KDN 056/82 ISSN 0126/5539

PERSATUAN GEOLOGI MALAYSIA

WARTA GEOLOGI

NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA

Jil. 8, No. 3 (Vol. 8, No. 3) Mei–Jun 1982

KANDUNGAN (CONTENTS)

DIKELUARKAN DWIBULANAN
ISSUED BIMONTHLY

PERSATUAN GEOLOGI MALAYSIA
(GEOLOGICAL SOCIETY OF MALAYSIA)

Majlis (Council) 1982/83

Pegawai-pegawai (Officers)

Presiden (President)	:	Khoo Teng Tiong, Jabatan Geologi, Universiti Malaya, Kuala Lumpur
Naib Presiden (Vice-President)	:	Leong Khee Meng, Carigali-BP, P.O. Box 757, Kuala Lumpur
Setiausaha Kehormat (Hon. Secretary)	:	Tan Boon Kong, Jabatan Geologi, Universiti Kebangsaan Malaysia, Bangi
Penolong Setiausaha Kehormat (Hon. Asst. Secretary)	:	Mohd. Ali Hasan, Jabatan Geologi, University Malaya, Kuala Lumpur
Bendahari (Treasurer)	:	Chin Lik Suan, Datuk Keramat Smelting, Jln. Brickfields, Kuala Lumpur
Pengarang (Editor)	:	Teh Guan Hoe, Jabatan Geologi, Universiti Malaya, Kuala Lumpur
Presiden Yang Dahulu (Immediate Past President)	:	Mohd. Ayob, Petronas P.O. Box 2444, Kuala Lumpur
Ahli-ahli Majlis, 2-tahun (Councillors, 2-year)	:	Abdul Aziz Hussin, Jabatan Kejuruteraan Petroleum, Universiti Teknologi Malaysia, K.L.
		Khoo Kay Khean, Pejabat Penyiasatan Kajibumi, Kuala Kangsar, Perak.
		Michael Leong , Petronas, P.O. Box 2444, Kuala Lumpur
		Yeoh Gaik Chooi, Esso Production, P.O. Box 857, Kuala Lumpur
Ahli-ahli Majlis, 1-tahun (Councillors, 1-year)	:	Abdul Malek Abdul Rani, Esso Production P.O. Box 857, Kuala Lumpur
		Ahmad Said, Petronas, P.O. Box 2444, Kuala Lumpur
		Choo Mun Keong, Malaysian Mining Corporation, P.O. Box 936, Kuala Lumpur
		Gan Ah Sai, Jabatan Penyiasatan Kajibumi, Bang. Ukor, Jln. Gurney, Kuala Lumpur
Juruodit Kehormat ((Hon. Auditor)	:	Peter Chew

*****

First published 28 Sept. 1982

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

CATATAN GEOLOGI
(GEOLOGICAL NOTES)

ROLE OF GROUNDWATER IN THE MALAYSIAN ENVIRONMENT

STEPHEN HANCOCK, Principal Consultant, Australian Groundwater Consultants Pty. Ltd., Melbourne, Australia.

When Australia and Malaysia are compared, there is really much more similarity than might be obvious. The populations are similar, the populated land area actually occupied is also similar, in geology and climate in Australia there are areas which closely resemble those of Malaysia, only in the broadscale, rainfall (average less than 300 mm in Australia) and evaporation (average greater than 2000 mm) do the countries differ. Closer to the subject though, there is no question of a difference, water shortage has forced Australia to develop its groundwater resources. As a result Australia can claim a 200 year history of deliberate groundwater development with 30 years of experience in specific quantitative groundwater engineering.

It is for the last mentioned reasons that the comments made may be of value to the Malaysian environment.

Water Resource Development Philosophy

The way in which water resources are developed can be said to be a result of - Water availability,
Water requirement, and
Economics

Three sources of water are available, namely rainfall, surface water and groundwater, and it is in this order that water resources have traditionally been developed. In modern society the impact of competition for water and pollution have not uncommonly advanced the development of groundwater. The recognition that groundwaters can be reliably evaluated as to maintainable yield, plus its inherent insensitivity to extremes of climate and finally the low capital cost and rapidity with which it can be developed has made it an attractive resource where it is available.

The question then for Malaysia is whether one has a significant resource?

Groundwater Resource Evaluation

Classification

Groundwater resources are classified internationally into the environments in which they occur, namely -

- Fractured rock
- Sedimentary Basins, and
- Alluvial Basins.

Delivered to the Geological Society of Malaysia on 20th Jan. 1982, Dept. of Geology, University of Malaya, Kuala Lumpur.

Fractured Rock Aquifers

In Malaysia these include the Palaeozoic sandstone, shales, limestones and granites of the mountain ranges. The effect of deep chemical weathering in tropical environments needs to be taken into account in assessing their potential as much as their propensity for fracturing under tectonic stress or suffering solution due to their mineralogy.

The tectonic environment of both East and West Malaysia indicates that incompetent rocks should be heavily jointed and fractured. However, major fault zones will most likely have suffered from metamorphism and deep weathering and will be clay packed and impermeable. Elsewhere however sandstones, slates and limestones should be highly productive not only because of their physical and mineralogical components but also because of the high rainfall they can receive as recharge, where they are not significantly covered by a deep clay weathering mantle.

Granites will not be a significant source of water in Malaysia mainly because of deep chemical weathering both in the surface mantle and down joint and fracture planes. The product of the weathering will be clays and these will at shallow depths plug the joints largely precluding the penetration of recharging meteoric waters. This factor is well evidenced in the springs which occur in road cuttings in the granites on the way to Genting.

The limestones of course are a massive aquifer where they occur below water table, and evidence is starting to emerge in many places of significant water supplies being obtainable from the Palaeozoic hard rock sequences.

Sedimentary Basins

In Malaysia the major sedimentary basins as opposed to alluvial basins are those of East Malaysia where they are mainly known for their being a source of oil and gas. These are predominantly Tertiary basins and seem likely to have major onshore potential for water productions. It may be argued that such production is not required in an area so richly endowed with surface water, but where major developments are occurring at the coast with tidal intrusion in streams, these deep basin sources may prove of great value.

Recharge to such basins seems likely to be derived in the up dip areas of the inland ranges, and in terms of storage and potential their development capacity must be considered of great magnitude. In all probability aquifers tapped at depth in such basins may flow strongly at the surface and provide major supplies without the need for any pumping equipment.

Alluvial Basins

Much of the populated area of Peninsular Malaysia at least is underlain by deep alluvial basin. Even the Klang Valley has over 100 m of river alluvium at the coast and the Perak River valley has over 200 m of alluvium recorded in tin exploration holes. It seems most unlikely that similar if not greater depths occur in the Pahang or Trengganu River basins.

The predominance of granites and siliceous rocks in the central mountain ranges of Peninsular Malaysia, coupled with the high rainfall

and high energy stream makes it certain that coarse grained sand gravel deposits will occur extensively in these basins. These will form the basis of major groundwater resources capable of development.

The size of these valleys, the nature of the surrounding bedrock, the presence of perennial streams overlying them and the generally high rainfall all ensure that these water resources will have very large maintainable supply capacity.

Some of the waters may be iron rich and highly charged with carbon dioxide in their natural state, but in general they should be of low salinity and amenable to simple treatment.

On the west coast of Peninsular Malaysia at least the alluvial deposits are overlain by Pleistocene and Recent marine and parallic clay deposits which are partly saturated with brackish to saline waters. Particularly close to tidal river reaches some brackish waters have been encountered in shallow wells. This is to be expected and could be avoided by tapping deeper aquifers and by casing and cementing off the shallow brackish water aquifers.

In summary, in Peninsular Malaysia there is vast potential for groundwater development and vast capacity to accommodate the development of this resource when it occurs. The value of these resources is all the greater because they occur in the areas where the major populations occur. As such they can be considered for development in conjunction with existing supplies or as a source on their own.

Considerations in Development

In order for groundwater resources to be considered for development, there needs to be either: -

- the stimulus of no practicable alternatives, or
- a knowledge which gives it a reliability equivalent to alternative sources.

The latter involves the expenditure of risk capital and is generally abhorent to water supply engineers. Not infrequently I have seen inordinately expensive surface water schemes developed because water authorities were not prepared to spend a fraction of the cost on exploration for groundwater.

For example Blue Speck Dam serves Townsville, Queensland, with water via 200 km of pipeline and crosses an area now developed as local supply at 50 ML/d (11 MGD) to a major new industry located 30 km from the city. The dam supply capacity is 50 ML/d and it has failed twice in the last decade. The difference in water cost is a factor of ten with the groundwater being cheaper. The whole investigation cost was less than the cost of 4 km pipeline.

In order to minimize risk capital and to get the best data from drilling it is desirable to set about exploration, evaluation and development of groundwater in a logical and integrated manner, the alternative to this is random drilling, which given the relative inexperience of most drillers in Malaysia is liable to result in either a failure to obtain reliable results, negative results, misleading results or a combination of all three.

Integrated Groundwater Exploration

At the outset, a viable hydrological concept is conceived which is related to the hydrogeological environment and the logistical constraints which apply (AGE, 1979). From this base the targets are progressively tested and refined until the best and most economic source is identified and evaluated.

Investigation Tools

The tools available to the hydrogeologist or groundwater engineer include —

- geological mapping - to establish broad concepts and targets,
- geophysical surveys - including seismic refraction, electrical resistivity surveys, magnetic surveys, and wireline logging,
- drilling and sampling.

It is necessary to select the tools most applicable to the environment and to select the intensity of their use and to consider the value of the data they contribute carefully in advance.

Geological mapping - may be very important in hard rock environments to distinguish between prospective and unprospective rocks, structural and sedimentary trends, etc, but it is of little value over alluvial basins or around sedimentary basins except to identify their margins.

Geophysical techniques - must be carefully selected both as to technique, equipment and application. Geophysical results can give extremely valuable data, but all too often as a result of inadequate equipment or application the results achieved are misleading and not representative of the target aimed at.

Certain results from surveys in S.E. Asia where electrical resistivity soundings were used over dipping rocks and low power equipment failed to penetrate the sequence. In Malaysia electromagnetic surveys have been used over flat lying low salinity saturated aquifers.

There is no doubt however that the operators in each case did not understand the application of the techniques they were using, the environments in which they were applying the technique or the equipment requirements.

Drilling - is the most expensive and least reliable technique unless the operation is closely supervised by people expert in drilling technology and in hydrogeology.

Drilling is capable of giving positive information (air lifted yields, water samples, etc.) but it is slow and the information is at one point only. The use of wireline logging, in particular single point resistance spontaneous potential and gamma radiation can improve the quality of the results considerably. Collection of penetration rates while drilling, air lifted water discharge values and salinities on a regular basis also add to the overall data base. Drilling where linked with geophysical survey becomes a very valuable and is always the ultimate tool.

Hydrological Evaluation

When an aquifer target has been defined by the integrated application of an appropriate array of tools, then hydrological evaluation can commence.

Such evaluations can include water level surveys, controlled pumping tests and extension of this data by correlation from well to well using the available data from the exploration programme.

The prime tools in hydrological evaluations are controlled pumping tests or flow tests these generally involve evaluation of both the well as a hydraulic structure and of the aquifer. As with geophysical results the analyses and interpretation may not give a unique and unequivocal results. The application of the conceptual understanding of the environment then must become the deciding factor.

Ultimately the data derived will be used to create a hydrogeological model which should include functions of area and hydrology. The hydrological parameters should include -

. recharge . discharge . underflow . transmissivity . storage
. leakage and perhaps . salinity and temperature.

In complex environments, such models may require the use of a computer, but frequently all that is needed is a desk top calculator and the experience to use it.

Monitoring and Management

Because of the large storage reservoir from which groundwaters are drawn and the complex interactions which occur with other elements of the hydrological cycle when these reservoirs are placed under stress, it is impossible to fully evaluate the sustainable capacity of a basin in advance of its development. Upgrading of estimates after production has commenced is an essential operation. The factual basis for such upgrading must be the records of pumpage, water level fluctuation, rainfall and streamflow which are collected by the system operators.

The periodicity of such upgrading normally is tied to the next major stage of groundwater development, but where this is nearly continuous the operation should be undertaken on a regular basis.

Monitoring should be an aspect of management which is undertaken at a local level with return of data to a central data bank.

The data should be collected in standard formats suitable for encoding and magnetic tape storage. It will then be amendable to computer analysis and output to assist in making decisions on resource management on both a local, regional and national basis within the context of overall water resources management.

The biggest problem involved in monitoring and management is that it will not just happen of its own volition. Sophisticated companies will monitor and manage their own wellfields because they recognise the need for this, but smaller communities, irrigators, etc, tend not to monitor and record data.

The only way problems of monitoring, data collection and remittance can be overcome is by legislative direction. This is an important and urgent need in Malaysia.

The legislation can be at a State or Federal level whichever is appropriate, but it should be uniform and consistent throughout the country. It must include provisions for -

i) advise of action prior to physical development taking place,
ii) control of well and wellfield construction,
iii) control of pumping level and pumping rates,
iv) provision for regular return of data on pumping and water levels in areas proclaimed to require such data, and
v) provision for appeal to an independent body in regard to the terms and conditions of permits or licences to drill and operate, or against failure to issue such permits or licences in areas where these are required to be approved.

