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PERSATUAN GEOLOGI MALAYSIA
(GEOLOGICAL SOCIETY OF MALAYSIA)

Majlis (Council) 1982/83

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First published 28 Sept. 1982
Printed by Art Printing Works Sdn. Bhd., 29 Jalan Riong, Kuala Lumpur
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.
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 paralic 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 abhorrent 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 30 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 its attendant problems of land subsidence and saltwater 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 expertise 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 expertise in groundwater technology and in the preparation of legislation. To quote an elderly American consultant, who was in Australia seeking groundwater expertise 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 expertise go to a water short country". Australia is such a country and groundwater technology has developed as a result of the dry continent.

Reference

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


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. COBBING¹, D.I.J. MALLICK¹, YAP FOOK LOI² & TEOH LAY HOCK²

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 different­
tiation of the Peninsula into three belts of mineralisation (eastern and
western tin belts and a central base metal belt) is paralleled 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 predomi­
nate and the initial Sr/Sr 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/Sr 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 na­
ture 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 Penin­
sular 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 varia­
tions 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

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ISSN 0126-6539 Warta Geologi, vol. 8, no. 3, May-June 1982
parts of the large granite batholiths could be mapped on the basis of variations in composition and texture and that consanguinity 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 superunits (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, meta-morphosed, 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 muscovite 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 biotite 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 micro-granite and rhylolitic 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 pendants 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


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Manuscript received 20 March 1982
**Gravity Traverse Across Northern Peninsular Malaysia - Preliminary Results**

G. Van Klinken & Ho Choon Seng

**Introduction**

To supplement gravity data now available elsewhere in the Peninsula (Ryall, 1976; Loke, et 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 route 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 crust 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 underthrusting 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

* Permission has been obtained from the Director-General, Geological Survey Malaysia to publish this paper.

ISSN 0126-6539 Warta Geologi, vol. 8, no. 3, May-June 1982
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


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$^3$. 
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(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
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Andrew Spykerman, Pernas Charter Management, Kuala Lumpur

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

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:

2. Tungsten deposits of Xihuashan, China by Prof. C.S. Hutchison, Dept. of Geology, University of Malaya, Kuala Lumpur.
6. Subaquatic plants as geochemical sample 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. Choeang 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. Interpretation 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.

<table>
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<th>Advance Registration Fees</th>
<th>Late Registration Fees</th>
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<tr>
<td>Full Members</td>
<td>MR 25.00</td>
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<td>Student Members</td>
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<tr>
<td>Student Non Members</td>
<td>MR 4.00</td>
<td>MR 5.00</td>
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Only speakers at the Seminar will be exempted from payment of registration fees.

Payment by crossed cheques, bank drafts or cashiers orders is acceptable and should be made payable to the Geological Society of Malaysia. Outstation cheques should include sufficient bank charges.
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Mr. Michael Leong
Organising Chairman
Petroleum Geology Seminar '82
Geological Society of Malaysia
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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
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

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PERTUKARAN ALAMAT (CHANGE OF ADDRESS)

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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.
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 2811, Houston, Texas 77001, USA.
15. Choy Kam Wai, CRA Exploration Pty. Ltd., 9, Pine Street, Eaglehawk, Vic. 3556, Australia.
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17. Thomas W. Wagner, P.O. Box 3103, Kathmandu, Nepal.
27. Paul K. Kopper, 21884 Mountsfield Dr., Golden, Co. 80401, USA.
28. Ho Kheng Hong, Blok 12, Bilik 003, Desasiswa Cahaya, Universiti Sains Malaysia, Pulau Pinang.
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:

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.
18. SEATRAD Library periodical list, June 1982.
19. SEATRAD Library acquisition list, April-June 1982.
34. AGID membership directory, 1982.
35. Oklahoma Geology Notes, vol. 41, nos. 1, 2, 5, & 6, 1981.

