Geological Society of Malaysia

KESATUAN KAJIBUMI MALAYSIA

NEWSLETTER

Number 28 January 1971

C O N T E N T S

Issued bi-monthly by the

Geological Society of Malaysia, c/o Department of Geology, University of Malaya, Kuala Lumpur.

Price to non-members: M $1/copy. Back issues M $0.50 to members.

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GEOLOGIC NOTES

A Note Concerning the Known Occurrences of Malayaite ($CaO.SnO_2.SiO_2$)

K.F.G. Hosking and E.B. Yeap
University of Malaya

Until about 15 months ago malayaite, the tin analogue of sphene, was known to occur in only two areas, one of which was in South-east Asia. Since that time the species has been found in a further five localities and all of these are in South-east Asia.

In view of the fact that a study of this species adds meaningfully to one's knowledge of the pure and applied geochemistry of tin and because it <u>might</u> somewhere occur in economically interesting amounts (it contains up to 58.8 percent SnO_2) a record of the known localities in which it occurs and a few notes concerning it and some of its associated minerals seem to be justified.

Malayaite was first discovered at Chenderiang in the Batang Padang district of Perak (fig. 1) and was named and described by the finders Alexander and Flinter (1965). Subsequently Dearman and el Sharkawi (1965) located the species in skarn on the dumps of the long-abandoned Red-a-ven (prospect) Mine which is situated just to the north of the Dartmoor granite mass in the south-west of England. A little over a year ago one of us (K.H.) and his colleague, Mr. J.H. Leow, discovered that an abundance of the mineral occurred in some of the skarns of Pinyok (tin) Mine, South Thailand (see Hosking, 1969). A little later malayaite was found in the Melor Syndicate Mines, Sungei Way, Selangor (Yeow, 1969), in the Teh Wan Seng No. 5 Mine, Salak South, Selangor (Yeap, 1969), and in the long abandoned hard-rock mine at Sungei Gow, Pahang (Hosking and Leow, 1970). Only a few months ago the mineral was identified in skarn from the Hiap Huat Mine, Rawang (T.W, Wong, K.F.G. Hosking and E.B. Yeap, unpublished studies) whilst the latest find was in the Kanching Tin Mine, Templar Park, Selangor (F.E.H. Haser, personal communication).

The following are some of the more important or interesting observations concerning malayaite and its occurrence:

i The species is always confined to skarns.

ii The <u>common</u> associated silicates are grossularite, andradite, vesuvianite, and diopside.

iii The andradite garnet may be distinctly stanniferous as is, for example, that from Red-a-ven and Pinyok.