Within such legislation, reasonable application of conditions can avoid the problems of groundwater and well contamination, excessive pumping with it attendant problems of land subsidence and salt water intrusion, as well as give the data necessary for overall resource management.

Conclusion

It will seem that as Malaysia advances rapidly in the 1980's and 1990's the development of what are undoubtedly very large groundwater resources can play a major part in expediting development and alleviating water shortages currently being experienced in many areas. The biggest problems confronting the country however is the lack of expertize to direct and implement such developments and the lack of legislation to control them.

There is an urgent need for training in groundwater technology at professional and subprofessional (driller) levels and to communicate to the senior water resource engineers the realities of groundwater resource development.

Australia has developed the expertize in groundwater technology and in the preparation of legislation. To quote an elderly American consultant, who was in Australia seeking groundwater expertize to work in Algeria when asked why he had come as far as Australia in his quest, he replied "If you want to find groundwater expertize go to a water short country". Australia is such a country and groundwater technology has developed as a result of the dry continent.

Reference

Australian Groundwater Consultants Pty Ltd., 1979. Manual of Australian groundwater Hydrology Practice - For Royal Melbourne Institute of Technology. 349 p.

*****

THE LOCALISED OCCURRENCE OF HORNBLENDE IN GRANITE FROM THE J.K.R. QUARRY, KUALA DIPANG, PERAK

D. SANTOKH SINGH & S.K. YONG, Geological Survey of Malaysia

Samples of a light grey, coarse-grained granite containing a greyish finely crystalline xenolith or enclave collected from the J.K.R. Quarry at Kuala Dipang in Perak were examined (Fig. 1).

The elongated patchy enclave, measuring approximately 6 cm by 3 cm, is observed to be separated from the enclosing host granite by a one-centimetre wide reaction rim of medium-grained granitic material. Microscopic examination of the enclave shows a hornfelsic texture developed by predominantly alkali feldspars (microcline and orthoclase), some sodic plagioclase and quartz with large crystals of hornblende (pleochroic from pale brown to dark green) and biotite (pleochroic from yellowish brown to reddish brown). The poikiloblastic hornblende and biotite are riddled with inclusions of quartz, feldspar and apatite giving rise to the formation of the characteristic sieve-structures. The quartz and feldspars form a mosaic of interlocking crystals containing numerous finely acicular apatite. The enclave has a hornblende-biotite-quartz-feldspar composition.

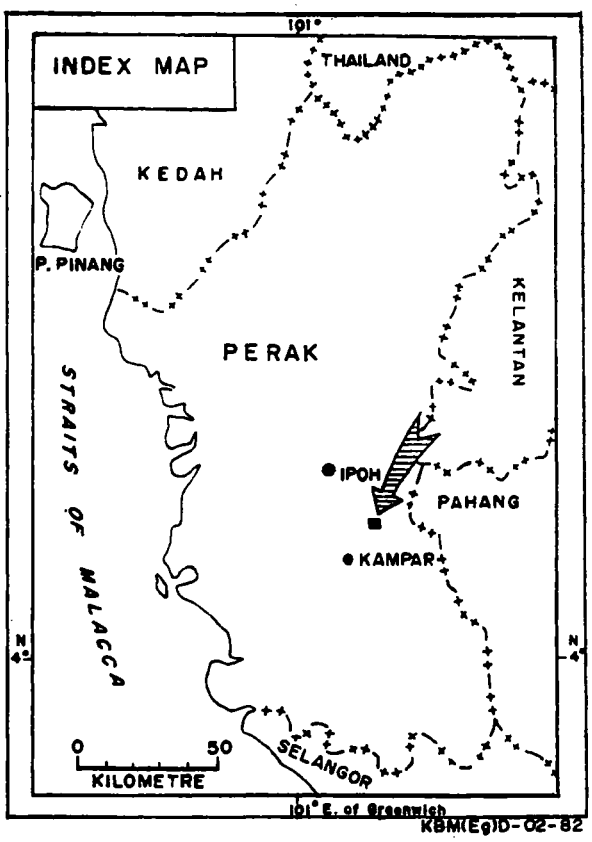
Examination of the microsection of the host granite enveloping the hornfelsic enclave indicates a hypidiomorphic-granular texture formed by patchy perthite, zoned plagioclase (essentially oligoclase), some quartz, biotite and hornblende. The hornblende encloses some inclusions of quartz and stout prismatic apatite whereas the closely associated biotite contains inclusions of zircon, quartz and apatite. These two minerals show pleochroic colours similar to those exhibited respectively by the hornblende and biotite in the enclave. Some of the distinctly zoned plagioclase crystals display alteration of the cores (more calcic than the rim) to sericite and clay minerals.

This reported occurrence of the quartzo-feldspathic enclave containing hornblende and biotite would probably suggest granitisation of a sedimentary rock with an arkosic composition. Previous work conducted by Ingham and Bradford (1960) and Chand (1970) on the samples of granite and associated xenoliths from other parts of the quarry shows the presence of biotite but not hornblende. Reexamination of the samples by the writers reveals similar findings. It appears that the presence of hornblende in the granite sample encountered is a localised phenomenon which seems to be confined to the vicinity of the granitised xenolith or enclave in the granitic body. It should be noted that to date there has been no published report of hornblende being recorded in the granite at the J.K.R. Quarry in Kuala Dipang or for that matter even in the Kinta Valley.

References

Chand, F., 1970. Bujang Melaka area: Geological Survey Malaysia Field Records v. 8 (unpublished).

Ingham, F.T., & Bradford, E.F., 1960. Geology and mineral resources of the Kinta Valley, Perak. Geological Survey Malaysia District Memoir 9.



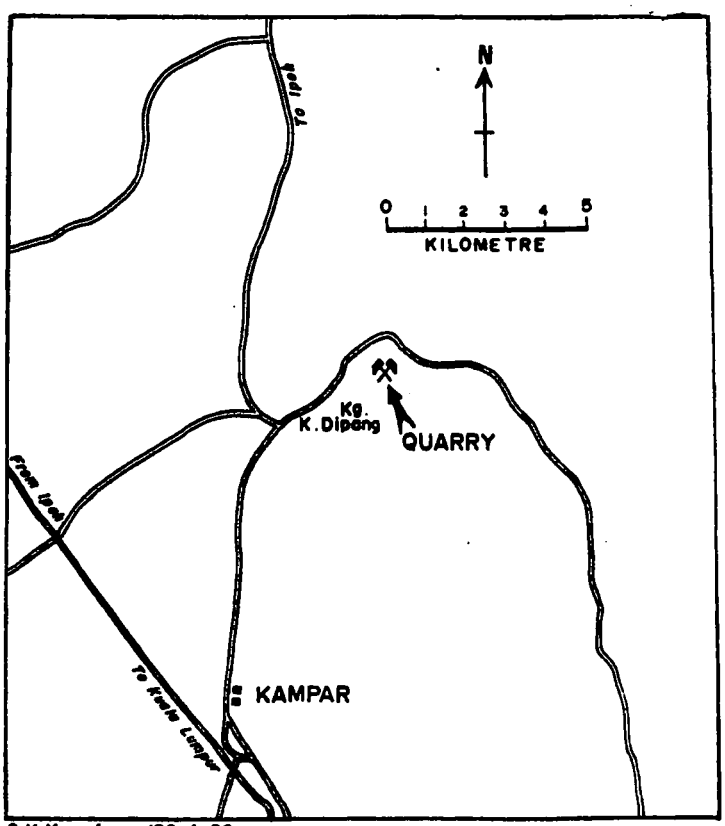


FIGURE 1. LOCATION OF JKR QUARRY, KUALA DIPANG, PERAK.

Revised manuscript received 31 May 1982

THE GRANITES OF PENINSULAR MALAYSIA: A COLLABORATIVE STUDY BY INSTITUTE OF GEOLOGICAL SCIENCES AND GEOLOGICAL SURVEY OF MALAYSIA

E.J. COBBING[1], D.I.J. MALLICK[1], YAP FOOK LOI[2] & TEOH LAY HOCK[2]

In recent years considerable advances have been made in resolving the nature of the granitic bodies of Peninsular Malaysia, mainly as a result of laboratory studies which have followed Geological Survey mapping programmes. This had led to the recognition that the differentiation of the Peninsula into three belts of mineralisation (eastern and western tin belts and a central base metal belt) is parallelled by a tectonic subdivision into three units and that the granitic bodies of the Eastern and Western Belts differ from one another in a number of respects (Hutchison, 1977). Of particular note are the following points. The Eastern Belt intrusives exhibit a wide range of composition from acid granite to mafic diorite and gabbro; non-porphyritic rocks predominate and the initial Sr^{87}/Sr^{86} ratios are rather low (0.705 - 0.708, Bignell and Snelling, 1977). By contrast the Western Belt granitoids exhibit a much narrower range of mineralogical and chemical composition, from granite to granodiorite; porphyritic rocks predominate and the Sr^{87}/Sr^{86} ratios are higher (0.709 - 0.716, Bignell and Snelling, 1977). Hutchison (1977) has also shown that there are differences in the structural state of the alkali feldspars in the granites of the two belts, differences which, together with other evidence, can be interpreted to indicate that the Eastern Belt granites were epizonal and the Main Range granites mesozonal. Insufficient is currently known about the nature of the Central Belt granites, although affinities with the Eastern Belt are indicated by our observations.

We considered that the proper initial objective in an overall study of the granites, which make up about 40% of the surface area of Peninsular Malaysia, must be understanding of just how they were built up; how many phases and components of granite and associated rocks were intruded during the period 290 Ma to 200 Ma (Bignell and Snelling, 1977), and what is the form of each? These questions can only be tackled adequately by detailed mapping of the granite bodies, a difficult task in view of logistic problems, the thickly forested nature of the terrain, and the deep tropical weathering. The Geological Survey has already made some valuable contributions to the subdivision of the granites; the outline of the main granitic batholiths is now well-defined, the range of lithological variations within them has been described and the presence of bodies of fine grained granite has been recognised, but, with some exceptions, the mapping of more detailed lithological variations has not been attempted. However, the combined work of Burton (1973), Lee (1977) and Chand (1978) in the Eastern Belt, and that of Roe (1953), Shu (1971) and Burton (1970) in the Western Belt, all suggest that lithological discrimination within the coarser granites is feasible.

Experience by one of us (EJC) in the coastal batholith of Peru, which is well exposed in the Andean desert, has shown that the component

---

1 Institute of Geological Sciences, Keyworth, Nottingham NG12 5GG, England.
2 Geological Survey of Malaysia, Ipoh, Malaysia.

parts of the large granite batholiths could be mapped on the basis of variations in composition and texture and that consanguineity could be established from textural similarities by using normal but detailed, petrographic examination in the field. By this means a history of plutonic activity and the form of the intrusive bodies was established (Cobbing and Pitcher, 1972; Cobbing, *et al.*, 1981) as was the association of base metal mineralisation with only some of the granite super-units (representing magma types).

Our fieldwork during a three month stay in Malaysia in 1981 has convinced us that a similar approach of detailed petrographic examination in the field could lead to a proper subdivision of the Malaysian granites. This conclusion has been reached on the basis of a small number of traverses by foot and/or Land Rover across and round a number of the granites; we plan to fill in some of the spaces between traverses by further work in 1982. Preliminary results are as follows:

Eastern Belt Granites

These are more comparable with the Peruvian granites than are the Western Belt Granites in that they have a wide compositional range from diorite to granite. They are also divisible on the basis of combined compositional and textural variations. The central part of the Kapal Granite on either side of the Sungei Trengganu is divided into four separate bodies by screens of sediments. Each of these bodies is composed of a different set of lithological types which, in three cases, range from hornblende granodiorite to megacrystic monzogranite. The fourth, where seen, consists only of two types of granite, the Kenyir Dam granite probably being the youngest rock in the area. The northern end of the Lawit Granite lacks sedimentary screens but, like most other bodies, has a markedly asymmetric distribution of rock types. The eastern part comprises a coarsely megacrystic granite intruded by a small body of diorite and by an equigranular granite. The western part is composed mainly of another, coarser, equigranular granite and abundant microgranite. The northern end of the Boundary Range batholith consists of a complex assemblage of granites with some granodiorite and diorite. One of the tonalite bodies figured by MacDonald (1967; Fig. 10) and regarded by him as a lateral marginal variation of the granite resulting from contamination, has been shown to be an intrusion crossing the Sungei Manik and causing growth of acicular hornblende in the adjacent, metamorphosed, granite. The Maras Granite consists of two closely similar bodies of grey megacrystic granite separated by a screen of sediments. The Jerong-Jerengau Granite mass comprises three separate suites of rocks; grey, equigranular granite to diorite in the north, a suite of pink, megacrystic granites and microgranites in the Jerengau Forest Reserve and grey, variable granites in the south.

