Way to Study Rock Drillability on a Laboratory Scale

B. SIRIMBUMRUNGSUKHA, Prince of Songkhla University

Scientific and engineering informations of basic performances of the impregnated diamond bits have been rather limited. Since it is difficult to bring the bit back to a standard sharp condition after it has drilled hard rock and become dull, impregnated microbits were used in this research project. A reconditioning process, which is believed to be simple, quick, and reproducible, is introduced in this paper. Wear of the matrix could also be quantified by using a wear measuring device developed in this work. Basic performances of the bit on drilling a very abrasive sandstone and hard, non-abrasive norite will be compared. Statistically, penetration rate decreases linearly with drilling distance. This simply allows the initial penetration rate (Vo) to be calculated and presented as rock drillability of the bit and the slope to be presented as an abrasive index (b). Rock drillability of seven rock types was plotted against some well established physical rock properties. It is concluded that uniaxial compressive strength, Brazilian tensile strength, and Sklerograf hardness could be only used as a rough guide to rock drillability with some exception.

*****

KELANTAN GROUNDWATER COMPUTER MODEL

ISMAIL M. NOOR, Jabatan Geologi, Universiti Kebangsaan Malaysia

A computer digital model has been constructed in order to assess the potential groundwater development of Kelantan. The model was based on Darcy and continuity equations. The model has 17 by 14 grid lines. The boundary conditions imposed on the model are the 'fixed-head' and the 'no-flow' boundaries. Basic aquifer parameters were introduced into the model and the model was calibrated using actual historical data. The model was used to assess the water requirement and the potential development of two areas within the model boundary; Kemasin-Semerak and Tanah Merah. Abstraction of the groundwater for the Kelantan State, including the projected irrigation requirements for the two areas, was simulated for ten years. The model predicted that the maximum limit that could be abstracted from the aquifer without causing adverse effects on the environment is about 150,000 m^3/day.

*****

SELECTION OF SOLID WASTE DISPOSAL SITES - SOME GEOLOGIC AND HYDROGEOLOGIC CONSIDERATIONS

TAN BOON KONG, Jabatan Geologi, Universiti Kebangsaan Malaysia

The proper disposal of solid municipal wastes (gabage, etc.) requires a thorough study, evaluation and characterization of the site conditions.

This short presentation discusses some of the geologic and hydrogeologic factors that must be considered in selecting a site for solid waste disposal, in particular with reference to the commonly practised "sanitary landfill" method. Some possible problems that might arise are also discussed, with local examples.

*****

WELL-FIELD DESIGN FOR AQUIFER NEAR BACHOK, KELANTAN

ISMAIL M. NOOR, Jabatan Geologi, Universiti Kebangsaan Malaysia

Twelve wells with a capacity of 350 m^3/hour for each well were proposed at the modal area in Kampong Chap, near Bachok. The design criteria for the proposed wells were based on the simulated 'peak month' requirement, well interference and 'worst well' concept. Variation in specific capacity of the wells were taken into account and the 'worst well' drawdown in the area was found to be about 11.84 metres.

*****

Problems and Application of the Seismic Refraction Method in Civil Engineering Projects in Malaysia

LIM BENG KUNG, Geomex Surveys Sdn. Bhd.

In recent years, the seismic refraction method has been graining popularity as an effective tool in civil engineering site investigation. This paper discusses some of the practical problems encountered in the application of the shallow seismic refraction techniques in Malaysia.

Apparently, as the depth of investigation becomes shallower, the limits of the practical capabilities of the method are approached because the differences between the theoretical assumptions and the actual conditions become more pronounce. Experience from shallow seismic work shows that the ground terrain, weathering pattern, soil conditions and other local irregularities have profound effects on the seismic results obtained. Results improved considerably when local ground conditions and terrain are taken into consideration in the planning of the layout of the geophone spreads and shot points.

Constraints by rugged and hilly terrain, thick low velocity layer and thick vegetation limit the practical capabilities and applications of the seismic refraction techniques in Malaysia. In sub-surface investigation for engineering earthworks, quarrying and foundation purposes, the seismic refraction method has proven to be more 'reliable', economical and less time consuming than large-scale conventional drilling method of investigation. Nevertheless, due to the inherent ambiguities in the seismic interpretation, it is advisable to include limited drilling programme in the seismic survey for correlation purposes.

*****

Geophysical Surveys in Civil Engineering Site Investigations

STEPHEN J. JONES, EG & G International Inc., Singapore

The field of geophysics is the application of physics to the study of geology and it can be usefully included in Civil Engineering site investigations, land and marine, both at the feasibility and final design stages.

At the feasibility stage of a project geophysical methods allow for rapid collection of data over a large area but unfortunately very rarely provide an actual sample of soil or rock under consideration. They are, however, a rapid cost-effective approach to obtain a broad scale picture of sub-ground conditions which can then be used to choose the optimum site for detailed examination.