****

BERITA-BERITA LAIN
(COThER 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 significant 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 1. World mine production of major minerals and metals, 1960-1981

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<tr>
<td>Bauxite</td>
<td>10^6 tons</td>
<td>37.9</td>
<td>60.6</td>
<td>77.0</td>
<td>84.0</td>
<td>87.9</td>
<td>92.6</td>
<td>90.0</td>
<td>Australia (31), Guinea (14), Jamaica (12), USSR (7), Burinans (5), Guyana (4)</td>
</tr>
<tr>
<td>Chrome</td>
<td>10^6 tons</td>
<td>4.9</td>
<td>6.1</td>
<td>8.3</td>
<td>9.61</td>
<td>9.52</td>
<td>9.73</td>
<td>9.0</td>
<td>South Africa (72), USSR (25), Albania (41), Philippines (6), Zimbabwe (5), Turkey (5)</td>
</tr>
<tr>
<td>Cobalt</td>
<td>10^3 tons</td>
<td>17.1</td>
<td>23.9</td>
<td>25.6</td>
<td>27.9</td>
<td>28.5</td>
<td>29.9</td>
<td>26.7</td>
<td>Zaire (59), Zambia (11), USSR (6), Cuba (5), Australia (5)</td>
</tr>
<tr>
<td>Copper</td>
<td>10^3 tons</td>
<td>4.263</td>
<td>6.403</td>
<td>7.346</td>
<td>7.866</td>
<td>7.630</td>
<td>7.800</td>
<td>US (18), USSR (14), Chile (13), Canada (8), Zambia (7), Peru (5)</td>
<td></td>
</tr>
<tr>
<td>Diamond</td>
<td>10^6 carats</td>
<td>49</td>
<td>48.2</td>
<td>47.3</td>
<td>48.0</td>
<td>47.2</td>
<td>47.0</td>
<td>Zaire (32), USSR (25), South Africa (18), Botswana (11)</td>
<td></td>
</tr>
<tr>
<td>Gold</td>
<td>t ons</td>
<td>1,486</td>
<td>1,589</td>
<td>1,197</td>
<td>1,212</td>
<td>1,220</td>
<td>1,250</td>
<td>1,260</td>
<td>South Africa (48), USSR (25), Canada (9), China (11), Peru (5)</td>
</tr>
<tr>
<td>Iron ore</td>
<td>10^5 tons</td>
<td>618</td>
<td>769</td>
<td>875</td>
<td>838</td>
<td>900</td>
<td>891</td>
<td>875</td>
<td>USSR (27), Brazil (11), Australia (10), US (10), China (8), Canada (7), India (4)</td>
</tr>
<tr>
<td>Lead</td>
<td>10^3 tons</td>
<td>2,741</td>
<td>3,460</td>
<td>3,602</td>
<td>3,618</td>
<td>3,627</td>
<td>3,650</td>
<td>3,400</td>
<td>USSR (15), US (14), Australia (11), Canada (9), Peru (5)</td>
</tr>
<tr>
<td>Manganese ore</td>
<td>10^6 tons</td>
<td>17.6</td>
<td>19.1</td>
<td>24.7</td>
<td>23.1</td>
<td>26.2</td>
<td>26.7</td>
<td>26.5</td>
<td>USSR (59), South Africa (20), Gabon (9), Brazil (8), India (7), Australia (6), China (6)</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>10^3 tons</td>
<td>n.a.</td>
<td>82.4</td>
<td>81.8</td>
<td>99.9</td>
<td>104.0</td>
<td>108.5</td>
<td>101.3</td>
<td>US (65), Chile (13), Canada (11), USSR (10), China (2)</td>
</tr>
<tr>
<td>Nickel</td>
<td>10^5 tons</td>
<td>537</td>
<td>665</td>
<td>744</td>
<td>704</td>
<td>679</td>
<td>748</td>
<td>650</td>
<td>USSR (22), Canada (19), New Caledonia (2), Australia (11), Indonesia (5), Cuba (5)</td>
</tr>
<tr>
<td>Phosphate rock</td>
<td>10^6 tons</td>
<td>63.9</td>
<td>84.9</td>
<td>107.5</td>
<td>124.7</td>
<td>128.0</td>
<td>133.0</td>
<td>140.0</td>
<td>US (38), USSR (21), Morocco (15), China (4), Tunisia (3), Togo (2)</td>
</tr>
<tr>
<td>Platinum</td>
<td>10^9 tons</td>
<td>95</td>
<td>178</td>
<td>198</td>
<td>207</td>
<td>220</td>
<td>229</td>
<td>218</td>
<td>USSR (48), South Africa (48), Canada (13)</td>
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<tr>
<td>Potash</td>
<td>10^6 tons</td>
<td>15.8</td>
<td>23.5</td>
<td>26.0</td>
<td>23.9</td>
<td>27.9</td>
<td>28.0</td>
<td>26.8</td>
<td>Canada (26), USSR (26), DDR (13), FRG (10), US (9)</td>
</tr>
<tr>
<td>Silver</td>
<td>tons</td>
<td>8,021</td>
<td>9,655</td>
<td>9,498</td>
<td>10,038</td>
<td>10,933</td>
<td>10,922</td>
<td>10,900</td>
<td>USSR (16), Mexico (14), Peru (12), Canada (11), US (11), Australia (8)</td>
</tr>
<tr>
<td>Tin</td>
<td>10^3 tons</td>
<td>191</td>
<td>217</td>
<td>220</td>
<td>236</td>
<td>258</td>
<td>255</td>
<td>236</td>
<td>Malaysia (27), Thailand (14), Indonesia (12), Bolivia (12), USSR (6), China (7)</td>
</tr>
<tr>
<td>Tungsten</td>
<td>10^3 tons</td>
<td>27.3</td>
<td>32.4</td>
<td>38.8</td>
<td>45.8</td>
<td>46.1</td>
<td>50.0</td>
<td>48.0</td>
<td>China (26), USSR (19), Bolivia (7), US (6), Rep. of Korea (6), Australia (5)</td>
</tr>
<tr>
<td>Vanadium</td>
<td>10^3 tons</td>
<td>8.9</td>
<td>23.8</td>
<td>27.6</td>
<td>34.7</td>
<td>35.9</td>
<td>35.6</td>
<td>South Africa (36), USSR (29), US (14), China (10), Finland (6)</td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td>10^3 tons</td>
<td>4,276</td>
<td>5,615</td>
<td>5,910</td>
<td>6,429</td>
<td>6,345</td>
<td>6,248</td>
<td>6,350</td>
<td>Canada (19), USSR (16), Australia (2), Peru (3), US (5)</td>
</tr>
</tbody>
</table>


