

K E S A T U A N K A J I B U M I M A L A Y S I A

G E O L O G I C A L S O C I E T Y O F M A L A Y S I A

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GEOLOGIC NOTES

Fauna from the Foothills Formation at Tuan Estate, Karak, Pahang and its significance

C.R. Jones, University of Birmingham
(formerly with Geological Survey of West Malaysia)

The fauna from beds of bleached and cleaved shales belonging to the Foothills Formation exposed at Tuan Estate south of Karak in west Pahang (3 c/9, 134, 137) mentioned in Jones, et al. (1966) has now been the subject of more detailed study by the writer. The fossils comprise an assemblage of reticulate sponges, inarticulate brachiopods, graptolites and fragmentary crustaceous indifferently preserved as impressions in slightly metamorphosed, steeply dipping shaly strata lying between tuffs and schists. The beds occur near the top of the so-called Foothills Formation, whose stratigraphical relationships and age have long been in dispute. The discovery of this faunule by Mr Ja'afar bin Ahmad and his assistants in 1965 and their subsequent determination has greatly helped in resolving the chronological and structural problems connected with this group of strata.

The fauna includes :

Sponges:	<u>Hydrodictya cylix</u> Hall & Clarke <u>Lyrodictya?</u> sp.
Brachiopods:	<u>Orbiculoidea sinensis</u> Mansuy
Graptolites:	<u>Monograptus</u> cf. <u>praehercynicus</u> Jaeger <u>Linograptus</u> sp.
Crustaceans:	<u>Ceratiocaris</u> sp. (identified by W.D.I. Rolfe)

Age considerations:

As a result of the detailed palaeontological studies now made it is necessary to revise the provisional Lower Wenlockian age assessment of the fauna given in Jones, et al. (1966). This was based on the identification of the graptolite element as Monograptus aff. vomerinus Lapworth. The graptolites have been redetermined as above and include Monograptus cf. praehercynicus, a monograptid of the "hercynicus" type.

The study and significance of the hercynicus - type graptolite has only recently been made known through the researches

of Jaeger (1959) in his monograph "Graptolithen und Stratigraphie des jüngstens Thüringer Silurs" (Deutsch. Akad. Wissensch.). They represent the youngest graptolites to occur and are presently known from central Europe, the Yukon and Australia. They are post-Ludlow in age but agreement has not yet been reached by students of the Siluro-Devonian Boundary as to whether the strata in which they are contained should be included in the Silurian or Devonian. The associated shelly fauna in central Europe and the Yukon allows correlation with the Gedinnian and the lower part of the Siegen Stages of the Devonian, although early members of the group appear in the eB2 beds of Europe (recently termed the Skala stage). Jaeger regards the eB2 beds as basal Devonian. Monograptus praehercynicus is the zone fossil of the praehercynicus Zone of the Gedinnian in Europe. The genus Linograptus is a frequent associate of hercynicus - type monograptids but also occurs in beds of Ludlow age. Of the other members of the fauna the sponges were first described from the Devonian of New York State, Orbiculoidea sinensis occurs in beds of Upper Silurian age in Yunnan and the phyllocarid genus Geratiocaris occurs widely in rocks of Silurian and Devonian age. The evidence based on the graptolites therefore indicates that the Tuan Estate beds can be considered as early Devonian in age and the associated fauna adds support to this chronology.

The precise dating of these beds is of great importance since the true stratigraphical position and structural affinities of the Foothills Formation are now proved. As the beds occur near the top of the sequence it is apparent that much of the succession is of Lower Palaeozoic age and equivalent, in part at least, to the Silurian rocks found on the west side of the Main Range granite. The sequence is seen to form an integral part of the geosynclinal pattern of deposition which occurred over the western half of the Malay Peninsula in Lower Palaeozoic times. The several theories of early geologists, notably those of Richardson (1946), which attempted to explain the irregularities and inconsistencies of the Foothills rocks when examined in the light of correlation based on comparative lithology are now satisfactory reconciled.

References: Berry, W.B.N., 1965. Description and age significance of M. hercynicus - type Monograptids from Eildon, Victoria. Proc. Roy. Soc. Victoria, Vol. 78, pt. 1, p. 1 - 14.