This paper considers general applications of geophysical techniques to land and marine projects at the planning stage. Examples are also given of the use of these techniques to attempt to solve problems encountered during construction.

*****

OFFSHORE GEOPHYSICAL SITE INVESTIGATIONS IN THE MALAY BASIN

D.F. DUNCAN & KHEE KOK KEAN, Esso Production Malaysia Inc.

Since 1969, more than a hundred exploratory wells have been drilled, and six oil production platforms with interconnecting pipelines installed in the Malay Basin. To facilitate the construction of these offshore strcutures and to provide pre-site well surveys for jack-up rig locations, geophysical site investigations must be conducted at selected locations during the initial stages of planning. Some common geophysical site investigations are side scan sonar, bathymetric, shallow boomer and sparker surveys. A reliable navigational network has to be set up to accurately determine the locations of structures and the locations of the pertinent geophysical and other data. All these methods help to identify the nature of the sea bottom, explore the shallow subsurface and recognise potential hazards such as areas of gas seeps or possible unstable foundations.

*****

BERITA PERSATUAN
(NEWS OF THE SOCIETY)

REGIONAL GEOLOGY SEMINAR '81 (THEME: GEOLOGY OF THE CENTRAL BELT, PENINSULAR MALAYSIA AND THAILAND) - SECOND CIRCULAR

The Organizing Committee has received overwhelming response from members and non-members indicating their interests in participating in the above Seminar.

As a large turnout is expected this year, all intending participants are advised to register early for the Seminar. This will help in the Seminar organization as well as saving yourselves payment of the late registration fees.

The Seminar will be held at the International Hall, Hotel Merlin with lunch and two tea breaks served in the Lotus Room on April 10th 1981.

Registration fees will be charged as follows:

	Advance registration	Late registration
All Members	M$10.00	M$20.00
Non-Members	M$30.00	M$40.00
Student Members (Tea only)	Free	M$5.00
Student Non-Members (Seminar only)	Free	Free

Advance registration will be accepted until 27th March 1981. Cheques, bank drafts or money orders should be made payable to the Geological Society of Malaysia. Outstation cheques should include sufficient bank charges. (For Singapore cheques, please add S$2.50 for bank charges).

Please send registration fees to: The Organizing Committee, Regional Geology Seminar '81, Geological Society of Malaysia, c/o Dept. of Geology, University of Malaya, Kuala Lumpur 22-11.

To date, 9 papers have been accepted for presentation with the possibility of a few more papers from Thailand:-

1. Background and progress of the geochemical exploration programme, Central Belt by Fateh Chand (Geological Survey of Malaysia).
2. Barite deposits, Pahang by Aw Peck Chin (Geological Survey of Malaysia).
3. Airborne Geophysical Survey, Central Belt by Gan Ah Sai (Geological Survey of Malaysia).
4. Structure and metamorphism of the Western Foothills of Mount Ophir, Johore/Malacca by Khoo Teng Tiong and Tan Bock Kang (University of Malaya).
5. Geology of Chini-6 area, Pahang by Low Keng Lok (University of Malaya).
6. Gunung Ledang radiometric age dating by Yap Fook Loy (Geological Survey of Malaysia).
7. Osmiridium - A discovery by Shu Yeoh Khoon (Geological Survey of Malaysia).
8. Interpretation of more gravity data across south-central Peninsular Malaysia by Lee Chong Yan, G.A. Van Klinken and Like Meng Heng (Universiti Sains Malaysia).
9. The margins of the Central Belt by Tan Bock Kang (University of Malaya).

Participants will be informed of the detailed programme by the next circular.

K.K. Khoo

*****

Annual General Meeting

The Annual General Meeting of the Geological Society of Malaysia will be held at 5.00 p.m. on Friday, 10th April 1981 at the International Hall, Hotel Merlin, Kuala Lumpur. Tea will be served at 4.30 p.m.

The agenda is as follows:

1. Confirmation of minutes of previous meeting
2. Matters arising
3. President's Report
4. Hon. Secretary's Report
5. Hon. Assistant Secretary's Report
6. Editor's Report
7. Treasurer's and Auditor's Reports
8. Announcement of New Council
9. Election of Hon. Auditor
10. Any other business.

Members wishing to request for items for discussion to be included in the Agenda are reminded that such requests have to be received by the Secretary at least seven days before the meeting.

*****

Annual Dinner

The Society will hold the Annual Dinner on Friday, 10 April 1981 at 8.00 p.m. in Peijin Restaurant, 2nd Floor, Wisma Central, Jalan Ampang, Kuala Lumpur. All members and also their wives are welcome to

reef complexes are being described; it seems that oil-company geologists are inhibited from calling a reef a reef even when it is one.