Western Belt Granites

As the Geological Survey have delimited areas of microgranite we have concentrated on subdividing the much more abundant coarse-grained rocks, which has been done mostly on textural grounds. The Penang Granite has been divided into three units; in the south is a rather variable set of muscovitic granites in which both the foliation and lithological variation are aligned in a N-S direction. These structures appear to be truncated by two closely related, generally muscovite-free, granite units forming respectively the NE and NW parts of the island. The Kledang and Dindings Plutons have each been divided into two types of megacrystic boitite granite and the Bubu Pluton into four units.

The Kulim Pluton has been divided into an outer mafic biotite granite and an inner leucocratic, muscovitic unit, the latter containing porphyritic, non-porphyritic and aplitic types.

Land Rover traverses along parts of the Main Range between Grik and Melaka have indicated that those granites may be similarly subdivided but no mapping of them has yet been undertaken. As an example of the type of subdivision of the Main Range granites likely to be possible we may quote the Kuala Lumpur - Karak highway section. In the centre is a screen of sediments with a large mass of pyroxene-xenocrystic microgranite and rhyolitic volcanics. This mass is faulted against granites to east and west. To the east is a mass of megacrystic granite with a medium-grained groundmass which extends north to the Genting Highlands and which is flanked on both sides by a megacrystic granite with a much coarser groundmass and which contains blue-grey quartz in distinctive aggregates. There are wide variations in the degree of foliation and shearing of these two granites which results in a convergence of petrographic characters. West of the sediment screen are two more granite types, both of which contain muscovite which may be associated with pegmatite injection in the western part of the section.

In summary, we are convinced that the subdivision of the Malaysian granites, at least into their major units, is a practical objective for future mapping programmes. Our limited work so far has indicated that a number of what were formerly thought to be large sedimentary xenoliths or roof pendents are, in fact, screens separating different granite units. While there are gradational variations in some rock units, many of the changes of rock type are abrupt, and are probably intrusive.

Acknowledgements

The funding for this study is being provided by the United Kingdom Overseas Development Administration and by the Geological Survey of Malaysia.

This paper is published by permission of the Directors of the UK Institute of Geological Sciences (N.E.R.C.) and of the Geological Survey of Malaysia.

References

Bignell, J.D., & Snelling, N.J., 1977. The geochronology of the Malayan granites. Overseas Geol. Min. Resources, No. 47, 70 p.

Burton, C.K., 1970. Geology and mineral resources of the Baling area, Kedah and Perak. Geol. Surv. Malaysia, District Mem. 12, 150 p.

Burton, C.K., 1973. Geology and mineral resources, Johore Bahru-Kulai area, South Johore. Geol. Surv. Malaysia, Map Bull. 2, 72 p.

Chand, F.C., 1978. The geology and mineral resources of the Ulu Paka area, Trengganu. Geol. Surv. Malaysia, District Mem. 16, 124 p.

Cobbing, E.J., & Pitcher, W.S., 1972. The coastal batholith of central Peru. Jl. Geol. Soc. Lond., Vol. 128, 421-460.

Cobbing, E.J., Pitcher, W.S., Wilson, J.J., Baldock, J.W., Taylor, W.P., McCourt, W., & Snelling, N.J., 1981. The geology of the Western Cordillera of northern Peru. Inst. Geol. Sci., Overseas Mem. 5, 143 p.

Hutchison, C.S., 1977. Granite emplacement and tectonic subdivision of Peninsular Malaysia. Geol. Soc. Malaysia, Bulletin 9, 187-207.

Lee, A.K., 1977. A preliminary economic appraisal of Ulu Lepar. Geol. Surv. Malaysia, Ann. Rept. for 1976, 117-124.

MacDonald, S., 1967. The geology and mineral resources of north Kelantan and north Trengganu. Geol. Surv. Malaysia, District Mem. 10, 202 p.

Roe, F.W., 1953. The geology and mineral resources of the neighbourhood of Kuala Selangor and Rasa, Selangor, Malaya. Geol. Surv. Malaya, Mem. 7, 163 p.

Shu, Y.K., 1971. The geology of new map Sheet 95, Jelebu District, Negeri Sembilan. Geol. Surv. Malaysia, Ann. Rept. for 1969, 72-81.

*****

Manuscript received 20 March 1982

GRAVITY TRAVERSE ACROSS NORTHERN PENINSULAR MALAYSIA - PRELIMINARY RESULTS*

G. VAN KLINKEN[1] & HO CHOON SENG[2]

Introduction

To supplement gravity data now available elsewhere in the Peninsula (Ryall, 1976; Loke, *el al.*, 1982), we conducted a regional traverse from Penang to Bachok on the Kelantan coast, via the still incomplete East-West Highway. 149 new gravity values at a nominal 3.2 km (2 mile) spacing were obtained along the ruote shown in Figure 1. All the usual corrections were applied except the terrain correction which will be applied later. Stations were projected onto a straight line (Fig. 2).

Interpretation of gravity data

We used a procedure based on non-linear computer optimization of a simple two-dimensional model. The observed profile (Fig. 2) shows a broad regional 45 mgal minimum, which was also observed over the Main Range further south (Loke, *et al.*, 1982). This we have again attributed to an undulation of the upper-to-lower crustal boundary. The residual anomalies are then accounted for by near-surface or exposed geological bodies. Studies on the known surface geology cover only about 2/3 of the traverse (MacDonald, 1967; Jones, 1969; Burton, 1970). The densities we used are those used by Ryall. Although these values affect the shape of the final model quite radically, they are not well defined. One simplifying assumption we made is that all geological formations have a uniform density. We realize this is not true. The Baling Formation for example contains high density pyroclastics which we did not distinguish. Major andesites occur east of Tanah Merah but have been lumped together with the slightly less dense Taku Schist.

For all this, our preliminary model (Fig. 3) gives a useful general indication of subsurface conditions. A more sophisticated model is not warranted at this stage because the terrain correction is incomplete, and because the situation in many places is actually three-dimensional. There is also unresolved ambiguity in the model because other subsurface controls are absent.

Results

Several features of the model in Fig. 3 deserve further discussion:

(1) Broad thickening of the upper curst occurs especially beneath the Main Range (km 100 - 140), where it reaches a maximum of 5 km in excess of an assumed "normal" thickness of 15 km. This would fit with Hutchison's (1978) concept of late Triassic partial under-thrusting of the western under the eastern plate resulting in the anatexis and uplift of the present Main Range. No such thickening is indicated in the west of the peninsula (km 0-50), or in the east (km 180 - 230).

(2) The most curious interpretation problem occurs across the Bok Bak fault (km 54). On the western side we find the low density Meso-

---

1. Pusat Pengajian Sains Fizik, Universiti Sains Malaysia, Pulau Pinang
2. Jabatan Penyiasatan Kajibumi, Ipoh, Perak.
* Permission has been obtained from the Director-General, Geological Survey Malaysia to publish this paper.

zoic Semanggol Formation, yet the gravity is high here. Conversely we find the higher density Lower Palaeozoic Baling Formation on the eastern side, but the gravity is low. The only way to circumvent this twin problem is to suppose that in both cases the surface rocks are thin and underlain by different rocks. Perhaps Lower Palaeozoic metamorphics occur below the Semanggol Formation, and granite below the Baling Formation. In any case the gravity data confirm the Bok Bak fault as a major structure, perhaps with vertical movement (upthrust on the northeast side) as well as horizontal.

(3) Although the Lower Palaeozoic metamorphics are thin near the Bok Bak fault, they thicken rapidly east of a point north of Grik (km 90). The thickness in excess of 5 km shown here would be reduced if higher density volcanics and other rocks are included in the model.

(4) The Taku Schist appears to be thick, but this again depends on the density, which is probably underestimated here. It may be underlain by oceanic crust as suggested by Hutchison's model, but this would be difficult to confirm by gravity alone.

(5) The Quaternary alluvial coastal plain near Bachok probably overlies Upper Palaeozoic metamorphic rocks. This appears to contradict the isolated outcrops of granite observed here.

Acknowledgements

The survey was sponsored jointly by the Geological Survey of Malaysia and Universiti Sains Malaysia. One of us (C.S. Ho) thanks the Director-General of the Geological Survey of Malaysia for permission to publish this paper. We thank Mr. Aw Peck Chin of the Geological Survey for reading it critically. Other participants of the survey were Messrs. Quazi Abdul Halim, Ishak Dun and Zulkefli Ahmad, all from U.S.M. Mrs. Siti Patimah Harun drew the figures. We thank the J.K.R. for hospitality in Kg. Jeli, and the East-West Highway security authorities for their cooperation.

References

Burton, C.K., 1970. Geology and Mineral Resources of the Baling area, Kedah and Perak, Geol. Surv. Malaysia District Memoir 12.

Hutchison, C.S., 1978. Southeast Asian tin granitoids of contrasting tectonic setting. J. Phys. Earth 26, Suppl. S221-S232.

Jones, C.R., 1969. Geology and mineral resources of the Grik area, Upper Perak. Geol. Surv. Malaysia District Memoir 11.

Loke, M.H., Lee, C.Y., van Klinken, G., 1982. Interpretation of regional gravity and magnetic data in Peninsular Malaysia. Bull. Geol. Soc. Malaysia, in press.

MacDonald, S., 1967. Geology and mineral resources of North Kelantan and North Trengganu. Geol. Surv. Malaysia District Memoir 10.

Ryall, P.J., 1976. Gravity traverse of Peninsular Malaysia - Preliminary results. Geol. Soc. Malaysia, Ipoh Meet., Abstr., Dec. 1976.

Manuscript received 17 April 1982

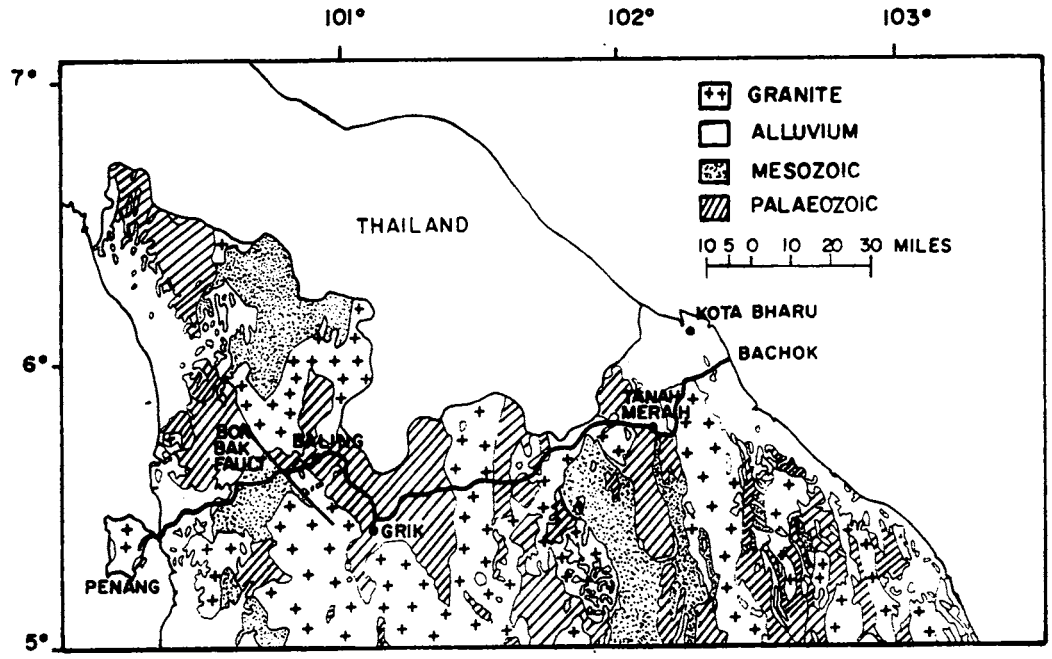


Fig. 1. Location of gravity traverse, on a simplified geological map (after Geol. Surv. Malaysia, 1973).