g/ 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.

g/ Platinum group metals (platinum, palladium, iridium, osmium, iridium, platinoid).
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:

c) Application of improved spiral technology for recovery of fine heavy minerals in tailings.
d) Recovery 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.

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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
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 Geo-
chemical 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.

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4TH INTERNATIONAL CONGRESS OF THE INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGISTS

The 4th Congress will be held in New Delhi, India from 1-8 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 construction material.
5. Engineering geological problems of sea-coast and shelf area.
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 Geotechnical 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 Organising Committee for the Seventh Conference is Mr. S.C. 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. Ijan 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 many 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

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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
Tel: (021) 284-6087/264-0285
Telex: (021) 30226 BACL BR.

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KALENDAR (CALENDAR)

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

1982
Contact: Jose Seixas Loureco, NCGG-UFPa, Caixa Postal Postal 1611, Belem-Para, 66000 Brasil. (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 : Kimberlite, (3rd International Conference), Clermont-Ferrand, France. (F. Boudier, Universite de Nantes, Laboratoire de Tectonophysique, 2 rue de la Houssiniere, 44072 Nantes, France).


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, 88 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, I-34100 Trieste, Italy (Jan-Feb 1982).

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. Hagn, 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 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).


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


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


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).


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


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).


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).
Aug 4 - 14 : 27th International Geological Congress, Moscow, USSR, (N. Bogdanov, Secretary General, 27th IGC Secretariat, 108180, USSR. Tel. 238-8588).

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BACK ISSUES AVAILABLE


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.


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. Hutchinson. 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. Halle. 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.

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