There are two petrological papers, on the Pranburi-Hau Hin metamorphic complex (Pongsapich, Vedchakanchana, and Pongpayoon) and on the evolution of alkali basaltic rocks of Kuantan, Pahang (Chakraborty).

Papers on engineering properties of some Malaysian rocks (B.K. Tan and S.F. Chan), on the incredibly complex structure of upper Palaeozoic rocks at Tanjung Gelang, Pahang (L.S. Yap and B.K. Tan), and on the first palaeomagnetic measurements on Upper Jurassic to Lower Cretaceous rocks in Peninsular Malaysia, complete an interesting and wide-ranging volume. The volume can be ordered from the Geological Society of Malaysia, c/o Jabatan Geologi, Universiti Malaya, Kuala Lumpur; no price is given. (Editor's note: The price is M$20.00 / US$10.00).

NSH
CCOP Newsletter
Vol. 7, no. 3, Sept. 1980

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GSM Young Geoscientist Publication Award 1980

The Council, on the recommendation of the Award Nominations Board, has decided to give the 1980 Award to Lim Beng Kung for his publication "The nature of the contact between the 'quartz porphyry' and the Jerai Formation in the Rest House, Kedah Peak, Kedah" (Warta Geologi, 5, 67-72).

The presentation ceremony to the first receipient of the Award will take place during the coming Society's AGM.

*****

Editor's Note

We start off the new year 1981 with volume 7 of the WARTA GEOLOGI. As a matter of interest, the first copy of the Society's newsletter was published in July 1966. That was exactly 15 years and 5 months ago. Well, time really flies.

Yes, and we have next the AGM 1981 just round the corner but before that you should have received your copy of Bulletin 13 together with this copy of the WARTA.

We would like to take this opportunity to express the Society's appreciation to all who have contributed in one way or another towards maintaining a steady flow of the Society's Publications for the past year - in particular the contributors of papers and reports and not forgetting the reviewers.

This is also the time to remind members that we need your contributions to keep our Publications going. It can well be an article or a report, news of members or just anything of interest to the earth science community. We have had a successful year of various seminars and it is hoped that the authors of papers would transform their oral presentations into writing and submit them for publication.

Editor

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THE GEOLOGICAL SOCIETY OF MALAYSIA
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BULLETIN OF THE GEOLOGICAL SOCIETY OF MALAYSIA

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BULETIN PERSATUAN GEOLOGI MALAYSIA

BULLETIN OF THE GEOLOGICAL SOCIETY OF MALAYSIA

KANDUNGAN
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Editor
G.H. TEH

DECEMBER 1980 No. 13

Price: M$20.00 (US$10.00)

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GEOLOGICAL SOCIETY OF MALAYSIA
c/o Dept. of Geology
University of Malaya
Kuala Lumpur 22-11
MALAYSIA

MEMBERSHIP

The following people have joined the Society:

Student Members

Mohammad bin Sidek, Jabatan Geologi, UKM, Kuala Lumpur.
Mohamad Noor bin Abdul Rani, Jabatan Geologi, UKM, Kuala Lumpur.
Abu Bakar bin Abu Samah, Jabatan Geologi, UKM, Kuala Lumpur.
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Ismail b. Omar, Jabatan Geologi, UTM, Kuala Lumpur.
Ab. Nizar bin Embi, Jabatan Geologi, UKM, Kuala Lumpur.

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Louis Mack, Petroconsultants SA, P.O. Box 228, 1211 Geneva 6, Switzerland.
Lye Yue Choong, c/o Geophysical Service Malaysia, P.O. Box 894, Miri, Sarawak.
Tan Sin Meng, 15, Jalan Setiapuspa, Damansara Heights, K.L.
T.G. Carson, Esso Production, P.O. Box 857, K.L.
Surapong Lerdthusnee, Dept. of Geological Sciences, Fac. of Science, Chiang Mai University, Chiang Mai, Thailand.
Dr. John Ringis, UNDP/CCOP, 41 Soi 4 Sukhumvit, Bangkok, Thailand.
D.C. Gerard, 1600 Orchard Towers, c/o Marathon Oil, S'pore 0923.
G.B. Minervini, Esso Production, P.O. Box 857, K.L.
Hajime Saga, Exploration Dept., Japan Petroleum Exploration Co. Ltd., Seiwaebisu Bldg., 18-14 Ebisu-1-chome Sibuya-ku, Tokyo, Japan.
Yukifusa Nakashima, Kiso Jiban Consultants Co., Harashima Bldg., 6 Sanei-cho Shinjuku-ku, Tokyo, Japan.
P.L. Cutts, Geoservices Far East, 15A/17A, Block 5022, Avenue 3, Ang Mo Kio, S'pore 2056.
Yong Swee Kee, Geological Survey, P.O. Box 1015, Ipoh, Perak.
Chen Shick Pei, Geological Survey, P.O. Box 560, Kuching, Sarawak.
Tetsuei Toyama, Idemitsu Oil Development Co., Ltd., 1202B, Hong Leong Bldg., 16 Raffles Quay, S'pore 0104.