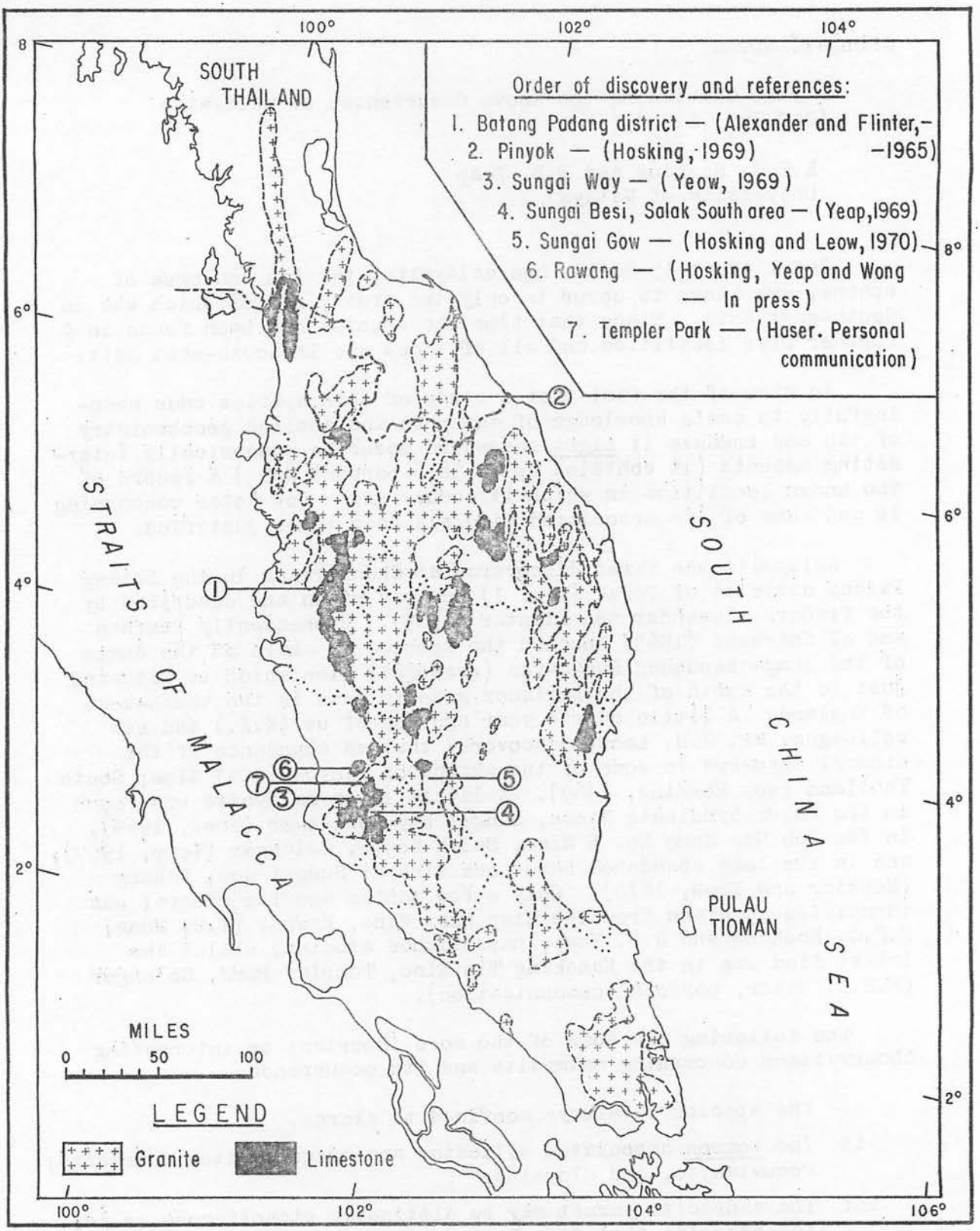

FIG. 1. THE OCCURRENCE OF MALAYAITE IN WEST MALAYSIA AND THAILAND.

iv Cassiterite may be associated with malayaite, as at Pinyok, S. Gow, and Salak South. The associated cassiterite may be, in part, due to the breakdown of malayaite by hydrothermal agents, as at S. Gow, but it would seem that most of it owes its origin to ascending stanniferous hydrothermal agents which either deposited the mineral directly in open spaces (as, locally, at Sungei Gow) or which enabled the species to develop by processes involving the replacement of essentially non-stanniferous skarn species (as at Pinyok).

v Crystals consisting solely of malayaite may occur, as, for example, at Pinyok, or crystals consisting of alternate zones of malayaite and sphene (stanniferous?) may be in evidence, as at Chenderiang (Hosking, 1970, p. 41). As a further variation, crystals of sphene (?) with a border of malayaite may be apparent, as at Rawang.

In addition, partial degradation of the malayaite by hydrothermal processes may locally result in the development of 'pseudomorphs' consisting of relicts of the tin silicate together with cassiterite, quartz, and calcite, as at S. Gow.

vi A variety of hydrothermal sulphides and quartz may also occur in the malayaite-bearing skarns, whilst scheelite, in varying amount, is almost always present and is particularly abundant in the Templar Park material.

vii In the zone of weathering malayaite may be converted to varlamoffite as, for example, at Chenderiang.

viii Finally, the identification of malayaite is facilitated by the fact that it fluoresce a characteristic yellow under short wave ultraviolet light.

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Peridotite-Gabbro Problems, with special reference to the Segama Valley and Darvel Bay Area, Sabah, East Malaysia.

K.M. Leong
Geological Survey, Malaysia.

The possible igneous nature of the gneissic texture in the Silumpat Gneiss of Darvel Bay was recently raised by Dr. Thayer in the July Newsletter. Dr. Fitch in the November Newsletter reiterated his opinion as expressed earlier in Memoir 4 (Fitch, 1955) that the banding in the "banded diorite" of the Segama area are contemporaneous and genetically related to the ultrabasic rocks in the Darvel Bay and Segama area respectively. Dr. Thayer commented that the Silumpat Gneiss may represent a gabbro; Fitch (1955, p.61) believed that the true gabbro in the Segama area to be probably a pegmatitic derivative of the ultrabasic rocks.

In the light of the recent comments by Drs. Thayer and Fitch, three fundamental problems or questions are raised concerning the Silumpat Gneiss, the "banded diorite", the ultrabasic rocks and the true gabbroic rocks of the Segama Valley and Darvel Bay area. The problems are:-

1. Are the strongly foliated and lineated amphibolite (Silumpat Gneiss) in the Darvel Bay islands and the

"banded diorite" in the Segama area metamorphic or igneous in nature?

2. Are the ultrabasic rocks contemporaneous and genetically related to the above amphibolite gneiss (or hornblende-plagioclase gneiss) and "banded diorite"?

3. What is the position of the true gabbros in the area with respect to the Silumpat Gneiss or "banded diorite" and the ultrabasic rocks?

Each of the above problems is reviewed with a summary of previous work and also in the light of recent field work by the author and partly by N.P.Y. Wong, formerly of the Geological Survey, Malaysia. The observed and inferred stratigraphical positions of the various rocks types under discussion and relevant rock formations in the area are tabulated in Table 1. For place names, the reader can refer to the published Geological Map of the Segama Valley and Darvel Bay Area, 1955. Fitch Gorge is named in honour of Dr. F.H. Fitch who first mapped the very inaccessible map-area in the early 50's. The gorge is about a mile long and is about 5 miles upstream from Fitch's highest point on the headwaters of the Segama River.

Silumpat Gneiss and "banded diorite": igneous or metamorphic?

Kirk (1962, p. 118) first noted the occurrence of foliated metamorphic amphibolite of uncertain age on Bohayan and adjacent islands in Darvel Bay. On the basis of later field work in the middle Segama Valley and of potassium-argon age determinations, he concluded that the metamorphic rocks were pre-mid Jurassic (now pre-lower Triassic) and together with the intrusive tonalite and other granitic rocks including the "banded diorites" of Fitch (1955), should be grouped together as Crystalline Basement (Kirk, 1964, p.83), a general, provisional term. Kirk (1962, p. 118) however was also of the opinion that the larger bodies of amphibolite is the Darvel Bay may be of intrusive nature the foliation being due to the effects of crystallization under stress.