Jaeger, H., 1959. Graptolithen und Stratigraphie des jüngstens Thüringer Silurs. Abh. Deutsch. Akad. Wissensch. Berlin, K1. Chem. Geol. Biol., no. 2, p. 1 - 197

Jones, C.R., et al., 1966. Summary of fossil record in Malaya and Singapore 1900-1965. Geol. and Paleont. Southeast Asia, Vol. II, p. 309-359

Richardson, J.A., 1946. The stratigraphy and structure of the Arenaceous Formation of the Main Range Foothills, F.M.S. Geol. Mag., Vol. 83, no. 5, p. 217-229

Oceanography in East Malaysia

G.E. Wilford, Geological Survey of East Malaysia

"The present is the key to the past" is particularly relevant in the context of the geological history of East Malaysia where, throughout much of Tertiary and Quaternary time and despite an energetic, and at times almost cataclysmic history, climate, fauna and flora have remained essentially equatorial as today.

Sea-bed sampling off the northwest Borneo coast was begun in 1955 by the Shell Group of oil companies (Jackson, 1963) as a part of the preliminary engineering work prior to finding sites where fixed drilling platforms could be located. Oceanographic research (sensu stricto) started in 1962 when 3 survey geologists participated in a voyage from Jesselton to Singapore in the "Argo", a Scripps Research Vessel (Haile, 1963), and continued in 1963 with a 3-week programme of work in the South China Sea on H.M.S. Dampier, a Royal Navy Ship (Haile, et al., 1964). Planktonic foraminifers in the sea bed samples have been studied by Keij (1964) and work on the mineralogy of seabed samples collected during the Dampier Cruise was completed at Reading University by Pimm (1965). Preliminary work on the sedimentation at the mouth of the Baram Delta has been recorded by Lallanne de Haut (1966) and studies on the foraminifers from the same area are shortly to be published.

Studies of the present day distribution, dispersal and preservation of pollen were started over a decade ago by the Shell group of oil companies, and are continuing. The results, when applied to the fossil record, not only enable rocks poor in other fossils to be dated, but give information on the depositional environment, depth of deposition, and proximity to shoreline. The evolution of mangrove vegetation from Eocene to the present day has been outlined (Muller, 1964) and further studies have shown that the montane flora during mid-Tertiary time was different from that existing at present and indicating (to some botanists) the presence of land bridges extending from the Southeast Asian mainland (Muller, 1966).

Oceanographic work was continued in 1967 by D.S. Dhillon, research student at the Geology Department, University of Malaya, as part of a continuing programme of co-operation with the Geological Survey, East Malaysia. He sampled the estuaries of the Lupar in Sarawak and the Labuk on the East Coast of Sabah, the main object being to study the distribution of brackish water Foraminifera.

References:

Haile, N.S., A.J. Keij, and A.C. Pimm (1964). Oceanographic Cruise of H.M.S. Dampier. Borneo Region Malaysia Geol. Survey Ann. Rept. for 1963, p. 119-145

Jackson, A. (1963). Sea-bed sampling off northwest Borneo. Brit. Borneo Geol. Survey Ann. Rept. for 1962, p. 51-55

Keij, A.J. (1964). The relative abundance of recent planktonic Foraminifera in seabed samples collected offshore Brunei and Sabah. Borneo Region Malaysia Geol. Survey Ann. Rept. for 1963, p. 146-153

Lallanne de Haut, J.P. (1966). Depositional history of the Recent Baram Delta. Borneo Region Malaysia Geol. Survey Ann. Rept. for 1965, p. 168-172

Müller, J. (1964). A palynological contribution to the history of the mangrove vegetation in Borneo. Ancient Pacific Floras, Univ. of Hawaii Press, p. 33-42

Müller, J. (1966). Montane pollen from the Tertiary of Northwest Borneo. Blumea, Vol. 14, p. 231-235

Pimm, A.C. (1965). Seabed sediments of the South China Sea. Borneo Region Malaysia Geol. Survey Ann. Rept. for 1964, p. 122-146

COMPUTER PROGRAMME AVAILABLE

Dr C.S. Hutchison of the Geology Department, University of Malaya, in collaboration with Dr J.E. Jeacocke of the Mathematics Department, have successfully programmed for the I.B.M. 1130 computer a complete Cationic Percentage and Niggli Norm calculation. The programme is held in the computer disc and any rock analysis

can be readily converted to a norm on the University computer. For anyone interested, either Dr Hutchison or Dr Jeacocke can make available the complete programme in Fortran language, or alternately a duplicate set of I.B.M. 1130 programme cards.

- C.S.H.

ESSO GIFT TO SOCIETY

On the afternoon of 14 June Dr H.H. Hall of Esso Standard Ltd. presented the Geological Society of Malaysia with a check for M\$ 6000.00. The check was accepted on behalf of the Society by its Vice-President, Mr S.K. Chung of the Geological Survey, Ipoh.