Institutional Member

Gulf Research & Development Co., P.O. Box 2038, Pittsburgh, PA 15230, USA.

*****

CHANGE OF ADDRESS

The following members have informed the Society of new addresses as indicated:

1. Che Ghani Ambak, Pejabat Kajibumi, Lot no. 106, Mukim Bukit Besar, Kuala Trengganu, Trengganu.
2. Stephen J. Jones, c/o EG & G International Inc., Block 2, Unit 3, Ground Floor, Ayer Rajah Industrial Estate, Ayer Rajah Road, Singapore 0513.

*****

BERITA-BERITA LAIN
(OTHER NEWS)

GEOSEA IV - UPDATE, TOURS AND OTHER SCIENTIFIC MEETINGS

Place and date

Manila, Philippines November 18-23, 1981.

The Fourth Regional Conference on the Geology, Energy and Mineral Resources of Southeast Asia will be held at the Philippine International Convention Center, Manila from 18-20 November, 1981.

Conference Fees

$100.00
$75.00 if paid before July 31, 1981.

Tours

Tour 1 - Cebu-Atlas - Nov. 21, 22, and 23.
$325 includes plane fare, bus, hotel, 2 dinners, 2 breakfast.

Tour II - Baguio City - Philex Mines - Sightseeing around Banguio City - Nov. 21, 22 & 23. $150.00.

Tour III - Zambales - Dizon Copper Project - Nov. 22. $33.00.

Tour IV - Makiling - Banahaw Geothermal Plant - Los Banos, IRRI, Phil. Art Center - Nov. 21. $25.00.

Other Scientific Meetings

November 17, 1981 (tentative)

CGMW Meeting: A meeting of the Commission for the Geological Map of the World is being arranged to take place in Manila the day prior to GEOSEA. This meeting will involve about 30 participants representing south and east Asian countries. Preparation of various thematic maps for the region will be discussed.

November 21-25 1981

CCOP Remote Sensing Seminar: A gathering of about 30 scientists from CCOP member countries organized by the Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP). Hosted in Manila by the Natural Resources Management Center of the Philippines, this seminar aims to disseminate information about the recent advances on remote sensing technologies among the CCOP member countries.

November 21-28 1981

Workshop on the Luzon - Marianas Transect of the Studies on East Asia Tectonics and Resources (SEATAR): A gathering of 60-70 geoscientists implementing the recommendations for research of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources. The workshop starts with a 5-day field excursion along the transect area across Luzon on November 21-25, 1981. Indoor meetings will be held in Manila on November 26-28, 1981 to integrate the present knowledge on geology, stratigraphy, geophysics, geodynamics, tectonics, hydrocarbon genesis, sedimentation, petrology, geochemistry and metallogenesis of the transect. This workshop is organized by the Philippine SEATAR Committee, in cooperation with CCOP, IOC and the U.S. IDOE-SEATAR Committee.

AGID Meeting

The role of universities in the education of geoscientists will be tackled in a meeting organized by the Association of Geoscientists for International Development (AGID). Arrangements are being undertaken to hold this meeting in Manila between November 18 and November 28 1981. The University of the Philippines and the Philippine Council for Agriculture and Resources Research are prospective hosts.

UNESCO Regional Network for Geosciences in Southeast Asia

Representatives of Southeast Asian countries to the UNESCO Regional Network for Geosciences in Southeast Asia will meet for a short period during the GEOSEA conference.

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Symposium New Mineral Raw Materials (NEMIRAM) 1981

General information

The Symposium New Mineral Raw Materials will be held in Karlovy Vary Czechoslovakia from June 9 till 11, 1981.

Two field-excursions supplement the Symposium. The cultural and historical excursion (A) before the symposium, June 6-8, 1981. The geological field trip (B) after the Symposium, June 12-17 1981.

The Symposium is organized by the Geological Survey Praha together with the Institute of Mineral Raw Materials Kutna Hora.

Topic of the Symposium

Scientific program may cover a broad range of problems including
- the exploitation of conventional materials from non-traditional sources.
- criteria for evaluation of non-traditional raw materials, resources and reserves.
- the implications for raw material market and requirements caused by the changes in the energy sources/solar energy, geothermal energy etc.
- the possible use of recent energy sources for other purposes.
- the trends of technology in 21st century and their implications for raw material requirements.
- energy saving and environmental pretecting raw materials.

One half day workshop (W-1) will be devoted to the economy of newly born raw materials, the second half day workshop (W-2) to the secondary raw materials and to use of industrial wastes.