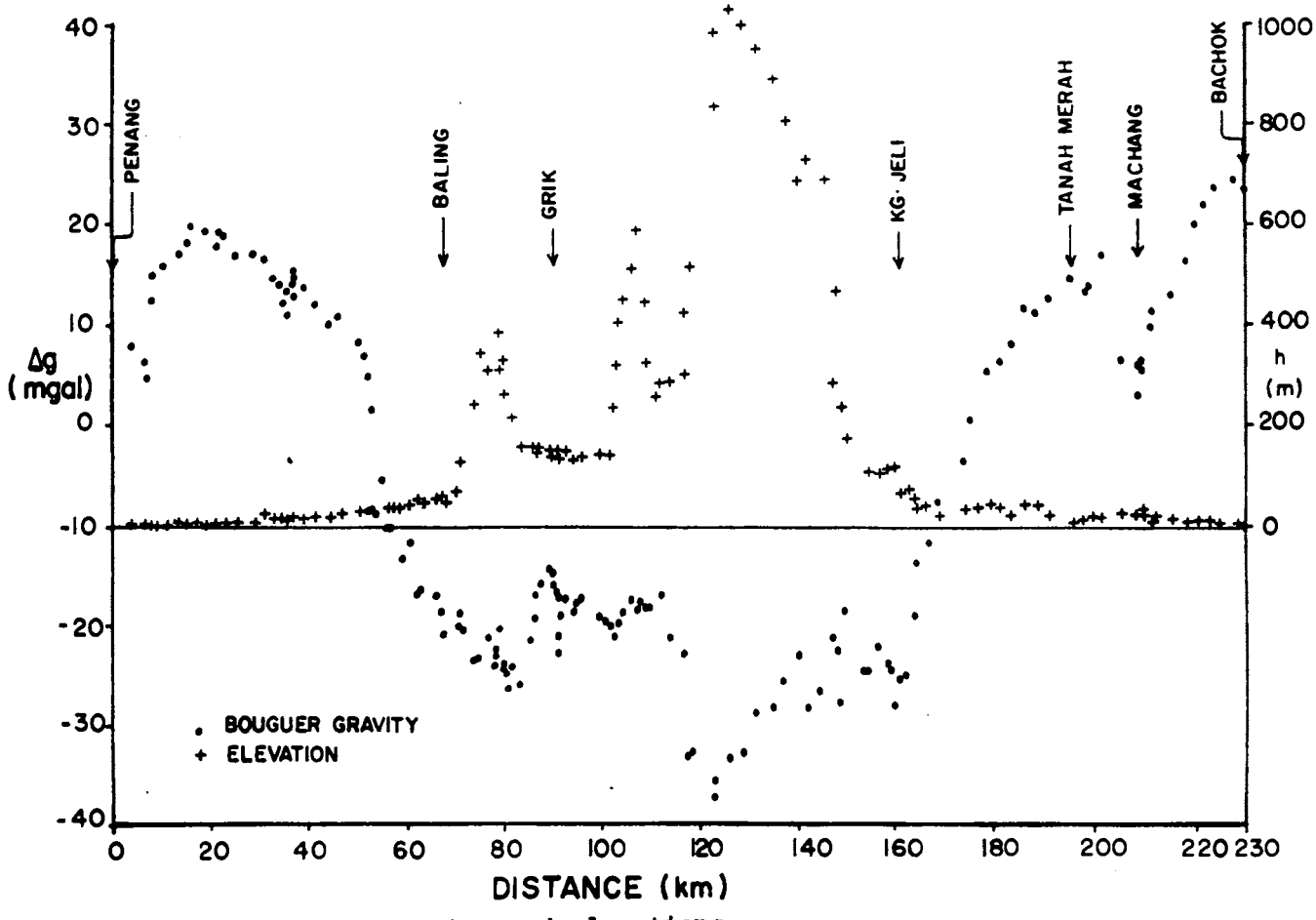


Fig. 2. Observed gravity and elevations.

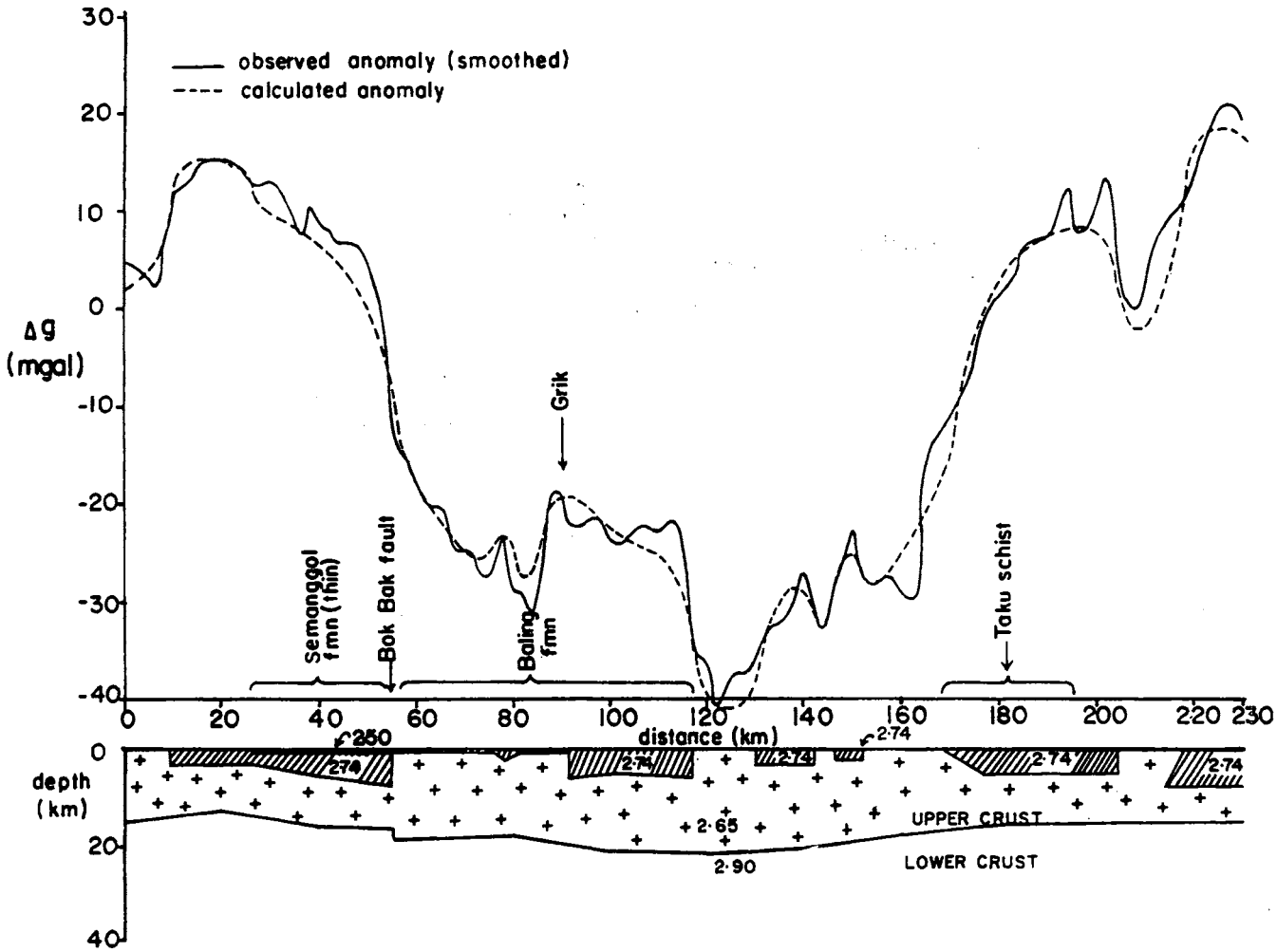


Fig. 3. Preliminary 2-D model of northern Peninsular Malaysia. Geological symbols identical to Figure 1. Densities are marked in gm/cm^3.

PERSATUAN GEOLOGI MALAYSIA

Geological Society of Malaysia

ADVERTISING SPACE ORDER FORM

I/We would like to take up advertising space in the following issues of WARTA GEOLOGI.

Please tick as appropriate:

- WARTA GEOLOGI, Vol. 9, No. 1 (Jan-Feb 1983) ☐
- WARTA GEOLOGI, Vol. 9, No. 2 (Mar-Apr 1983) ☐
- WARTA GEOLOGI, Vol. 9, No. 3 (May-Jun 1983) ☐
- WARTA GEOLOGI, Vol. 9, No. 4 (Jul-Aug 1983) ☐
- WARTA GEOLOGI, Vol. 9, No. 5 (Sep-Oct 1983) ☐
- WARTA GEOLOGI, Vol. 9, No. 6 (Nov-Dec 1983) ☐
- Other issues (specify year and month) .....

.....

.....

Charges for black and white:

- ☐ Full inside page M$300 per issue or M$1,600 for 6 issues
- ☐ Half inside page M$200 per issue or M$1,000 for 6 issues

Charges for colour:

- ☐ Full inside page M$600 per issue or M$3,500 for 6 issues
- ☐ Half inside page M$500 per issue or M$3,000 for 6 issues

Name of Company .....

Designation .....

Enclosed cheque/money order/bank draft No ..... for M$ .....

.....

(Signature)

Please send this completed order form together with remittance to:

The Editor
Geological Society of Malaysia
c/o Dept. of Geology
University of Malaya
Kuala Lumpur 22-11
Malaysia

BERITA PERSATUAN
(NEWS OF THE SOCIETY)

GSM COUNCIL 1983/1984 NOMINATIONS

The Council's list of nominees for the 1983/1984 Council is as follows:

President	:	Khoo Teng Tiong, Dept. of Geology, University of Malaya, Kuala Lumpur
Vice President	:	Leong Khee Meng, Carigali-BP Sdn. Bhd., Kuala Lumpur
Hon. Secretary	:	Mohd. Ali Hasan, Dept. of Geology, University of Malaya, Kuala Lumpur
Hon. Asst. Sec.	:	Koh Tuck Wai, Petronas-Carigali, Kuala Lumpur
Hon. Treasurer	:	Gan Ah Sai, Geological Survey Malaysia, Kuala Lumpur
Editor	:	Teh Guan Hoe, Dept. of Geology, University of Malaya, Kuala Lumpur
Councillors (2 year)	:	Yeap Ee Beng, Dept. of Geology, University of Malaya, Kuala Lumpur
		Syed Sheikh Almashoor, Dept. of Geology, National University of Malaysia, Bangi
		Choo Mun Keong, Pernas Charter Management, Kuala Lumpur
		Andrew Spykerman, Pernas Charter Management, Kuala Lumpur

The following 2-year Councillors will continue to serve in the 1983/84 Council:

	:	Abdul Aziz Hussein, Jabatan Kejuruteraan Petroliam, Universiti Teknologi Malaysia, Kuala Lumpur
		Khoo Kay Khean, Geological Survey Malaysia, Kuala Kangsar, Perak
		Yeoh Gaik Chooi, Esso Production Malaysia Inc. Kuala Lumpur
		Michael Leong Pheng San, Petronas, Kuala Lumpur.

*****

NEW PACKAGE DEALS FOR GSM BULLETINS (WHILE STOCKS LAST)

For members who would like to complete their collection of GSM Bulletins, two new package deals are now available:

Package Deal 1 : Bulletins 1 to 8 plus Field Guide 1

Student members	:	M$12.00 (US$10.00)
Other members	:	M$25.00 (US$15.50)
Non-members	:	M$45.00 (US$28.50)

Package Deal II: Bulletins 9 to 12

Student members	:	M$40.00 (US$22.00)
Other members	:	M$60.00 (US$32.00)
Non-members	:	No offer

Please note that the Package Deal offer is limited to ONE order per member only. Prices may be changed without notice.

All prices quoted are inclusive of postage and packing by surface mail; for Air mail, please write in for enquiry. Allow 6-8 weeks for delivery. Cheques, money orders or bank drafts must accompany all orders.

Individual copies of Bulletins 1 - 10 and Warta Geology are available to members at half price.

Orders should be addressed to :

The Hon. Assistant Secretary
Geological Society of Malaysia
c/o Dept. of Geology
University of Malaya
Kuala Lumpur 22-11, Malaysia.

*****

Economic Geology Seminar 1982

Date and Venue

The one-day Economic Geology Seminar 1982 is scheduled for 25th October 1982 at the Hotel Merlin, Kuala Lumpur.

Papers

So far 11 papers have been confirmed for presentation at the Seminar; the tentative list is as follows:

1. A case history - prospecting, evaluation and development of the Mamut Mines by Y. Akiyama, OMRD - Sabah Bhd., Mamut Mine, Sabah.
2. Tungsten deposits of Xihuashan, China by Prof. C.S. Hutchison, Dept. of Geology, University of Malaya, Kuala Lumpur.
3. Niobium - Tantalum minerals from Peninsular Malaysia by Dr. Wan Fuad b. Wan Hassan, Dept. of Geology, Universiti Kebangsaan Malaysia and Oleg von Knorring, Dept. of Earth Sciences, University of Leeds, Leeds, England.
4. Prospects for placer tin around the Dindings area, Perak by T. Suntharalingam, Geological Survey Malaysia, Ipoh.
5. Loci of primary tin mineralization in the Kinta Valley - a new look at old data by Aw Peck Chin, Geological Survey Malaysia, Ipoh.
6. Subaquatic plants as geochemical samples by Dr. Tan Teong Hing, Dept. of Geology, Universiti Kebangsaan Malaysia, Bangi.
7. Origin of some granitoids and their possible implications in the exploration for Sn, W, U and base metal deposits in Malaysia by Dr. Cheang Kok Keong, School of Applied Sciences, Universiti Sains Malaysia, Penang.
8. Limestone survey by seismic reflection by Abdul Halim Quazi, School of Physics, Universiti Sains Malaysia, Penang.
9. Reinterpretation of the Sn-Fe mineralization of the Waterfall Mine, Pelepah Kanan by Dr. Yeap Ee Beng, Dept. of Geology, University of Malaya, Kuala Lumpur.
10. Gravity surveys for tin-bearing geological structures in the Pusing area, Perak - some preliminary results by Loke Meng Heng & Dr. Lee Chong Yan, School of Physics, Universiti Sains Malaysia, Penang.
11. The 6-inch Banka Drill as a sampling unit for auriferous gravels by Choo Mun Keong & A. Spykerman, Malaysia Mining Corp, Kuala Lumpur.

*****

Society's Field Trips

The following field trips have been proposed:

i) Pulau Besar (off Melaka)
ii) East-West Highway
iii) Taman Negara/Tembeling.