Recent detailed petrographic and structural studies on the outcrops on Bohayan and other islands in the Darvel Bay and along the Silam coast by Khoo (1965), Tan (1965), Hutchison (1966), Dhonau and Hutchison (1966) and Koopmans (1967) have shown that the amphibolite gneiss is of metamorphic in origin with strongly developed foliation, lineation and numerous ptymatic folds. A second period of deformation and possibly lower grade metamorphism is also indicated or inferred from field evidence and structural

analysis.

The vast areas in the Segama area first mapped by Fitch (1955) as underlain by "Eocene banded diorite" are now separated into two distinct groups of rock types in the light of recent field work. The first group of "banded diorite" is similar to the metamorphic, medium to coarse-grained amphibolite or hornblende-plagioclase gneiss of the Darvel Bay and is now mapped under the term Crystalline Basement which includes the Silumpat Gneiss. The second group comparises a younger unmetamorphosed rock of gabbroic composition which has been "hornblendized" in varying degrees. The banding in this group of rocks varies from weakly to strongly developed, thus giving the rock a gneissic appearance. The banding reflects the different proportions of the minerals, hypersthene, hornblende and plagioclase (labradorite) but all three minerals are commonly present in the different bands. These banded gabbros are best observed in the upper Telewas and Diwata Valleys and their association with the Silam ultrabasic intrusion is discussed below. The composition of these banded gabbros ranges from feldspar-rich norite to hypersthene gabbro and hornblendic hypersthene gabbro. Within the fresh banded hypersthene gabbro are found narrow zones of almost completely "hornblendized" gabbro; the banding is still preserved but the rock contains essentially green hornblende and plagioclase commonly of calcic composition. These rocks may be called "epidiorite", which resemble diorite but were actually gabbro (Thayer, personal communication).

Actually the above two groups of rocks are clearly shown by plates XXXIII and XXXIV in Fitch (1955) which he has classified them together under "banded diorite". Plate XXXIII banded diorite is now considered a metamorphic amphibolite gneiss with ptymatic folds similar to the Silumpat Gneiss of Darvel Bay; plate XXXIV "banded diorite" is now considered a banded "hornblendized" gabbro or banded epidiorite of igneous origin. Evidence for the igneous origin of the banded gabbro are given by the granular or gabbroic texture, the lack of orientation of the amphibole in contrast to the Silumpat Gneiss, and the exsolution lamellae in the pyroxenes which characterize igneous pyroxenes (Thayer, personal communication). Similar gneissic or banded gabbros of igneous origin have been described nearly in the Philippines by Stoll (1958). The alteration of the gabbros to epidiorite may be spatially related to the gabbros to epidiorite may be spatially related to the serpentinization of the Silam ultrabasic rocks or as in the Canyon Mountain Complex, Oregon to the trondhjemite intrusion (Thayer and Himmelberg, 1968). Trondhjemite occuring sparsely in the upper Telewas Valley and associated with the banded gabbro has been

determined by Thayer (personal communication).

The Ultrabasic Rocks

Dr. Thayer in the July Newsletter expressed his opinion that both the ultrabasic rocks and the Silumpat Gneiss in the Darvel Bay were co-magmatic and were emplaced contemporaneously. Almost similar opinions were earlier expressed by Tan (1965) who considered that the gneisses and the ultrabasic rocks in the Darvel Bay and along the Silam coast to be genetically related and of the pseudostratiform Alpine-type. Kirk (1962, p.119) and Dhonau and Hutchison (1966, p.156) however considered that the ultrabasic rocks were intruded after the formation of the amphibolite gneiss, i.e. after the regional metamorphism.

In the Segama area, Fitch (1955) considdred that the ultrabasic rocks to be genetically related to and contemporaneous with the "banded diorite". However under Kirk's grouping of the rock types under the term Crystalline Basement, there is a complete separation of the ultrabasic rocks which he believed to be younger and post-date the Basement (Kirk 1968, p.41).

From recent re-mapping of the Segama-Darvel Bay area on a similar regional scale (Leong, in preparation), the ultrabasic rocks showing close field relationship to the basic rocks are provisionally considered under two groups. Isolated occurrences of ultrabasic rocks with no observable association with basic rocks and vice versa are not described in this paper.

The first group of ultrabasic rocks, mainly serpentinite and serpentinized peridotite includes those in the Darvel Bay under discussion above and also several large bodies in the Segama area occurring within or surrounded by amphibolite gneiss, fine-grained amphibolite and epidote amphibolite. The elongations or trends of most of these large bodies of ultrabasic rocks are approximately concordant or parallel to the foliation of the surrounding gneiss, as for example the ultrabasic bodies in the Ulu Purut and the Mount Ambun areas. Some of these ultrabasic rocks showing close spatial relationship to the surrounding gneiss or are enclosed within the gneiss in the Segama and Darvel Bay areas are tentatively regarded as possible "older", ultrabasic rocks. They are provisionally classified under the Crystalline Basement (see Table 1). However the possibility that the ultrabasic rocks occurring within the amphibolite belts as "tectonic slabs" emplaced along major faults or tension joints (now observed) parallel to the foliation of the gneiss cannot be ruled out.