Since the form and subject of the Symposium is non-traditional, futuristically tuned and geologically oriented non-traditional papers will be accepted.

The Symposium should touch such questions as:
- are there resources in the planetary bodies and what about their extraction and implication for space colonization?
- are there any irreplaceable traditional materials?
- is there anything that technologists should say to geologists well in advance?

Language

The working language of the Symposium will be English. The simultaneous translation of papers from English to Russian will be secured. English, Russian and Czech languages could be used during the Workshop W-1 and W-2. Individual translation will be arranged by the participants themselves.

Presentation of papers

Participants wishing to present a paper to the General Session are asked

a) to announce the paper to the Organizing Committee not later than April 15, 1981.
b) to dispatch abstract (deadline as above).
c) the full text of the paper is to be submitted to the Chairman of the General Session on the day of oral presentation.

Organization

The General Session of the Symposium, workshops and field excursions are organized by the Organizing Committee. Its address is as follows:

Symposium NEMIRAM 1981
Organizing Committee
Ustredni ustav geologicky
Malostranske nam. 19
11821 Praha 1
Czechoslovakia.

*****

7TH INTERNATIONAL CLAY CONFERENCE

September 6th to 12th 1981, Bologna and Pavia, Italy, organized by the Italian Group of AIPEA (International Association for the Study of Clays).

Preliminary Programme

Bologna
Sunday, 6th September (late afternoon and evening)
Opening session and getting together party.

Monday, 7th September (Full day)
Invited lecture "present state and development trends of clay science", scientific sessions, seminars and round-tables - exhibitions.

Tuesday, 8th September
(Morning) scientific and poster (1) sessions-exhibitions.
(Afternoon) visit the International Museum of Ceramics at GAENZA.
(Evening) folklore show and Conference dinner.

Wednesday, 9th September (full day)
Invited lecture "Thermodynamic approach of clay mineral equilibria", special session "Advanced methods of investigation applied to clay minerals", scientific and poster (2) sessions - exhibitions.

Milano or Sassuola
Thursday, 10th September (full day)
(a) visit to Research Centre of E.N.I. (National Oil Company) in Metanopoli-MILAN and oil-gas drilling in the area, special session "Clays in petroleum generation and as catalysts".

(b) visit to the ceramic district around SASSUOLA, special session "Clays in ceramics".

Pavia (University buildings)
Friday, 11th September (full day)

Invited lecture "Teaching clay mineralogy", special sessions "The role of clay minerals in environmental sciences" and "Clays in engineering and soil mechanics", scientific sessions and extemporaneous meetings.

Saturday, 12th September

(Morning) general assembly of AIPEA and closing session.

Further details may be obtained from:

Prof. Fernando Veniale
Chairman of the Organizing Committee
7th International Clay Conference
c/o Istituto Mineralogia Petrografia - Universita via Bassi, 4 - 27100 Pavia, Italy.

*****

Cubic Zirconia - the Wonder Gem, the hottest item in cut stones

Ever since the prehistoric times, gems and jewelry have been important to man. Today, diamonds are among the most valuable to precious stones. Due to the high cost of diamonds, however, a substitute gem has frequently been sought. One substitute has been synthetic diamond, but it is still costly. Rhinestones, yag (garnet), topaz, etc. have been substituted, more or less successfully, for the market.

Recently, a synthetic (cubic zirconia, ZrO_2, also called C.Z.) material has been made available which may prove to be the most popular diamond substitute thus far. Its beauty and dazzling brilliance challenge for the first time the precious diamond, the world's most sought-after gem. The advantage that C.Z. has over previous substitutes is that it more nearly duplicates the properties of diamond which make it valuable, namely refractive index and dispersion.

A comparison of physical properties between diamond and cubic zirconia is listed here:

	Diamond	C.Z.
Refractive Index	2.42	2.2
Dispersion	Very high	Very high
Mohs Hardness	10	8.5
Density	3.5	5.7

The refractive index is a measure of how much light is bent as it passes through the stone. (It is also a measure of how fast light travels through the stone). A "high" refractive index stone has a brilliant surface luster as well as the ability to give the stone the ability to "radiate" light. The refractive index of cubic zirconia is still less than diamond, however.

Dispersion is a necessary property for all good diamond substitutes. Dispersion is the breaking up of white light into component colors. It is the "fire" in a good gem. Rhinestones, topaz, etc. have lower dispersion and so do not make good substitutes. Dispersion is inherent in a material and does not depend on trace coloring agents, style of faceting, etc.

The additional properties are also important, but are secondary. For example, the higher density of C.Z. means that one carat weight of stone is slightly smaller than a one carat diamond. Hardness is essential for durability. ("Hard" means scratching hardness. All gemstones are brittle to some extent.) Diamonds and cubic zirconia can come in all colors.