Members will be informed when plans for these trips have been finalised. Members who have other interesting places in mind can write in to the Hon. Secretary.

*****

GSM Petroleum Geology Seminar 1982

Seminar objectives

The Geological Society of Malaysia is planning to hold its Petroleum Geology Seminar '82 on 6-7th December 1982 at the Hotel Merlin in Kuala Lumpur. The Seminar is the sixth such annual event to be organised by the Society.

This Seminar will bring together a large number of geoscientists and explorationists from various oil, consulting and service companies as well as universities, government and local research organizations and will provide a forum for discussions on the various aspects of petroleum geology in this region and new techniques of petroleum exploration in general.

Papers

Many outstanding papers have been presented at the five previous Seminars and the Geological Society of Malaysia would greatly appreciate your contribution of a paper to the Seminar this year. Papers on any topic relevant to the understanding of the petroleum geology of the South East Asian region and to petroleum exploration would be most welcomed. Abstracts should be submitted by 31st October 1982.

Registration

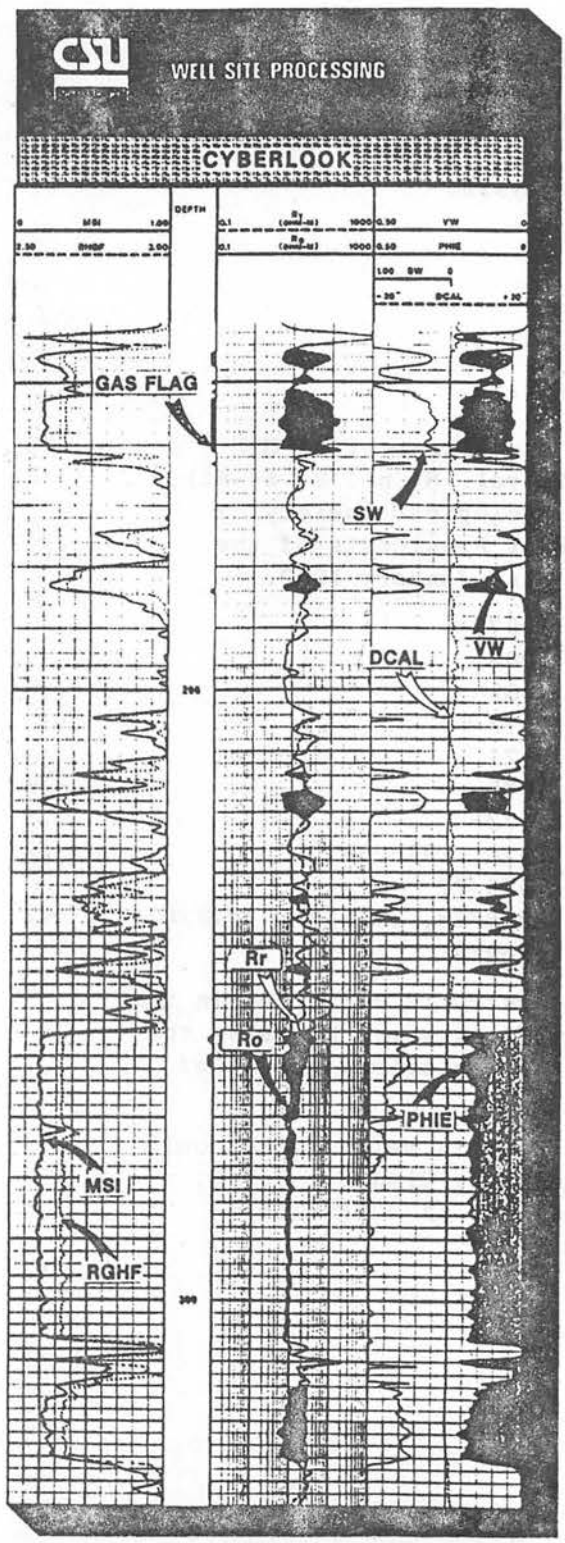
All intending participants are advised to register early for the Seminar as a large turnout will again be expected this year. Advance registration for the Seminar will be accepted until 30th November 1982. Late registration will be accepted at the Registration Desk in Hotel Merlin.

	Advance Registration Fees	Late Registration Fees
Full Members	MR 25.00	MR 35.00
Non Members	MR 60.00	MR 80.00
Student Members	Free	Free
Student Non Members	MR 4.00	MR 5.00

Only speakers at the Seminar will be exempted from payment of registration fees.

Payment by crossed cheques, bank drats or cashiers orders is acceptable and should be made payable to the Geological Society of Malaysia. Outstation cheques should include sufficient bank charges.

CYBERLOOK*
brings Schlumberger computing power to the well site for decision makers



CYBERLOOK is a Dual-Water Computer model, easy to use, requiring a minimum of parameter selection and applicable to a wide range of formations. It is fast to run with outputs of grain size, porosity, fluid saturation and shale index, all answers you require from logs at the wellsite for making decisions on testing and completion of your well.

CYBERLOOK provides wellsite answers.

*Mark of Schlumberger.

CSU

Schlumberger

Please send registration fees to:

The Treasurer
Geological Society of Malaysia
c/o Department of Geology
University of Malaya
Kuala Lumpur 22-11
Malaysia

to reach us before 30th November 1982.

Further information

Please write to:

Mr. Michael Leong
Organising Chairman
Petroleum Geology Seminar '82
Geological Society of Malaysia
c/o Department of Geology
University of Malaya,
Kuala Lumpur 22-11, Malaysia.

*****

EDITOR'S NOTE - PAST PRESIDENTS OF GSM

Further to P.H. Stauffer's contribution on 'Alignment of GSM Presidents' (which appeared in Warta Geologi, vol. 8, no. 2, 84-85), let us on this Fifteenth Anniversary of the Geological Society of Malaysia look at the list of distinguished Past Presidents of the Society since the Inaugural AGM on Tuesday 31st January 1967.

Neville S. Haile	1967
Harvey C. Olander	1968
Charles S. Hutchison	1969
Ken F.G. Hosking	1970
Dennis Taylor	1971
Peter H. Stauffer	1972
Richard W. Murphy	1973
D. Santokh Singh	1974, 1975/76
Lee Whye Kwong	1976/77
Tan Bock Kang	1978/78, 1978/79, 1979/80
Mohd. Ayob	1980/81

The vast field of Earth Science in the country is reflected in the GSM Presidents having come not only from the University, but also the Petroleum and Mining Industries as well as the Geological Survey of Malaysia.

As to the Past Presidents no longer resident in Malaysia we could add Lee Whye Kwong to the list of N.S. Haile, H.C. Olander, K.F.G. Hosking and R.W. Murphy. Mr. Lee is now resident in Australia.

G.H. Teh

*****

PERTUKARAN ALAMAT (CHANGE OF ADDRESS)

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

1. **Sahalan Abd. Aziz, Exploration Dept., Petronas, P.O. Box 2444, Kuala Lumpur**
2. **Gan Lay Chin, Western Mining Corp., Ltd., Exploration Division, P.O. Box 71, Kalgoorlie, Western Australia 6430.**
3. **Joseph C. Mueller, CONOCO. P.O. Box 4800, Woodlands, Tx. 77380, USA.**
4. **Gerry van Klinken, 163 Stanley Terrace, Taringa Q4068, Australia.**
5. **Lim Beng Kung, Western Geophysical Co., c/o ARAMCO, P.O. Box 2377, Dhahran, Saudi Arabia.**
6. **P.C. Cranfield, 30 Alderbury Street, Floreat Park, Perth 6014, Western Australia.**
7. **Tan Loong Keat, 484, Jalan 17/17, Petaling Jaya, Selangor.**
8. **V.P. St. John, Southeastern Oil and Gas Pty. Ltd., 60 Albert Road, South Melbourne, Vic. 3205, Australia.**
9. **Mustapha Kamal Shahrom, Ayer Hitam Tin Dreding Malaysia Bhd., Batu 17, Puchong, Selangor.**
10. **Mohammad Yamin Ali, K14M - 104, Komsis E, Universiti Kebangsaan Malaysia, Bangi, Selangor.**

11. Wong Piang Yow, 14, SS17/2L, Subang Jaya, Selangor.
12. Md. Shahid Ayub, PUSPATI, No. 4, Jln. 1/4, Bandar Baru Bangi, Selangor.
13. Lai Kok Hoong, Geology Division, Indian Photo-Interpretation Institute (N.R.S.A.), 4, Kalidass Road, Dehradun 248001 (U.P.), India.
14. F.T. Barr, Tenneco Oil, P.O. Box 2511, Houston, Texas 77001, USA.
15. Choy Kam Wai, CRA Exploration Pty. Ltd., 9, Pine Street, Eaglehawk, Vic. 3556, Australia.
16. Cheang Kok Keong, School of Applied Sciences, Universiti Sains Malaysia, Penang.
17. Thomas W. Wagner, P.O. Box 3103, Kathmandu, Nepal.
18. Cathy Connor, Branch of Alaskan Geology, U.S. Geological Survey, Gould Hall, A.P.U. Campus, University Drive, Anchorage, Alaska 99504, USA.
19. Looi Keng Mun, T42, Desa Melor, Ampang Jaya, Kuala Lumpur.
20. Tee Peow Keong, Blok 357B, Bilik 241A, Desasiswa Permai, Universiti Sains Malaysia, Pulau Pinang.
21. Eric S.C. Toh, 28 Threadbow Crescent, Wheelers Hill, Melbourne 3150, Australia.
22. Maris G. Ambuvirayan, Robertson Research Singapore, Units 10E-17E, Block 6, Ayer Rajah Industrial Estate, Singapore 0513.
23. Yaw Ban Soon, 27, SS14/6M, Subang Jaya, Selangor.
24. Mohd. Ashri Muda, K 15 A-116, Komsis E, Universiti Kebangsaan Malaysia, Bangi, Selangor.
25. Askury Abd. Kadir, Geological Survey Malaysia, P.O. Box 1015, Ipoh, Perak.
26. John N. Bubb, Esso Exploration Inc., St. Clements House, Church Street, Walton-on-Thames, Surrey, England KT12 2QL.
27. Paul K. Kopper, 21584 Mountsfield Dr., Golden, Co. 80401, USA.
28. Ho Kheng Hong, Blok 12, Bilik 003, Desasiswa Cahaya, Universiti Sains Malaysia, Pulau Pinang.
29. Lee Swee Guan, Woodside Offshore Petroleum Pty. Ltd., 77 St. George's Terrace, Perth, Western Australia 6000.
30. Lee Chong Yan, c/o Dept. of Geological Sciences, The University of Birmingham, P.O. Box 363, Birmingham B15 2TT, England.

*****

Pertambahan Baru Perpustakaan PGM (New GSM Library Additions)

The following books were added to the Library of the Society:

1. Committee for Co-ordination of Joint Prospecting for Mineral resources in South Pacific Offshore areas (CCOP/SOPAC). Proceedings of the 10th session, Port Vila, Vanuatu, 6-14 Oct. 1981.
2. South Pacific Marine geological notes, vol. 2, no. 5, 1981.
3. Geosruvey Newsletter, v. 14, no. 9-15, 1982.
4. Narromine 1:250.000 - Metallogenic map, 1982.
5. Berliner geowissenschaftliche Abhandlungen, band 32, 34-37, 1971 (in German)
6. Type and origin of uranium mineralizations in the Khorat Plateau, Thailand by Werner Gocht & Emanuel Pluhar. 1981.
7. Geodynamic evolution of the Apennines & Hellenides by Giese, et al.

8. Das karhorn bei Lech/Vorarlberg - eine Deckscholle by Renak Zylka & Volker Jacobshagen (in German). Aun Naturbust. Mus. Wien, 83, 387-398, 1980.
9. Bulletin of Inst. of Mineral Engineering, Malaysia, no. 7, 1982.
10. World Mining, May 1982.
11. A directory of SIRIM certified products 1981/82 Panduan.
12. AGID News, nos. 30-32, 1982.
13. AAPG Explorer, Feb., May, June, & July, 1982.
14. Geology and Palaeontology of Southeast vol. 23, 1982.
15. Committee for Co-ordination of Joint Prospecting for mineral resources in South Pacific Offshore areas (CCOP/SOPAC). Proceedings of the 9th session, Tarawa, Kinbati, 20-28 Oct. 1980.
16. Jurutera Galian, no. 6, 1982.
17. Geological Correlation no. 10, 1982.
18. SEATRAD Library periodical list, June 1982.
19. SEATRAD Library acquisition list, April-June 1982.
20. SEATRAD Bulletin, vol. 3, no. 2, 1982.
21. Annales Academiae Scientiarum Fennicae, series A, no. 133, 1982.
22. Scripta Geologica, no. 64, 1981 & 65, 1982.
23. Oklahoma Geological Survey, Circular 84, 1981.
24. Geological Survey of New South Wales, Bull. 29, 1982.
25. IMM Bulletin 905 - 909, 1982.
26. National Library Singapore, adult reference collections, accession list, Jan - May, 1982.
27. Nanjing Inst. Geol. & Pal, Bull. 3, 1981.
28. Acta Palaeontologica Sinica, v. 21, no. 1, 1982.
29. Jour. Stratigraphy, v. 6, no. 1, 1982.
30. Commonwealth Science Council, Newsletter nos. 1 & 3, 1982.
31. IMM Transactions A, v. 91, April, July, 1982.
32. Bulletins of the Geological Survey of India, series A - Economic Geology, no. 42, (1981), no. 44 (1980), no. 38 (1974), no. 45 (1981).
33. Geosurvey Newsletter, v. 13, nos. 15-24, 1981 & v. 14, nos. 1-8, 1982.
34. AGID membership directory, 1982.
35. Oklahoma Geology Notes, vol. 41, nos. 1, 2, 5, & 6, 1981.
36. Bull. of the National Science Museum, vol. 8, nos. 1 & 2, 1982.
37. Science reports of the Institute of Geoscience, University of Tsukuba, vol. 3, 1982.
38. Science reports of the Tohoku University, vol. 52, nos. 1-2, 1982.
39. Contributions from the Institute of Geology & Palaeontology, Tohoku University, no. 84, 1982.