It is interesting to note that in the Basement Complex ofthe Philippine Islands, metagabbro, metavolcanics and amphibole schist are common as in the Crystalline Basement of Sabah, but ultrabasic rocks are rare, except in Mindoro Island where the metagabbro is possibly associated with peridotite (see Gervasio, 1966, Table 1). Moreover in some areas in Japan especially in the Hitati and Kinokawa metamorphic belts, a very close spatial association between ultrabasic and basic rocks is noticed (Miyashiro, 1966). The ultrabasic rocks are abundant within the metamorphic belts where the basic rocks are now metamorphosed into amphibolites. In some cases the emplacement of serpentinite within the metamorphic belts took place earlier than the regional metamorphism. Similar age relationship and condition may have prevailed in the Segama and Darvel Bay area where there is also close spatial association between the ultrabasic rocks and the amphibolite. However a major difficulty is in determining petrographically those ultrabasic rocks which may have possibly been regionally metamorphosed. The very common serpentinization which has obscured the mineralogy is not necessarily related to metamorphism.

The second group of ultrabasic rocks are associated with true gabbro and are intrusive into the Chert-Spilite Formation (Upper Cretaceous-Early Tertiary). These "younger" ultramafic complexes are considered in the next section.

The Gabbroic Rocks

Gabbros associated with "younger" ultrabasic rocks were observed in the following areas:- Silam-Beeston (upper Telewas and Diwata valleys), Tambuku, Maratokop and Ulu Binuang. The associated ultrabasic rocks in the first two areas are intrusive into the Chert-Spilite Formation and epidote hornfels are found at the contact zones. These peridotite-gabbro associations appear to resemble the Alpine-Type described in Thayer (1960).

The strongly gneissic or banded gabbros in the Upper Telewas area have already been described earlier Baily (1962) found gabbroic dykes cutting the ultrabasic rocks especially near the G. Beeston area. Similar dykes have also been observed in recent field work. The ultrabasic-basic complex appears to dip north-westerly in the upper Telewas area; similar structures in both the ultrabasic and basic rocks have earlier been observed by Kirk (1963, p.34) to the east of Telewas i.e. in the upper Diwata Valley. The Silam-Beeston ultrabasic body is about 20 miles long and at its eastern end near the Silam coast, Tan (1965) considered that the ultrabasic rock and the gneiss were genetically related. This view is difficult to reconcile with the stratigraphy and the

relationship of the ultrabasic body to the banded gabbro at the western end. Towards the north on the Segama River limestone of the Chert-Spilite Formation overlies unconformably on gneisses (Wong and Leong, 1969) which are similar to the Silumpat Gneiss and as mentioned above the ultrabasic rock is intrusive into the Chert-Spilite Formation thus indicating that the Silam-Beeston ultrabasic-basic complex is younger than the gneiss. It is more likely that the gneisses which Tan (1965) described are probably related to the ultrabasic rocks in the Darvel Bay and along the Silam coast (see Table 1). In most of the "younger" ultrabasic bodies in the areas mentioned above, inclusions of amphibolite gneiss have been found.

In the ultramafic complexes in the other areas, Tambuka, Maratokop and Ulu Binuang, olivine predominates and hypersthene is minor. The gabbroic rocks vary from olivine gabbro to pyroxene troctolite and troctolite. Banding is not so strongly developed, although planar orientation of the plagioclase and weakly oriented olivine can be observed in the outcrops giving the rocks an appearance of igneous flow-layering. Minor layers of anorthosite and anorthositic gabbro are also present.

The "younger" peridotite-gabbro complexes in the Segama area may be correlated with similar complexes of the Philippine Islands which are of late Cretaceous and early Tertiary age (see Gervasio, 1966, Table 1).

Summary

The following points may be summarized:-

1. The foliation in the amphibolite gneiss appears to be metamorphic. However the present foliation could be concordant to the original banding of the parent gabbro.

2. It is still problematical whether the amphibolite gneiss in the Segama-Darvel Bay area is genetically related to some of the ultrabasic rocks and both intruded contemporaneously. However the close spatial association of some of the ultrabasic bodies to the gneiss suggests a possible genetic relationship, both having been metamorphosed together. However the possibility that the ultrabasic bodies are "tectonic slabs" emplaced along major faults in the gneiss cannot be ruled out.

3. Fitch "banded diorite" is now separated into two groups: amphibolite gneiss and banded gabbro, the latter belonging to "younger" peridotite-gabbro complexes post-dating the

Crystalline Basement.

4. Reliable petrographic criteria are still lacking in distinguishing between the possible "older" and "younger" ultrabasic rocks which are mainly serpentinized. The present tentative grouping is based on field occurrence and association with the gabbroic rocks and gneiss.

5. Re-emplacement of the ultrabasic rocks which is difficult to determine in the field and not considered in this paper may be an important factor in complicating and obscuring the geological relationship of gneiss, gabbro and ultrabasic rocks.

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Table 1. Stratigraphy of the Pre-Tertiary and Early Tertiary of the Segama Valley and Darvel Bay Area

Pre-Oligocene	Ultrabasic and Basic Rocks "Younger" Peridotite-Gabbro complexes in the following area:- Silam-Beeston, Tambuku, Maratokop and Ulu Binuang. Large bodies of gabbro associated with dolorite north of Danum valley. Isolated gabbroic and ultrabasic bodies. Intrusive and fault contacts observed
Upper Cretaceous - Early Tertiary (probably Eocene)	Chert-Spilite Formation Mainly sandstone, shale, limestone, radiolarian chert, volcanic breccia, spilite, keratophyre, basalt, tuff, agglomerate. Unconformity on both Madai-Baturong and Crystalline Basement observed
? Lower Cretaceous and/or older	Madai-Baturong Limestone Formation Mainly massive limestone with some oolitic and pisolitic layers Unconformity inferred
Lower Triassic and/or older	Crystalline Basement Intrusive tonalite, granodiorite and minor granite
	Fine-grained amphibolite, epidote amphibolite and actinolite schist (most probably metavolcanics)
Pre-Lower-Triassic	Medium to coarse-grained amphibolite, hornblende schist, and hornblende-plagioclase gneiss (most probably metagabbro, includes Silumpat Gneiss). The ultrabasic rocks occuring within the amphibolite belts in the following areas may be associated with the above amphibolite:- Darvel Bay and Saddle Islands, Silam coast, Mount Ambun, Sabahan, Ulu Purut, Long Gorge, near Fitch Gorge, Ulu Lakanoy.