The first production of C.Z. was made by four Soviet scientists, Dr. V.V. Osiko and his research associates, and they have called their material "phyanite". Phyanite apparently stems from the same Greek root word as diaphanous: phainein. This root means "to show" because something is transparent. This name is a registered trade mark and the process was patented to stop the world-wide competitive manufacture of C.Z. The Russian gem boules are made from molten Zirconia (ZrO_2) but other slightly different methods of synthesis have been developed by other people and the material is widely marketed under the generic name of cubic zirconia.

(V.T. King, WARD'S Natural Science Estab., Inc.)

*****

Diamonds are a Crook's Best Friend

Fake diamonds, so cleverly made that they are fooling leading diamond dealers, are the fashionable confidence trick this Christmas. Most of the victims are either too embarrassed to report the matter to the police or fear equally embarrassing questions from the inland revenue.

Glasgow police have recently interviewed 23 retail jewellers who admitted buying diamond rings which they believed were genuine only to find that they were superb fakes. Only three of the jewellers are prepared to testify should the police catch the culprits.

The fakes are made from a compound called cubic zirconia developed by the Swiss in 1975 as an aid for laser beam research. The Russians realised that the compound had magnificent optical qualities and would cut and polish like a diamond. They began to manufacture in quantity and export the uncut and unpolished stones to Taiwan and Korea, where they are finished and then re-exported to Europe described as what they are - "brilliant stones for costume jewellery". The price is £3 a carat including VAT.

It is at this stage the conmen move in. The principal difference between the fakes and the genuine article is in the specific gravity, which can be checked only if the stone is removed from its setting. Therefore the fakes are mounted in intricate and expensive settings.

Raymond Graff, who runs the buying end of Knightsbridge dealers Graff Diamonds, said: "Some of them are so good that we are fooled." He and several Hatton Garden experts say they have shelled out a few thousand pounds on the fakes.

(Condensed from The Sunday Times, England, 12th Dec. 1980)

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CALENDAR

A bracketed date, e.g. (Mar-Apr 1979), denotes entry in that issue carried additional information.

1981

Apr 8 - 10: International Symposium on the Hellenic arc and trench (H.E.A.T.). Prof. S.S. Augusthithis, National Technical University, Department of Mineralogy-Petrography-Geology, 42, October 28th Street, Athens T.T. 147, Greece. (Sept-Oct 1980).

Apr 9 - 11 : SEATRAD Seminar on "Complex Tin Ores and Related Problems", Bandung, Indonesia. The Director, SEATRAD Centre, 14 Tiger Lane, Ipoh, Perak, Malaysia. (Nov-Dec 1980).

Mar 29 - Apr 4 : International Conference on Arid Soils - Properties, Genesis and Management, Jerusalem, Israel. International Conference on Arid Soils, P.O. Box 3054, 122 Hayarkon St., Tel Aviv, Israel. (May-Jun 1979).

May : International Symposium on "Concept and Method in Palaeontology" Barcelona. Dr. Jordi Martinelli, Department de Paleontologia, Facultar de Geologia, Univ. Barcelona, Gran Via de las Corts Catalones, 585, Barcelona-7, Spain (May-Jun 1980).

May 13 - 15 : Industrial Minerals (Forum), Albuquerque, New Mexico, USA. (G.S. Austin, New Mexico Bureau of Mines & Mineral Resources, Campus Station, Socorro, N.M., 87801, USA. Tel. 505-835-5125).

May 18 - 22 : Fourth International Coral Reef Symposium, Manila, Philippines. Marine Sciences Center, Univ. of Philippines, P.O. Box 1, Diliman, Quezon City, Philippines. (May-Jun 1980).

May 26 - 27 : Indonesian Petroleum Association - Tenth Annual Convention, Jakarta. Thomas A. Miller, Chairman Lecture Committee, 10th Annual IPA Convention, P.O. Box 63/JKT, Jakarta, Indonesia. (Sep-Oct 1980).

Jun 24 - 26 : ICAM 81 - International conference on Applied Mineralogy in the mineral industry, Johannesburg, South Africa. Pre- and post-conference field excursions. (L.F. Haughton, ICAM 81, Nat. Inst. for Metallurgy, Private Bag X31Q5, Randburg, 2125, South Africa). (Jan-Feb 1980).

June : Groundwater '81. International conference and exhibition at the Hilton Hotel, Kuala Lumpur. The Technical Editor, Groundwater '81, P.O. Box 143, Chatswood, NSW 2067, Australia. (Sep-Oct 1980).

Aug : United Nations Conference on New and Renewable Sources of Energy, Nairobi, Kenya. Information Officer, UN Conference on New & Renewable Sources of Energy, DESI/DPI - Room 1072-C, United Nations, New York, NY 10017, USA. (Jul-Aug 1980).