*****

BERITA-BERITA LAIN
(OTHER NEWS)

FINANCIAL SUPPORT TO ATTEND 27TH INTERNATIONAL GEOLOGICAL CONGRESS IN MOSCOW ON AUGUST 4-14, 1984

The Association of Geoscientists for International Development (AGID) is assisting the Secretary General of the 27th International Geological Congress, Dr. N. Bogdanov, in the search for young geoscientists from

developing nations who wish to attend the Congress in Moscow on August 4-14, 1984. The Organizing Committee of the IGC will provide support for travel and living expenses in Moscow and will reduce the registration fee for these geoscientists.

Qualified earth scientists can write in to the Hon. Secretary of GSM for the application forms. It is essential that these forms be returned to AGID not later than January 1, 1983.

T.T. Khoo

*****

Fulbright Visiting Professor at University of Malaya

In early June, Bruce W. Nelson took up his appointment as Fulbright Visiting Professor for 1982-83 in the Department of Geology, University of Malaya, on a Fulbright program sponsored by the Malaysian-American Commission on Educational Exchange (MACEE).

Professor Nelson's specialties are clay mineralogy, geochemistry and sedimentology as applied to environmental problems. He is on leave from the University of Virginia, USA where he is Professor of Environmental Sciences.

The purpose of Nelson's visit is to stimulate the scientific study of environmental problems in the University and elsewhere in Malaysia. In the Department he will be teaching the Geochemistry Courses which will include some lectures on environmental geochemistry. He will also give lectures in the Department of Zoology and the Engineering Faculty on topics of special interest.

Professor Nelson is a fellow of the Geological Society of America and Mineralogical Society of America and a Member of the American Association for Advancement of Science, the Clay Minerals Society and the Society of Economic Paleontologists and Mineralogists.

He has held academic teaching posts at Virginia Polytechnic Institute (1955-63), the University of South Carolina (1963-79), as well as the University of Virginia (1974 -). He has also held various academic administrative posts, first as Head of Geology (1963-66), then as Dean of Arts and Sciences (1966-72) and Vice Provost for Advanced Studies and Research (1972-74) at South Carolina. At Virginia he was Dean of Continuing Education (1974-77) and Associate Provost (1977-81).

He has conducted research on the mineralogy of clays and shales and on the mineralogy, geochemistry and sedimentology of rivers, estuaries and deltas. In particular, he has studied estuaries of the Chesapeake Bay and its tributaries in USA and the delta of the Po River in Italy.

Besides various scientific papers he was editor of Memoir 133, Geological Society of America, Environmental Framework of Coastal Plain Estuaries.

G.H.Teh

*****

PRODUCTION TRENDS FOR MINERALS AND METALS IN 1981

The continuing economic depression in the United States of America and a low level of economic activity in most other developed market economies, which together account for some two thirds of the world's consumption of mineral raw materials and an even higher share of the mineral commodity exports of developing countries, have caused a drop in price levels for many mineral raw materials and severe difficulties in those countries which are most dependent on mineral exports of copper, iron ore, nickel, molybdenum, silver and others. Some of the international companies active in these metals and minerals closed down mines and plants, or reduced production, in particular in the United States, Canada and other producing countries, including some of the developing countries, such as Guatemala and the Dominican Republic (nickel). On the other hand, large mines in some major countries continued production at previous levels, though smaller operations, due to higher operating costs, discontinued work - at least temporarily.

Production. While consumption statistics are not yet available for 1981, preliminary estimates of world mine production show that the general trend of recent years (1978-1980) continued in 1981 with few exceptions. Production has remained unchanged or output has declined, in some cases considerably. Production of chromite, cobalt, copper, diamonds, gold, iron, lead, molybdenum, nickel, silver, tin, tungsten and zinc was either lower in 1981 than during the past three years or unchanged (Table 1), in some cases, output was even lower than in 1975 - in the case of nickel by a wide margin. Furthermore, these global statistics conceal much larger production cutbacks in some countries, in particular in the developed market economies and in selected developing countries.

If the preliminary estimates are correct, a signficant increase in production has only taken place for the two fertilizer minerals - phosphate rock and potash - included in the table, for silver - which has come very close to an all-time high - and for gold, as a result of an increase in the USSR and some smaller producer countries.

(Extracted from 'Natural Resources & Energy', vol. 6, no. 1/2, Mar-May 1982)

*****

GASTECH 82 - PARIS

The 9th International LNG/LPG Conference and exhibition will be held from October 5-8, 1982, at the Palais des Congres of the Centre International de Paris.

Outline of Conference Programme

Tuesday, October 5
- Session 1: World gas supplies

Wednesday, October 6
- Session 2: LPG production and trade
- Session 3: Gases as transportation fuels

Thursday, October 7
- Session 4: Transportation technology & operations
- Session 5: Safety & training

Table I. World mine production of major minerals and metals, 1960-1981

Minerals and metals	Unit	1965	1970	1975	1978	1979	1980	1981 a/	Major producer countries (1979 share of world per cent)
Bauxite	10^6 tons	37.9	60.6	77.0	84.0	87.9	92.6	90.0	Australia (31), Guinea (14), Jamaica (13) USSR (7), Suriname (5), Guyana (4)
Chromite	10^6 tons	4.9	6.1	8.3	9.61	9.52	9.73	9.0	South Africa (35), USSR (25), Albania (11) Philippines (6), Zimbabwe (6), Turkey (5)
Cobalt	10^3 tons	17.1	23.9	25.6	27.9	28.5	29.9	26.7	Zaire (53), Zambia (11), USSR (6), Cuba (6), Australia (5)
Copper	10^3 tons	4,963	6,403	7,346	7,866	7,646	7,630	7,800	US (18), USSR (14), Chile (13), Canada (8), Zambia (7), Peru (5)
Diamond	10^6 carats		49	48.2	47.3	48.0	47.2	47.0	Zaire (32), USSR (25), South Africa (18) Botswana (11)
Gold	tons	1,486	1,589	1,197	1,212	1,220	1,250	1,260	South Africa (48), USSR (25) Canada (5) China (4), US (4) b/
Iron ore	10^9 tons	618	769	875	838	900	891	875	USSR (27), Brazil (11), Australia (10) US (10), China (8), Canada (7), India (4)
Lead	10^3 tons	2,741	3,463	3,602	3,618	3,627	3,603	3,480	USSR (15), US (14), Australia (11), Canada (9), Peru (5)
Manganese ore	10^6 tons	17.6	19.1	24.7	23.1	26.2	26.7	26.5	USSR (39), South Africa (20), Gabon (9) Brazil (9), India (7), Australia (6), China (6)
Molybdenum	10^3 tons	n.a.	82.4	81.8	99.9	104.0	108.5	101.5	US (63), Chile (13), Canada (11), USSR (10), China (2)
Nickel	10^3 tons	437	663	744	643	679	748	650	USSR (22), Canada (19), New Caledonia (12 Australia (11), Indonesia (5), Cuba (5)
Phosphate rock	10^6 tons	63.9	84.9	107.5	124.7	128.0	133.0	140.0	US (38), USSR (21), Morocco (15), China (4), Tunisia (3), Togo (2)
Platinum c/	tons	95		178	198	207	220	218	USSR (48), South Africa (48), Canada (3)
Potash	10^6 tons	13.8		23.5	26.0	25.9	27.9	28.8	Canada (28), USSR (26), GDR (13), FRG (10), US (9)
Silver	tons	8,021	9,635	9,498	10,858	10,933	10,422	10,900	USSR (14), Mexico (14), Peru (12) Canada (11), US (11), Australia (8)
Tin	10^3 tons	191	217	220	236	238	235	236	Malaysia (27), Thailand (14), Indonesia (12), Bolivia (12) USSR (8), China (7)
Tungsten	10^3 tons	27.3	32.4	38.8	45.8	46.1	50.0	48.0	China (28), USSR (19), Bolivia (7), US (6), Rep. of Korea (6), Australia (5)
Vanadium	10^3 tons	8.9		25.8	27.6	34.7	35.9	35.6	South Africa (36), USSR (29), US (14), China (10), Finland (8)
Zinc	10^3 tons	4,274	5,615	5,910	6,429	6,345	6,248	6,300	Canada (19), USSR (16), Australia (8), Peru (8), US (5)

Sources: Metallgesellschaft AG, Metal Statistics, 1960-1970 and 1970-1980, United States Bureau of Mines, Minerals Yearbook, various issues, and Mineral Commodity Summaries 1982 (Washington, D.C.); Mining Annual Review, various issues, and other sources.

a/ Estimates by the Natural Resources and Energy Division, Department of Technical Co-operation for Development, United Nations Secretariat.

b/ Shares estimated by the Gold Institute for 1982.

c/ Platinum group metals (platinum, palladium, iridium, osmium, rhodium, rubidium).

Friday, October 8

Session 6: Liquefied gas storage
Session 7: Materials workshop
Session 8: Commercial documentation in the gas trade

For further information contact:

Gastech Secretariat
2 Station Road
Rickmansworth
Herts WD3 1QP, England.

*****

SEATRAD Centre Seminar "Beneficiation of tin and associated minerals

Seminar: Beneficiation of tin and associated minerals

Place: The Rama Tower Hotel, Bangkok, Thailand.

Date: Thursday 7 October to Saturday 9 October, 1982.

Organisers: Southeast Asia Tin Research and Development Centre and Department of Mineral Resources, Thailand.

Objective:

The objective of the Seminar is to provide a forum for discussion on the beneficiation of tin and associated minerals, with the view towards promoting exchange of information and collection of data on the practices in different tin-producing countries of the region and the world. It is hoped that the Seminar will cover not only the existing technologies but also the new technologies as well as to identify areas where further research need to be done.

Field trip

A field trip to Phuket will be arranged for 11-13th October:

11 October 1982:

0600 hours: Leave hotel for airport
0800 hours: Departure from Bangkok to Phuket by air
0940 hours: Arrival at Phuket
1000 hours: Visit S.A. Minerals Amang Treatment Plant
1200 hours: Proceed to Pearl Hotel for check in. Free to obtain own lunch
1330 hours: Visit Thaisarco Tin Smelter
1530 hours: Visit gravel pump mine
1730 hours: Return to Pearl Hotel

12 October 1982:

0700 hours: Visit offshore dredge (lunch box provided)
1400 hours: Return to Pearl Hotel

13 October 1982:

0800 hours: Leave Pearl Hotel for airport
1000 hours: Return from Phuket to Bangkok by air.

List of papers

A provisional list of papers to be presented at the Seminar is as follows:

a) Retreatment of table tailings using gravity concentrating trays at Berjuntai Tin Dredging Sdn. Bhd., Malaysia.
b) A case study of the beneficiation of tin ore on a dredging property at Bidor Malaya Tin Sdn. Bhd., Malaysia.
c) Application of improved spiral technology for recovery of fine heavy minerals in tailings.
d) Recoverying of tungsten from tin concentration by caustic leaching.
e) Application of the heavy media cyclone in the treatment of tin ores.
f) Pyrometallurgy and hydrometallurgy applied to a tin-tantalite-antimony association at Greenbushes Australia.
g) Liberation of tin in limonitic boulders from an eluvial tin deposit.
h) Development of tin ore treatment at P.T. Koba Tin.
i) Processing of aluvial tailing.
j) Treatment practices of Bolivian tin ores
k) Recovery of byproduct minerals from the Malaysian tin industry
l) Cost and energy considerations in the beneficiation of tin ores by open cast mining methods.

Contact

The Director, SEATRAD Centre, 14, Tiger Lane, Ipoh, Perak, Malaysia. Tel: 05-517124 & 05-517833. Cable: TINCENTRE IPOH.

*****

Regional Mineral Resources Development Centre - Workshops 1982

Workshop on the Importance of Mining to Industrial Development, Bandung, 1-6 November 1982

- in collaboration with Mineral Technology Development Centre, Ministry of Mines and Energy, Indonesia.
Leader: Dr. Herman Stigzelius, RMRDC.

The Workshop is to report on and discuss recent mining developments in the ESCAP region and their influence on industrial development as a whole.

Background papers will be presented on the effect of mining on industrial development in some industrialized countries such as Australia, Canada and Finland.

Invitations have been submitted to all developing countries of the ESCAP region which have a substantial mining potential.