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PROPOSED PALEOMAGNETIC STUDIES IN MALAYSIA: A NOTE

N.S. Haile
University of Malaya

There is a dearth of palaeomagnetic data from the Southeast Asia. Such data, if it could be obtained, would enable a reconstruction of the position of the various parts of Southeast Asia relative to the equator to be attempted, and the relevance of the hypothesis of plate tectonics and continental drift to the region to be tested. Palaeomagnetic data are also relevant to such problems as palaeoclimatology, polar wandering, structural geology and stratigraphic correlation.

The University of Malaya has received an offer from the Australian National University to test suitable specimens for remanent magnetism, and it is hoped to send a few samples as a pilot project soon.

The assistance of any society member who would like to participate in this project would be welcomed. Initially this could be in the form of suggestions as to suitable rocks to test (including precise locality if possible) which should be sent to:

Professor N.S. Haile
Department of Geology
University of Malaya
Kuala Lumpur, MALAYSIA

Rocks to be tested (according to A.N.U.) should be fresh and free from excessive cleavage or small scale fractures. The types preferred in order of preference are: lava flows; sills and dykes; ignimbrite and tuff; red fine-grained sandstone. Granitic and metamorphic rocks, and limestone, are unsuitable. It may be added that age of the rocks tested should be known at least approximately, or there should be a reasonable chance that the rock can be dated by radiometric or palaeontologic methods. Strongly tectonized formations would normally be unsuitable.

Malaysian rocks which could be tried include: Segamat basalts; rhyolites and ignimbrites and other volcanic rocks of various ages, from areas which are not too strongly folded; red beds from the Tembeling Formation, Singa Formation, or others. Pre-Cretaceous rocks are most likely to yield information bearing on continental drift, but it would also be worth testing younger rocks, such as the Cainozoic lavas of Sarawak, and Sabah and Malaya.

NEWS FROM THE MINERALOGICAL SUB-GROUP

The Commission on Ore Microscopy of the International Mineralogical Association has recently launched a News Bulletin entitled Mineralogy & Materials News Bulletin for Quantitative Microscopic Methods. Below is a quotation from the editorial of Bulletin 1 (4 pages) regarding the purpose and contents of this News Bulletin.

"In recent years there has been a considerable development in polarized reflected-light microscopy. It could have been said a decade ago that the microscopic study of crystalline materials in reflected light was lagging seriously behind the study in transmitted light. For most users reflected-light microscopy was only qualitative, while the theory was but little understood. Now this is no longer true, and the growing interest in the quantitative aspect of this field of study is shown by the success of three different kinds of activity. The Commission on Ore Microscopy (COM) of the International Mineralogical Association (IMA) has established itself as the international authority by the provision of standards of reflectance that are now used throughout the world and by the publication of the first issue of International Tables for the Microscopic Determination of Crystalline Substances Absorbing in Visible Light (see p.4). Over the past seven years there have been two international, one regional, and four national Summer Schools on Quantitative Methods in Reflected-Light Microscopy. Beginning in 1965 but becoming an annual event in 1968, there are

the Annual Regional Conference on the subject, "Study of Minerals and Artificial Materials in Polished Section on the Micro Scale" (p.4). The launching of the present News Bulletin can be regarded as a fourth kind of activity, although it is not organisationally linked with any of these other activities.

First it must be stated that this News Bulletin is not another scientific periodical for the publication of papers on original work. It will indeed contain short articles on fields of application of certain techniques, but these should be regarded as journalistic news, and they should not be abstracted or used as references. As its name implies, its function is to keep its subscribers in touch with the news in a particular field of scientific application. It will carry invited articles on apparatus that is availabe commercially. It will give information on publications and will have in each issue a Chronicle of past events, as well as a Calender of future ones.

In such a News Bulletin the only difficulty is to indicate its field of interest, but this has to be attempted if the publication is to develop and keep a character of its own. Let us outline the field in a general way, without defining ti too narrowly because of the risk of excluding something that might in the future come within our scope. The central part of our field consists of microscopic methods using electro-magnetic radiation extending on either side of the visible into the infra-red and the ultra-violet. Our interest is essentially in methods which are quantitative or which can be developed to become quantitative. Our substances are natural and artificial minerals and mineral-like materials, predominantly crystalline but not excluding the amorphous. The method of examination can vary and will employ thin sections as well as polished pieces or sections. Our field also includes micro-indentation hardness measurement because this is a technique involving microscopic measurement and also because of its importance in the identification by the microscope of opaque minerals. Preparation techniques are, of course, of importance to us. We are interested in the results of electron-probe studies and of X-ray fluorescence and X-ray diffraction examination, but the actual techniques of these methods lie outside our scope. We are interested in the theory of our methods, in Crystal Optics and in Microscope Optics, in particular.

The future of this News Bulletin will be decided in the light of experience and in accordance with the needs of its subscribers. Editorial policy can develop, but its initial basis can be set out here. Books etc. will not be accepted for review, but information about these will be welcomed so that this may be printed in this News Bulletin. There will be no advertisements, but information on apparatus will be invited from firms, as has been done in the present issue. Letters to the Editor will not be printed, but they will be

replied to personally, and all points of general interest raised in such letters will be discussed in Editorials."