Aug 7 - 16 : 4th International Conference on basement tectonics. (Conference with field excursions), Oslo, Norway.

Major theme: origin, propagation and significance of basement fractures. (I.B. Ramberg, Dept. of Geology, University of Oslo, Box 1047, Blindern, Oslo, 3, Norway).

Aug 9 - 14 : Second international symposium of the Cambrian system, Golden, Colorado, USA. Sponsored by the Cambrian Subcommission of the IUGS Commission on Stratigraphy and the U.S. Geological Survey. (The Cambrian Symposium, Paleontology and Stratigraphy Branch, U.S. Geological Survey, Box 25046, Mail Stop 919, Denver Federal Center, Co. 80225, USA). (Nov-Dec 1980).

Aug 16 - 25 : XIIth Congress and General Assembly - International Union of Crystallography, Carleton University, Ottawa, Canada, Mr. Charbonnean, XIIth I.U. Cr. Congress, National Research Council of Canada, Ottawa, Ontario, Canada K1A OR6. (Jul-Aug 1980).

Aug 28 - Sep 9 : Arc volcanism, symposium, Tokyo (Aug. 31/Sept. 5), & field trips (Aug 28-30 to Hokkaido & geothermal fields; Sept. 6-9 to Kyushu, Izu, Oshima & Asama), by Volcanological Society of Japan and international Association of Volcanology & Chemistry of the Earth's Interior. Daisuke Shimozuru, Earthquake Research Institute, University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.

Sep 1 - 6 : Second International Conference, Graptolite working group for the International Palaeontological Association, (Conference and field excursions), Cambridge, U.K. (P.R. Crowther, Dept. of Geology, University of Cambridge, Sedgewick Museum, Downing Street, Cambridge CB2 3EQ, U.K.).

Sep 7 - 12 : 7th International Clay Conference, Bologna and Pavia, Italy. Conference with pre- and post-meeting field trips. (F. Veniale Istituto di Mineralogia e Petrografia, Universita di Pavia, Via Bassi 4, 27100 Pavia, Italy). (Jan-Feb 1981).

Oct 7 - 9 : ASEAN Council on Petroleum (Meeting), Manila, Philippines. (ASCOPE '81 Organizing Secretariat), Philippine National Oil Co., 7901 Makati Ave., Makati, Metro Manila, Philippines, Telex: 63667 PNOC PM).

Nov 18 - 23 : GEOSEA IV - Geology, Mineral and Energy Resources of Southeast Asia; Philippine International Convention Center, Manila, Philippines. The Secretary, Geological Society of the Philippines, Bureau of Mines Bldg., Pedro Gil St., Malate, Manila, Philippines. (Jul-Aug 1980 & Jan-Feb 1981).

Nov 23 - 26 : Asian Mining '81, Singapore. The Secretary, IMM, 44, Portland Place, London W1N 4BR, England. (May-Jun 1980).

Dec 7 - 11 : Ore deposits, ann. workshop, Toronto. (E.T.C. Spooner, Dept. of Geology, University of Toronto, M5S 1A1).

1982

May 12 - 14 : 9th International Geochemical Exploration Symposium, Saskatoon, Canada. (L.A. Clark, Saskatchequan Mining Development Corp., 122 3rd Ave. North, Saskatoon, Sask., Canada S7K 2HG).

Aug 20 - 23 : IV International Symposium on the Ordovician System, Oslo, Norway. One pre-meeting excursion in Norway and three post-meeting excursions in Sweden. (D.L. Bruton, Paleontologisk Museum, Sars gate 1, Oslo, 5, Norway).

Aug 22 - 28 : Circum Pacific Energy and Mineral Resources Conference, Honolulu, Hawaii, USA. (M.T. Halbouty, 5100 Westheimer Road, Houston, Texas 77056, USA).

Aug 22 - 28 : Eleventh International Congress on Sedimentology, Hamilton, Ontario, Canada. IAS Congress 1982, Dept. of Geology, McMaster University, Hamilton, Ontario L8S 4 M1, Canada. (Nov-Dec 1980).

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PERSATUAN GEOLOGI MALAYSIA
(GEOLOGICAL SOCIETY OF MALAYSIA)

Tujuan Persatuan Geologi Malaysia adakan untuk memajukan sains bumi, terutama sekali di Malaysia dan negara negara jiran. Barang siapa yang ingin menjadi ahli Persatuan adalah dipersilakan mendapatkan borang-borang daripada Setiausaha Kehormat.

The aim of the Geological Society of Malaysia is to promote the advancement of geological sciences particularly in Malaysia and the neighbouring countries. Anyone interested in becoming a member of the Society should obtain the necessary forms from the Hon. Secretary.