Workshop on Biogeochemical Mineral Exploration in Tropical Rainforest Environment, Bandung 29 November - 4 December 1982

- in collaboration with Directorate of Mineral Technology Development Centre, Indonesia and the Swedish Geological Survey.

The Workshop is to discuss the results of the 'Experimental Geochemical Exploration Programme' recently carried out in Sumatra by the Directorate of Mineral Resources of Indonesia and the Swedish Geological Survey with financial support by UNDP.

The objective of the project was to test the new method in tropical rainforest environment.

*****

4TH INTERNATIONAL CONGRESS OF THE INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGISTS

The 4th Congress will be held in New Delhi, India from 1-6 December 1982.

The selected themes are:

1. **Engineering geological studies for environmental evaluation and development.**
2. **Engineering geological problems of tunnelling and excavation of cavities.**
3. **Soil and rock as contruction material.**
4. **Engineering geological problems of natural and man-made lakes.**
5. **Engineering geological problems of sea-coast and shelf area.**
6. **Seismic and seismo-tectonic investigations of engineering projects.**
7. **History and development of engineering geology.**

Address all correspondence to:

Mr. K.N. Srivastava
Secretary, Organising Committee
47-48 Pragati House
Nehru Place, New Delhi, 110019, India.

*****

SYMPOSIUM AND SHORT COURSE ON SOIL & ROCK IMPROVEMENT TECHNIQUES INCLUDING GEOTEXTILES, REINFORCED EARTH AND MODERN PILING METHODS

Symposium: 29th November - 3rd December 1982

Short Course: 6th - 10th December 1982.

At the request of a large number of participants from the universities and geotechnical engineering practice, an important change has been made in the sequence of the November - December 1982 Symposium and Short Course on 'Soil & Rock Improvement Techniques including Geotextiles, Reinforced Earth and Modern Piling Methods'. According to the new arrangement, the Symposium will take place prior to the Short Course from 29th November to 3rd December 1982. The Short Course will follow the Symposium from 6th to 10th December 1982. The above change in sequence has been made at the request of a large number of overseas participants who are intending to attend the Seventh Southeast Asian Geotecynical Conference in Hong Kong from 22nd-26th November 1982, prior to attending the Bangkok Symposium beginning 29th November with a week-end gap between the two events. Indeed, this will give an unique opportunity for the participants to benefit the maximum from the Hong Kong Conference and the Bangkok Symposium, both being co-sponsored by the Southeast Asian Geotechnical Society.

Southeast Asian Conference on Soil Engineering were held in Bangkok (1967 & 1977), Singapore (1970), Hong Kong (1972), Kuala Lumpur (1975), and Taipei (1980). The Seventh Conference will be held at the Regent Hotel in Hong Kong from 22nd-26th November 1982. Serving as Chairman of the Organizing Committee for the Seventh Conference is Mr. S.G. Elliott with other members including Prof. Peter Lumb, Mr. A.J. Vail and Dr. E. W. Brand.

The regular geotechnical meetings held at the Asian Institute of Technology annually during November-December has now reached a very high and excellent standard with respect to the technical content as well as the relevance to the region. The invited speakers in the Symposium and the Short Course on Soil & Rock Improvement Techniques including Geotextiles, Reinforced Earth and Modern Piling Methods include Prof. B. Broms, Prof. J.K. Mitchell, Dr. P. Sembenelli, Prof. T. Yamanouchi, Dr. W.H. Ting, Mr. J.S. Younger, Dr. Ir. W.F. Van Impe, Dr. R.K. Bhandari, Dr. C. Mascardi, Prof. L. Jessberger, Mr. C.R. Lawson, Dr. A. Tomiolo, Dr. L. Wittman, Dr. Claude Carron, Mr. K.R. Datye, Prof. G. Miki, Dr. F. Schlosser, Mr. M. Gambin, Dr. J. Brauns, Prof. T. Tumay, Dr. R.D. Holtz, Mr. E. Ichimoto, Dr. Alan McGown, Prof. G. Blight, Mr. J. de Ruiter, Mr. G. Berta, Prof. G. Petrasovits, Prof. S.K. Saxena, Dr. M.R. Madhav, Mr. M. Walleys, Dr. F. Gallavresi, Mr. B. Stetzler, Dr. Kutzner, Prof. Gopal Ranjan, Mr. J.C. Golver, Mr. Ilan Juran, Mr. V. Baumann, Prof. S. Hansbo, Mr. C.J. Gravare, Mr. D.P. McKittrick, Mr. F. Lizzi, Dr. Herbst, Dr. H. Thurner, etc. In addition to the Symposium and the Short Course, a large number of comprehensive country reports are expected to be presented by experts from amny countries in Asia. Also a large number of instrument manufacturers and other consultants and contractors involved in ground improvement works have expressed their strong support and interest in displaying exhibits and to have technical films and slide shows.

For further information, write to:

Prof. A.S. Balasubramaniam
Division of Geotechnical & Transportation Engineering
Asian Institute of Technology
P.O. Box 2754
Bangkok, Thailand 10501

*****

1 MEETING OF THE SOUTHERN HEMISPHERE ON MINERAL TECHNOLOGY

The First Meeting of the Southern Hemisphere on Mineral Technology and IX National Meeting on Mineral Treatment and Hydrometallurgy, that will take place in Rio de Janeiro, from 5 to 10 December 1982, in collaboration with several National and International groups concerned with the subjects.

The Meeting's aim will be the search for practical results that can be utilized as subsidies for the working out of a Policy and Technology that will help the countries of our hemisphere to take the best possible profit from their mineral resources.

Therefore, the Events will give the opportunity to discuss themes that, for a long time, deserved a more detailed analysis, and at the same time to assimilate the experience of all those who deal with the subject matter, either in the Southern Hemisphere or at International level.

Preliminary topics

1. Technical Sessions
1. 1 - New trends in mineral industry
1. 2 - Fine particle technology
1. 3 - Waste treatment, recovery and ecology
1. 4 - Sampling & comminution

1. 5 - Classification
1. 6 - Concentration
1. 7 - Dewatering
1. 8 - Hydrometallurgy
1. 9 - Pyrometallurgy
1.10 - Optimization, automation and simulation
1.11 - Radioactive ores
1.12 - Low grade ore exploration
1.13 - Manpower for the mineral technology
1.14 - Energy for mining.

2. Round Table Discussions
2. 1 - Large mineral projects in the Southern Hemisphere
  2.1.1 - Financing and Enterprise Participation
  2.1.2 - Adequate technology (processes & equipments)
  2.1.3 - Auxiliary infra-structure and transport
  2.1.4 - Ecological consequences
  2.1.5 - Social consequences
  2.1.6 - Marketing of products
  2.1.7 - Other aspects
2. 2 - Alternatives to the mineral technology development in the Southern Hemisphere
  2.2.1 - Manpower for the mineral development and the scientific and technological policies
  2.2.2 - Utilization of mineral resources of developing countries
  2.2.3 - International technical cooperation
  2.2.4 - Technological adaptation for regional conditions
  2.2.5 - Degree of labor sophistication to project, implement and operate industrial complexes
2. 3 - International market: ores, mineral products & metals
  2.3.1 - International situation of principal ores, mineral products and metals
  2.3.2 - Mineral resources self-sufficiency of the Southern Hemispherical countries
  2.3.3 - The role of international mining and metallurgical companies in exploitation of mineral resources of the Southern Hemisphere

Contact: Dr. Maneol Almeida Couto de Castro
Rua Almirante Cochrane, 202
CEP 20.550 - Rio de Janeiro - RJ, Brasil.
Tel: (021) 284-6087/264-0285
Telex: (021) 30226 BACL BR.

*****

KALENDAR (CALENDAR)

A bracketed date (Mar-Apr 1982) denotes entry in that issue carried additional information.

1982

Sep 1 - 8 : International Symposium on Applied Geophysics in Tropical Regions, Sept. 1-8, 1982, Belem Brazil. Contact: Jose Seixas Lourenco, NCGG-UFPa, Caixa Postal Postal 1611, Belem-Para, 66000 Brazil. (Nov-Dec 1981).

Sep : International Symposium on Archean and Early Proterozoic Geologic Evolution and Metallogenesis (ISAP), Salvador, Brazil. Symposium will precede the 32nd Brazilian Geological Congress. Presymposium field trips. (Augusto J. Pedreira, ISAP Coordinator, CPRM - Rua Barros Falcao, 21, 40,000 Salvador, Bahia, Brazil).

Sep : Fluids in Metamorphism (Geological Society of London and Metamorphic Studies Group Meeting), Glasgow, Scotland, U.K. Excursions. (M. Brown, Dept. of Geology and Physical Sciences, Oxford Polytechnic, Headington, Oxford OX3 OBP, U.K.).

Sep Kimberlite, (3rd International Conference), Clermont-Ferrand, France. (F. Boudier, Universite de Nantes, Laboratoire de Tectonophysique, 2 rue de la Houssiniere, 44072 Nantes, France).

Sep 2 - 10 : Volcanic Processes in Marginal Basins. (Volcanic Studies Group Meeting), Keele, England. Field meeting to Ordovician volcanic terrains of SW Wales and Snowdonia. (R.A. Roach, Dept. of Geology, The University, Keele, Staffordshire ST5 5B6, England).

Sep 3 - 11 : Water Resources (4th World Congress), Buenos Aires, Argentina. Sponsored by the International Water Resources Association. (G.E. Stout, Water Resources Center, University of Illinois, 2523 Hydrosystems Laboratory, 208 N. Romine, Urbana, Illinois 61801, USA).

Sep 5 - 11 : International Association of Hydrogeologists (6th Congress), Praha, Czechoslovakia. Excursions. Languages: English, French, Russian, Czech, Slovak. (Stavebni geologie n.p. Praha, Gorkeho namesti 7, 11309 Praha 1, Czechoslovakia).

Sep 7 - 12 : International Association on the Genesis of Ore Deposits, (VI IAGOD Symposium), Tbilisi, USSR. Languages: Russian and English. (A.G. Tvalchrelidze, Caucasian Institute of Mineral Resources, 85 Paliashvili St., 380030 Tbilisi, USSR). (Jan-Feb 1982).

Sep 9 - 10 : Volcanic Processes in Marginal Basin, (Meeting), Staffordshire, U.K. (Dr. B.P. Kokelaar, Ulster Polytechnic, School of Environmental Sciences, Shore Road, Newtonabbey, Co. Antrim, BT370QB, N. Ireland).

Sep 19 - 25 : International Mineralogical Association (13th General Meeting and field excursions), Varna, Bulgaria. (Secretary General, 13th IMA Meeting, University of Sofia, Chair of Mineralogy, Boulv. Russki 15, Sofia, 1000 Bulgaria).

Sep 21 - Nov 12 : Autumn Course on Geomagnetism, the Ionosphere and Magnetosphere, 21 Sept - 12 Nov 1982, Trieste, Italy. Contact: International Centre for Theoretical Physics, P.O. Box 586, 1-34100 Trieste, Italy (Jan-Feb 1982).

Oct 4 - Nov 5 : Remote sensing: Geologic Interpretation, (Advanced training course for foreign nations), Flagstaff, Arizona, US. Geological Survey, 917 National Center, Reston, Virginia 22092, USA).

Oct 4 - 8 : Applied Ore Microscopy, (12th Annual Short Course), Rolla, Missouri, USA. To precede International Conference on Mississippi Valley-type lead-zinc deposits in Rolla. (R.D. Hagni, Dept. of Geology and Geophysics, University of Missouri, Rolla, Missouri 65401, USA).

Oct 7 - 9 : SEATRAD Centre - Seminar on Beneficiation of Tin and Associated minerals, October 1982, Bangkok. Contact: The Director, SEATRAD Centre, 14 Tiger Lane, Ipoh, Perak, Malaysia. (Jan-Feb 1982 & Kay-Jun 1982).

Oct 17 - 23 : XIV International Mineral Processing Congress, Toronto, Canada, L.J. Vincze, Publicity Chairman XIV IMPC, c/o CE Lummus - Minerals Division, 25 Consumers Road, Willowdale, Ontario M2V 4H4, Canada (Jan-Feb 1982).

Oct 5 - 8 : Gastech 82, 9th International LNG/LPG Conference & Exhibition, Palais des Congres of the Centre International de Paris (Gastech Secretariat, 2 Station Road, Rickmansworth, Herts WD3 1QP, England). (May-Jun 1982).

Oct 25 : Economic Geology Seminar '82, Hotel Merlin, Kuala Lumpur. Contact: A. Spykerman, Economic Geology Seminar, Geological Society of Malaysia, c/o Dept. of Geology, University of Malaya, Kuala Lumpur 22-11, Malaysia.

Oct 27 - 29 : New Paths to Mineral Exploration, (3rd International Symposium on Mineral Resources), Hannover, F.R.G. (R. Weber, Federal Institute for Geosciences and Natural Resources, Postfach 51 01 53, D-3000 Hannover 51, F.R.G.).

Nov 1 - 6 : RMRDC Workshop on the Importance of Mining to Industrial Development, Bandung (Contact: Dr. Herman Stigzelins, RMRDC, Jalan Jenderal Sudirman 623, Bandung, Indonesia). (May-Jun 1982).