Editorial correspondence can be addressed to Dr. N.F.M. Henry, Department of Mineralogy, Downing Place, Cambridge CB2 3 EW, England. Business correspondence is Polyhedron Printers Limited, Publications Department, 51 Fen End, Over, Cambridge CB4 5NE, England. Applications for the subscription of the News Bulletin can be addressed to Polyhedron Printers Limited, England, or through your G.S.M. Representative on the International Mineralogical Association and the Commission on Ore Microscopy who is Mr. J.H. Leow, c/o McPhar (Asia) Pte. Ltd., 51 Kallang Place, Singapore-12.

The Commission on Ore Microscopy has held its Fourth Annual Regional Conference on the 'Study of Minerals and Artificial Materials in Polished Section on the Micro Scale' in Leoben, Austria, from 16th to 18th April, 1970. Volume 10 of 'Archiv fur Lagerstattenforschung in den Ostalpen' contains papers presented at this Conference and may be obtained by airmail for a sum of 70 Austrian Schillings from Prof. O.M. Friedrich, Institut fur Mineralogie und Gesteinskunde, Montanistische Hochschule, A 8700 Leoben, Austria.

International Tables for the Microscopic Determination of Crystalline Substances Absorbing in Visible Light. Provisional Issue, August 1970, published by the Commission on Ore Microscopy (COM) of the International Mineralogical Association (IMA), are obtainable from the following for a payment of US$1.00 including postage:-

Prof. M. Font Altaba,
Departamento de Cristalografia y Mineralogia,
Universidad de Barcelona,
Barcelona 7,
Spain.

The Fifth Annual Regional Conference on the 'Study of Minerals and Artifical Materials in Polished Section on the Micro Scale' will be held in Cagliari (Sardinia) Italy on April 13th to 16th 1971.

Further information can be obtained from Prof. P. Zuffardi, Istituto di Giacimenti Minerari, Universita di Cagliari, 09100 Cagliari, Italy.

- JHL -

NEW SECRETARY GENERAL OF IUGS

Since May 1970, the Secretary General of the International Union of Geological Sciences (IUGS) is Dr. S. van der Heide (address: P.O. Box 379, Haarlem, Netherlands).

Dr. W.P. van Leckwijck, the previous Secretary General, has asked us to inform members of this change and requests that correspondence concerning IUGS no longer be sent to him.

The Associate Secretary General continues to be Dr. J. Petranek, Dept. of Geology, Charles University, Albertov 6, Praha 2, Czechoslovakia.

RECENT MEETINGS OF THE SOCIETY

Meeting of 11 December 1970: S. Sartono

A meeting of the Society was held in the Geology Department, University of Malaya, on the evening of Friday, 11 December, 1970. The meeting opened with a new feature - exhibits and demonstrations from members. On the first occasion there were two exhibits: P.H. Stauffer showed a fossilized beehive (?) of possible Tertiary age from Batu Caves, and K.F.G. Hosking and F.E.H. Haser demonstrated fluorescent minerals from West Malaysian tin mines under short-wave ultraviolet light: yellow-fluorescing malayaite, some in large zoned crystals, and blue-fluorescing scheelite.

The main speaker at the meeting was Professor S. Sartono of the Jabatan Kajibumi (Department of Geology), Universiti Kebangsaan Malaysia in Kuala Lumpur. Professor Sartono, one of the leading current workers on Pithecanthropus, gave an interesting talk on "The Java Man: a short note". The talk was illustrated with colour slides, including a number showing the recently

discovered nearly-complete skull from east Java. Professor Sartono has kindly made available the text of his talk, which is appended to this Newsletter in lieu of a full report of his remarks.

N.S. Haile proposed a vote of thanks to the speaker for his interesting presentation. About 20 members and guests attended.

- PHS -

Ipoh Discussion Meeting, December 18-19, 1970

The Geological Society of Malaysia held its second Ipoh discussion Meeting on 18-19 December 1970 (the first was held in December 1969). The meeting was timed, as last year, to immediately follow the Geological Survey of Malaysia's annual conference, so most of the Survey's geologists were able to be present. In addition, strong contingents came from the mining companies and the University of Malaya.

The theme of the meeting was the igneous rocks of Malaysia and the mineral deposits associated with them. The following papers were presented:

1. "Association of granitic rocks and acid tuffs in West Malaysia" by S.K. Chung, Director, Geological Survey of Malaysia.
2. "Rhyolitic and granitic rocks around Genting Sempah, Selangor and Pahang, Malaysia, with a definition of a proposed new formation, the Sempah Conglomerate" by N.S. Haile, Professor of Geology, University of Malaya.
3. "Volcanic rocks and mineralization in Southeast Pahang and Johore" by R.H. Cook, Colombo Plan geologist with the Geological Survey of Malaysia, Johore Bahru Office.
4. "Distribution of metals in the base metal belt of central West Malaysia" by D. Santokh Singh, Deputy Director, Geological Survey of Malaysia.
5. "Observations on the sulphide deposits of the Sungai Aring area, Kelantan, and their relationship to volcanism" by P.C. Aw, Geological Survey of Malaysia, Kota Bahru Office.

6. "A discussion of the geology of the Bukit Ibam orebody, Ulu Rompin, Pahang, with some speculations on its genesis" by D. Taylor, Chief Geologist, Conzinc Riotinto Malaysia.