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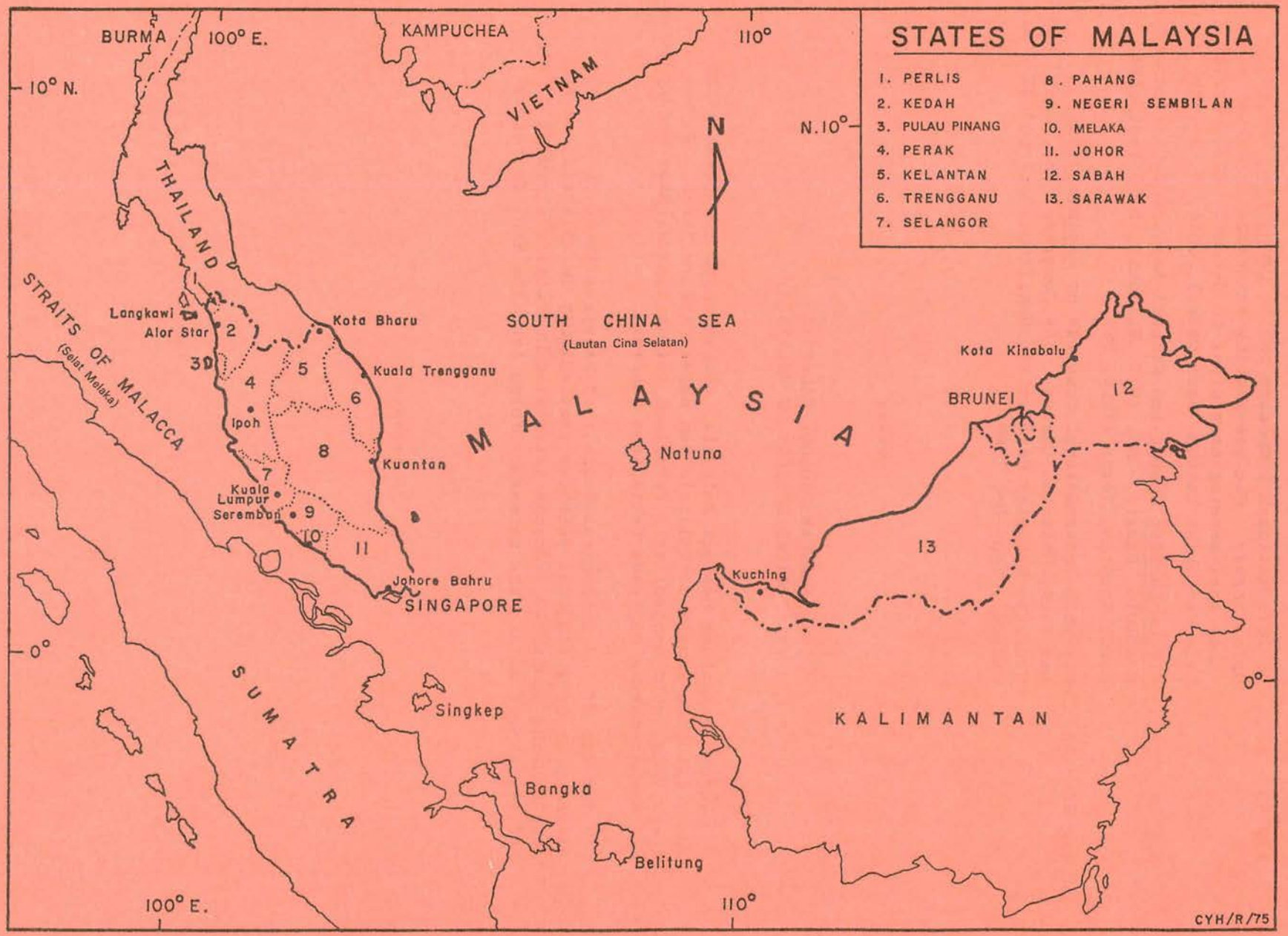
STATES OF MALAYSIA
1. PERLIS
2. KEDAH
3. PULAU PINANG
4. PERAK
5. KELANTAN
6. TRENGGANU
7. SELANGOR
8. PAHANG
9. NEGERI SEMBILAN
10. MELAKA
11. JOHOR
12. SABAH
13. SARAWAK
BURMA
100° E.
10° N.
KAMPUCHEA
VIETNAM
110°
N
N.10°
THAILAND
STRAITS OF MALACCA
(Selat Melaka)
Langkawi
Alor Star
Kota Bharu
SOUTH CHINA SEA
(Lautan Cina Selatan)
Kuala Trengganu
Kota Kinabalu
BRUNEI
MALAYSIA
Ipoh
Natuna
Kuantan
Kuala Lumpur
Seremban
Johore Bahru
SINGAPORE
Kuching
0°
SUMATRA
Singkep
KALIMANTAN
Bangka
Belitung
100° E.
110°
CYH/R/75