Nov 17 - 19 : Ophiolites and Oceanic Lithosphere (Meeting), London, England. (S. Lippard, Department of Earth Sciences, Open University, Milton Keynes MK7 6AA, U.K.).

Nov 24 : Metamorphic Studies: Research in Progress (Joint Geological Society and Mineralogical Society Metamorphic Studies Group Meeting), London, U.K. (M. Brown, Metamorphic STudies Group, Department of Geology and Physical Sciences, Oxford Polytechnic, Readington, Oxford OX3 OBP, U.K.).

Nov : 1st International Short Course on Small Scale Mining (Sponsored by AGID and includes lectures, lab work, seminars and field tours), Bangalore, India. (Prof. C. Naganna, Director, School of Earth Sciences, Bangalore University, Jnana Bharathi, Bangalore 560 056, India).

Nov 29 - Dec 4 : RMRDC Workshop on Biogeochemical Mineral Exploration in Tropical Rainforest Environment, Bandung. (Contact: Dr. H. Stigzelins, RMRDC, Jalan Jenderal Sudirman 623, Bandung, Indonesia). (May-Jun 1982).

Nov 29 - Dec 3 : Symposium and Short Course on Soil & Rock Improvement Techniques including Geotectiles, Reinforced earth and Modern Piling Methods, Bangkok. (May-Jun 1982).

Dec 1 - 6 : 4th International Congress of Engineering Geology, New Delhi. Contact: G. Pant, Geological Survey of India, 47-48 Pragati Bhawan. Nehru Place, New Delhi 110019, India.

Dec 6 - 7 : Petroleum Geology Seminar 1982, Hotel Merlin, Kuala Lumpur 22-11, Malaysia. Contact: Mr. Michael Leong, Organising Chairman, PGS, Geological Society of Malaysia, c/o Dept. of Geology, University of Malaya, Kuala Lumpur 22-11.

1983

Jan 30 - 31 : Workshop on Geoscience Curriculum Development in Southeast, Chiangmai, Thailand. Contact: Dr. T. Ramingwong, Dept. of Geological Sciences, Chiangmai University, Chiangmai 50000, Thailand.

Feb 1 - 11 : XV Pacific Science Congress, Dunedin, New Zealand. Secretary-General, 15th Pacific Science Congress, P.O. Box 6063, Dunedin, New Zealand, (Jan-Feb 1982).

Feb 1 - 11 : Pacific Neogene Stratigraphy, (3rd International Meeting), Dunedin, New Zealand. Sponsored by the Royal Society of New Zealand and IUGS. (A.R. Edwards, Secretary, N.Z. Geological Survey, P.O. Box 30 - 368, Lower Hutt, N.Z.).

Mar 6 - 10 : 3rd International Symposium on Hydrometallurgy, Atlanta, Georgia, USA. K. Osseo-Asare, Dept. of Materials, Science and Engineering, 202A Steidle Building, The Pennsylvania State University, University Park, Pennsylvania 16802, USA).

Aug 7 - 12 : Fossil Corals (Symposium), Washington, D.C. (W.A. Oliver, Jr., U.S. Geological Survey, E-305 Natural History Building, Smithsonian Institution, Washington, D.C. 20560, USA).

Aug 27 : Krakatau Eruption (Centennial Symposium), Jakarta, Indonesia. (D. Sastrapradja, Indonesia Institute of Sciences, Box 250, Jakarta, Indonesia).

Sep : 10th International Geochemical Exploration Symposium, Helsinki, Finland. Sponsored by the Association of Exploration Gkochemistry. (L.K. Kauranne, Organizing Committee, 10th IGES., The Geological Survey of Finland, Kivimiehentie 1, 02150 Espoo 15, Finland).

Sep : International Symposium on Engineering Geology and Underground Construction, Lisbon, Portugal. (Sociedade Portuguesa de Geotecnia, c/o L.N.E.C., Av. Brasil, 101, 1799 Lisboa Codex, Portugal).

Sep 12 - 17 : Carboniferous Stratigraphy and Geology, (10th International Congress), Madrid, Spain. Languages: English, French, German, and Spanish; English and Spanish preferred for oral presentations. (Comite organizador del X Congreso Internacional de Estratigrafia y Geologia del Carbonifero, Instituto Geologico Minero de Espana, Rios Rosas, 23-Madrid - 3, Espana).

Sep 19 - 23 : World Energy, (12th Conference), New Delhi, India. (E. Ruttley, World Energy Conference, 34 St. James Street, London SW1A 1HD, U.K.).

Dec : Groundwater 1983, (IAH Symposium), Sydney, Australia. (W. Williamson, Ibis House, 201/211 Miller St., P.O. Box 952, North Sydney, N.S.W. 2060, Australia).

1984

Aug 4 - 14 : **27th International Geological Congress, Moscow, USSR, (N. Bogdanov, Secretary General, 27th IGC Secretariat, 109180, USSR. Tel. 238-8588).**

*****

BACK ISSUES AVAILABLE

Bulletin 1 (1968). 79 p. Studies in Malaysian Geology, edited by P.H. Stauffer. A collection of papers presented at a meeting of the Geological Society of Malaysia on 31st January 1967. M$3.00 (US$1.50).

Bulletin 2 (1968). 152 p. Bibliography and Index of the Geology of West Malaysia and Singapore by D.J. Gobbett. Price: M$10.00 (US$5.00)—softcover; M$15.00 (US$7.50)—hardcover.

Bulletin 3 (1970), 146 p. Papers in Gemorphology and Stratigraphy (with Bibliography supplement), edited by P.H. Stauffer. Price: M$10.00 (US$5.00).

Bulletin 4 (1971), 100p. Papers in Petrology, Structure and Economic Geology, edited by P.H. Stauffer. Price: M$10.00 (US$5.00).

Bulletin 5 (1973), 70 p. The Search for Tungsten Deposits by K.F.G. Hosking. Price: M$10.00 (US$5.00).

Bulletin 6 (1973). 334p. Proceedings, Regional Conference on the Geology of Southeast Asia, Kuala Lumpur, March 1972. Edited by B.K. Tan. Price: M$22.00 (US$11.00)—hardcover only.

Bulletin 7 (1974), 138 p. Edited by B.K. Tan. Price: M$12.00 (US$6.00).

Bulletin 8 (1977), 158 p. Edited by T.T. Khoo. Price: M$12.00 (US$6.00).

Bulletin 9 (1977). 277 p. The relations between granitoids and associated ore deposits of the Circum-Pacific region. A collection of papers presented at the IGCP Circum-Pacific Plutonism Project Fifth Meeting, 12–13 November 1975, Kuala Lumpur, edited by J.A. Roddick & T.T. Khoo. Price: M$25.00 (US$12.50).

Bulletin 10 (1978), 95 p. A collection of papers on the geology of the Asean region. Edited by C.H. Yeap. Price: M$10.00 (US$5.00).

Bulletin 11 (1979), 393 p. Geology of Tin Deposits. A collection of papers presented at the International Symposium on 'Geology of Tin Deposits', 23–25 March 1978, Kuala Lumpur. Edited by C.H. Yeap. Price: M$50.00 (US$25.00).

Bulletin 12 (1980), 86p. Papers on Petroleum Geology, Engineering Geology, Structure, Palaeomagnetism & Petrology, edited by G.H. Teh. Price: M$20.00 (US$10.00).

Geological Map of the Malay Peninsula (1:1,000,000 coloured) compiled by D.J. Gobbett. 1972. Price: M$4.00 (US$2.00)—folded flat.

Field Guide for a 7-day, one thousand mile, geological excursion in Central and South Malaya (West Malaysia and Singapore (1973). 40 p. by C.S. Hutchison. Price: M$5.00 (US$2.50).

Abstracts of papers. Regional Conference on the Geology of Southeast Asia, Kuala Lumpur (1972). 64 p. 8 figs., 3 tables, many extended abstracts. Edited by N.S. Haile. Price: M$6.00 (US$3.00).

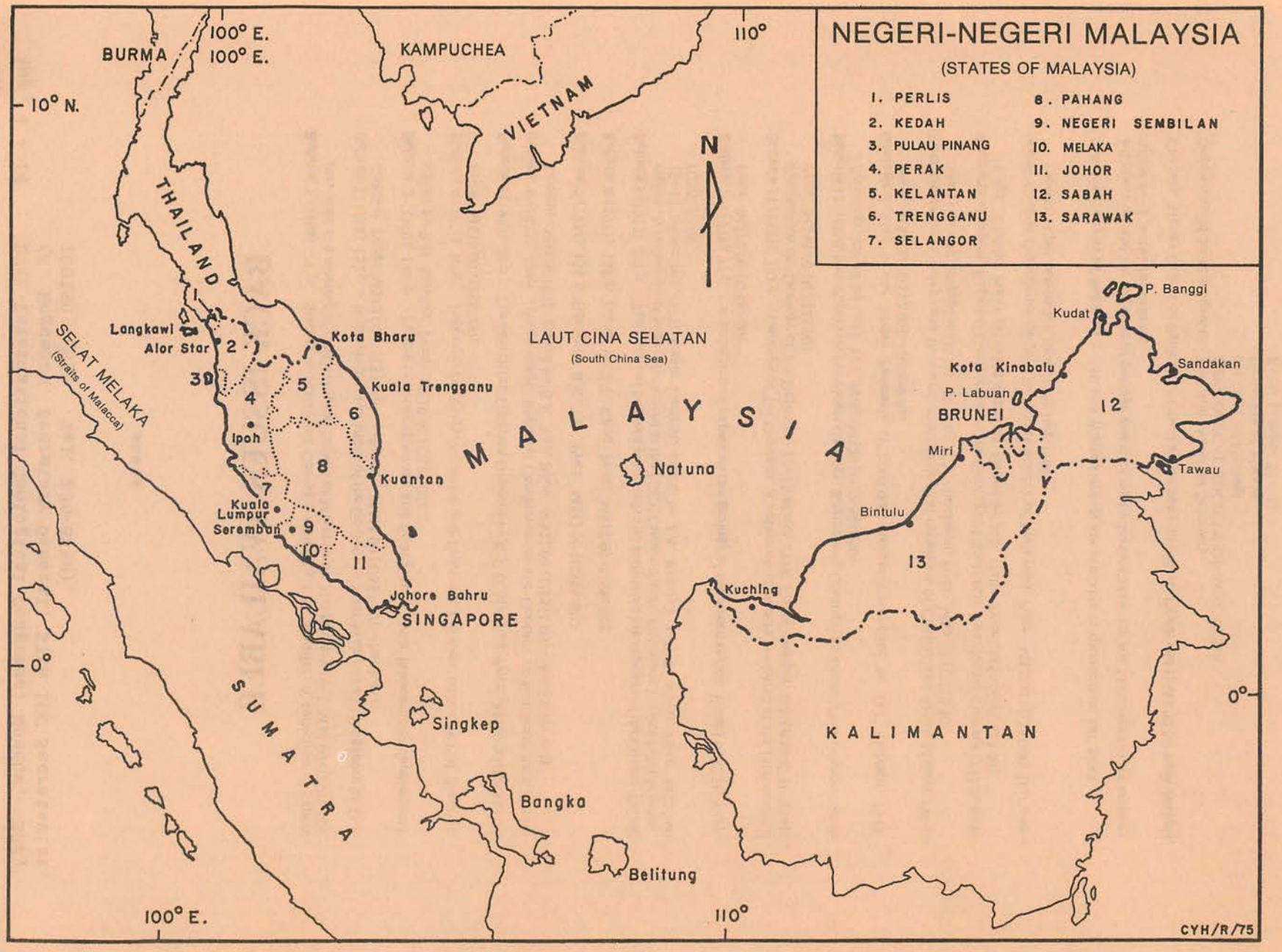
Warta Geologi (Newsletter of the Geological Society of Malaysia). Price: M$2.00 (US$1.00) (for non-members) per bimonthly issue from July 1966.

Individual copies of Bulletins 1—10 and Warta Geologi are available to members at half price.

All prices quoted are inclusive of postage and packing by Surface Mail; for Air Mail, write in for enquiry. Allow 6—8 weeks for delivery.

Cheques, Money Orders or Bank Drafts must accompany all orders. **Please add US$1.30 for bank charges.**

Orders should be addressed to: The Hon. Assistant Secretary
GEOLOGICAL SOCIETY OF MALAYSIA
c/o Dept. of Geology
University of Malaya
Kuala Lumpur 22—11
MALAYSIA


NEGERI-NEGERI MALAYSIA
(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
KAMPUCHEA
VIETNAM
THAILAND
100° E.
110°
10° N.
0°
N
LAUT CINA SELATAN
(South China Sea)
MALAYSIA
SELAT MELAKA
(Straits of Malacca)
Langkawi
Alor Star
Kota Bharu
Kuala Trengganu
Ipoh
Kuantan
Kuala Lumpur
Seremban
Johore Bahru
SINGAPORE
Natuna
SUMATRA
Singkep
Bangka
Belitung
KALIMANTAN
Kuching
Bintulu
Miri
BRUNEI
P. Labuan
Kota Kinabalu
Kudat
P. Banggi
Sandakan
Tawau
CYH/R/75