7. "Mineralogical study of the arsenical gold ores from the Bau Mining District, Sarawak, Malaysia" by J.W.E. Lau, Geological Survey of Malaysia, Kuching Office.

The abstracts of the seven presented papers are appended with this Newsletter. There were no field trips this year, unlike the previous year.

All the papers presented provoked considerable lively discussion. The observations and criticisms made were all in a positive and constructive spirit and the discussion dealt extensively with the origin and nature of the economic deposits and their relationship with the igneous rocks.

On the Friday evening (18th December), Mr. S.K. Chung, the Survey's Director, hosted all the participants in the meeting to an excellent 'makan' and much liquor at his home.

In the latter part of the Saturday morning (19th December) session Professor N.S. Haile provided a marvelous film show - the colour film "Surtsey", showing the birth and development of a new volcanic island on the mid-Atlantic ridge south of Iceland.

At the end of the meeting, the President, Professor K.F.G. Hosking, said that the meeting demonstrated the fine spirit of cooperation which existed between geologists of the Geological Survey, the private sector, and the Universities. This co-operation and the consequent success of the meeting augured well for the future. He also requested topics for the next Ipoh meeting and asked members to send in their suggestions to the Hon. Sec. of the Society.

Finally the President thanked the Geological Survey and its Director, S.K. Chung, for their generous hospitality, and all the participants for their contributions. He expressed the hope that both the Survey and the Society would regard the Ipoh Discussion Meeting as an established annual event and that the Survey would continue to offer hospitality for the event.

- KFGH -

Meeting of 30th December 1970 : D.P. Agrawal

A meeting of the Society was held in the Department of Geology, University of Malaya, on the afternoon of December 30th. At the start of the meeting time was allowed for short presentations from members, and three exhibits were shown: Dr. D. Taylor displayed some large air-photo mosaics of a portion of west-central Sumatra, on which the Semangko rift shows as a marked lineament having strong topographic expression and striking stream offsets, in a right-lateral sense; Prof. K.F.G. Hosking and Mr. S.C. Chan showed some beautiful specimens of scorodite (an oxidation product of arsenopyrite) from the Sungai Besi Mines near Kuala Lumpur; and Prof. Hosking also showed a sample of very rich tin ore from a gossanized cassiterite lode at Sungai Besi.

The President then introduced the main speaker, Dr. D.P. Agrawal of the Tata Institute of Fundamental Research in Bombay, India, who spoke on the topic "Sea Level changes and C^{14} dating in India and Southeast Asia: methods and results." A synopsis of Dr. Agrawal's talk follows.

The geophysics section of the Tata Institute has in recent years become more interested in late Cenozoic geology through its radiometric dating laboratory. We have so far worked mainly on the west coast of India and are still in a relatively early stage of the work. We are still in the data-gathering stage and all conclusions should be regarded as at present very tentative.

The major previous work on the Pleistocene in India was done in the 1930's. The focus of the Tata Institute's work is on reconstructing the palaeogeography and ecology of the prehistoric cultures of India as fully as possible. But India is a big country encompassing very diverse regions and climates. In the north we have Pleistocene glacial sequences, while these are lacking in the south. We must therefore try to establish reference points and work from the known to the unknown.

On the west coast of India we have no evidence of young tectonics, save for some oscillatory vertical movements in the Kutch-Gujarat area in the north. The west coast is also a region where rivers are short, there were no glaciers in Pleistocene, and only limited erosion and sedimentation took place. Hence it seems reasonable to suppose that the fundamental control on coastal geomorphology and stream regimen has been the sea level changes during the Pleistocene.

This is a region rich in material datable by C^{14}, especially raised corals, often some distance inland, and shell accumulations.

The rivers draining to the west coast are short, about 30 miles, and so are easy to study for their terraces and geomorphic development.

The literature on sea level changes in India is very limited, and some of the papers which have been published make an excessive and probably premature attempt to correlate levels in detail with the Mediterranean data. From our work we now recognize the following tentative levels above present sea level along the west coast of India:

+ 90 m
+ 60 m
(+ 30 m) – little evidence
+ 20 m
+ 9 m

} Marked by wave-cut platforms or terraces and sea cliffs

+ 3 m – marked by "littoral concrete" – cemented shells and sand – and raised coral reefs

Fluvial terraces in one river are found at these heights above the river:

+ 9m (+ 30 ft)
+ 6m (+ 20 ft)
+ 3m (+ 10 ft)

} Sections show three gravels, the middle one containing Middle Stone Age stone tools

These terraces are very near the sea, and climatic fluctuations in this region are not thought to have been severe, hence these terraces probably relate to sea levels.

Radiometric datings of some of these levels have been obtained, using the C^{14} and U-Th methods. Most of the dates are from the Kutch-Gujarat region, where some instability may have been present, but some are from the coast nearer Bombay, where tectonic stability is reasonably certain. Results are as follows:

+ 3.5 m level : c. 30,000 B.P. C^{14}
+ 2 m level : c. 5,000 B.P. C^{14}

The latter date can be compared with data compiled by N.S. Haile for Malaysia:

Tambelan & Bunguran Islands:

+ 3 m : c. 5,500 B.P. C^{14}
+ 4 m : c. 5,200 B.P. C^{14}
– 0.7 m : c. 6,200 B.P. C^{14}

From Bukit Chuping in Perlis:

+ 3 m : c. 5,400 B.P. C^{14}

We also have evidence of some regressive levels below present sea level:

- 16 m	c. 14,000 B.P.	But these are from Kutch - Gujarat, not certainly stable tectonically.
- 16 m	c. 14,000 B.P.	
- 4 m	c. 6,500 B.P.	
- 5 m		
- 5 m		

Some of these levels may represent more than one time period. For instance, material from a level at + 3 m has also given an age of 85,000 B.P. by U-Th method, after being found to be beyond C^{14} ($> 37,000$ B.P.). So we have superimposed levels, which may make the story considerably more complicated.

These older dates may be compared to some older dates obtained here in West Malaysia: 36,000 B.P., $>$ 41,000 B.P. and $>$ 41,000 B.P. for alluvium at Sungai Besi. In India we have Older Alluvium which has given the following datings:

Mula River:	32,000 B.P.	associated with Middle Stone Age tools
	39,000 B.P.	
Paithan River:	19,000 B.P.	
Krishna River:	39,000 B.P.	

All of these data are as yet unpublished. Interpretation of their meaning is at a very early stage, and conclusions must be regarded as tentative. I have tried to present the raw data which we have so far obtained.

During discussion following Dr. Agrawal's talk, several topics were brought up. The speaker was asked about the effective age ranges of the several methods in use, and the sort of material which they could date. He gave this outline in reply:

Method	Age range (B.P.)	Material
C^{14}	up to 40,000	Any carbon fixed at time of interest
U-Th	10,000-200,000	Thick, unrecrystallized aragonite shells
K-A	300,000 and up	Volcanic rocks and ash

The possible existence of much higher sea levels (say above + 50 m) was discussed, and it was agreed that the evidence for these is

very weak both in India and in Malaysia. The complex origin of the "alluvium" of West Malaysia was discussed, and the question of whether the presence of framboidal pyrites is a good indication of marine or brackish water origin was brought up.

P.H. Stauffer proposed a vote of thanks to the speaker for his interesting talk, and the meeting adjourned. About 20 members attended.

NEWS OF THE SOCIETY

New Members

Since the last Newsletter, the following have been elected to the indicated class of membership in the Society at the Council meetings of November 20, and December 30, 1970. (A = Associate member; S = Student member; others are Full members).

Mr. T.L. van Eijk
H.V. Billiton Maatschappij
Bangunan Getah Asli
Jalan Ampang
Kuala Lumpur

Dr. G. Eijkelboom
Serem Malaysia
805 AIA Building
Jalan Ampang
Kuala Lumpur

Mr. Ng Chak Ngoon (formerly S)
Department of Geology
University of Malaya
Kuala Lumpur

Mr. E.A. Olofin (S)
c/o Geography Department
University of Malaya
Kuala Lumpur

Dr. M.E. Scrutton
23 Nassim Road
Singapore 10

Mr. Tan Check Hong (formerly S)
90 Rombau Street
Klang,
Selangor

Mr. E.W. Westrick (A)
Thailand Gulf Oil Company
P.O. Box 979
Bangkok,
Thailand

CHANGE OF ADDRESS

The following members have moved to the new addresses indicated.

Mr. Beh Chong Aun
39 Bunga Tanjong
Canning Garden
Ipoh, Perak

Mr. J.D. Bignell
17 Nursery Close
Biggleswade
Beds.
United Kingdom

Mr. R.A.S. Cayzer
20 Shirley Road
Roseville 2069
N.S.W.
Australia

Mr. Chong Foo Shin
Geological Survey Headquarters
Scrivenor Road
P.O. Box 1015
Ipoh, Perak

Mr. Foo Khong Yee
Pejabat Penyiasatan Kajibumi
Jalan Gurney
Kuala Lumpur

Mr. S. Gopalapillai
No. 79 Jalan Abdul Manap
off Maxwell Road
Ipoh, Perak

Mr. M. Muthuppalaniappan
74, Paul Street
Seremban, N.S.

Mr. E.C. Salmon
Orchard Hill Lane
Greenwich
Connecticut
U.S.A.

Dr. T.R. Sweatman
Sheen Laboratories Pty Ltd.
80 Railway Crescent
Queen's Park 6107
Western Australia

Mr. Paul B. Truitt
Gulf Oil Company - Latin America
P.O. Box 910
Coral Gables
Florida 33134
USA

Mr. J.O. Zehnder
Unocal Corporation
3rd Floor
Ming Court Hotel
Tanghn Road
Singapore 10

Resignations:

The following persons have resigned from the Society.

Mr. N.V. Edwards
Mr. J.D. Parker
Mr. G.W. Fuller
Mr. H.W. Oliver
Mr. Tan Han Thor

Use of Klompé Reading Room by GSM members

By agreement with the Department of Geology, University of Malaya, the Society's Library is housed in the Klompé Reading Room of the Department of Geology. The Society's holdings and the Department's are equally available for consultation by GSM members as well as Staff and students of the Department. In the past, GSM members have also been allowed to check out books from the Department's holdings. This practice, however, can no longer be continued, owing to heavy pressure on the Reading Room from increased student members.

GSM members may still visit and consult all the holdings of the Klompé Reading Room.

A Reminder: AGM February 12-13

Members are reminded that the Society's Annual General Meeting will be held on 13 February 1971, and a two-day discussion meeting in conjunction with the AGM will be held on the 12th and 13th.

A number of papers are promised, but there is still room for more. Deadline for sending in titles is 25 January, and abstracts must be submitted by the end of the month. Members wishing to attend the Society's dinner on 12 February and/or the planned Rawang field trip on the 14th (Sunday), should indicate so by returning the form which was sent out earlier.

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