Dr Hall indicates that the purpose of this generous gift was to enable the Society to publish geological material on Malaysia. The money has been put on fixed deposit, along with previous gifts, to constitute a 'Publications Fund'. The gift from Esso, the largest so far received by the Society raises the Fund to a level such that the appearance of a series of Bulletins is guaranteed.

CARTOGRAPHY OF METAMORPHIC BELTS

The International Union of Geological Sciences has established a new group, under the chairmanship of Professor H.J. Zwart of Aarhus University, Denmark, to prepare a world petrological map series on the scale 1:15,000,000, and for some well-investigated areas 1:2,500,000. The following are the participating members in East and South-east Asia:

Malaysia, Thailand, Indochina: Dr C.S. Hutchison, University of Malaya

Philippines: Dr Froilan C. Gervasio, Bureau of Mines, Manila

Indonesia: Prof. D. de Waard, Syracuse Univ., U.S.A.

Taiwan: Dr T.P. Yen, Geological Survey, Taipei

Japan: Prof. G. Kojima, Hiroshima Univ.; Dr Shohei Banno, Univ. of Tokyo; Dr Yotaro Seki, Saitama Univ., Urawa; Dr Mitsuo Hashimoto, National Science Museum, Tokyo.

Korea: Prof. Sang Man Lee, Seoul National University.

- C.S.H.

PROGRESS REPORT ON SOCIETY PUBLICATIONS

1. **Newsletter** : This issue marks the first anniversary of the Newsletter. Till now it has served primarily as a simple 'notice-board', but No. 7 also contains for the first time, scientific communications of 'Note' category. Full articles are more appropriately directed to the Bulletin series (see below), but for a short note announcing a discovery, or reviewing a topic, the Newsletter has the advantage of a maximum publication delay of two months.

We would still welcome more contributions from our members especially those outside the main centers such as K.L. and Ipoh. Let the membership know what you have been doing, and any interesting things you have turned up.

The Newsletter is sent free to all members and certain libraries and other institutions. Newly-joined members receive all issues starting with the January of the calendar year in which they join. Back issues are available for purchase by anyone, at the rate of M\$ 0.50 per copy.

2. **The Bulletin Series**: This series, designed to contain monograph-length works and collections of papers of article length, is now assured of substantial publication during the coming year or two. Manuscripts are in hand or in prospect sufficient for at least four Bulletins. And the healthy state of the Publications Fund ensures the financial feasibility of at least that many as well.

Bulletins planned so far:

Bulletin No. 1 : Containing the papers presented at the Discussion Meeting on 31 January 1967. Nearly ready to be sent to the printer, with whom the Society has already made tentative long-term arrangements.

Bulletin No. 2 : Annotated bibliography and index of the geology of the Malay Peninsula to 1967. Being prepared by D.J. Gobbett; probably ready for the printer in a few months.

Bulletin No. 3 : may be a companion bibliography for East Malaysia, to be prepared by members of the Geological Survey of East Malaysia.

Bulletin No. 4 : is tentatively planned to be a collection of papers on Malayan paleontology and possibly more general stratigraphy. Papers by three authors are already in prospect, and more are welcome. Hopefully to appear early in 1968.

Bulletin No. 5 : It is hoped to be able to put together a set of papers on tin mining and/or petrology of tin lodes and/or the tin-bearing alluvium. One or two manuscripts are already possibilities. More papers in these topics are especially wanted.

The Society welcomes and encourages the submission of manuscripts on any topic relevant to Malaysian geology, for publication in the Bulletin series. Especially wanted are papers in the topics already selected for Bulletins.

3. Book on 'The Geology of the Malay Peninsula (West Malaysia and Singapore)': The following contributors have undertaken to write a chapter for the book:

- Dr B.N. Koopmans (Univ. of Malaya) Ch. 2 : Geomorphology
Ch.10 : Structure
- Mr C.R. Jones (Univ. of Birmingham) Ch. 3 : Lower Palaeozoic (Mr Jones has indeed already written the basis of this chapter as a paper for the Bull. Am. Assoc. Petroleum Geologists)
- Dr D.J. Gobbett (Univ. of Malaya) Ch. 4 : Upper Palaeozoic
- Mr C.K. Burton (Chulalongkorn Univ.) Ch. 5 : Mesozoic
- Dr P.H. Stauffer (Univ. of Malaya) Ch. 6 : Tertiary and Quaternary
- Mr S.K. Chung (Geol. Survey, Ipoh) Ch. 7 : Volcanic activity
- Dr C.S. Hutchison (Univ. of Malaya) Ch. 8 : Plutonic activity
Ch. 9 : Metamorphism
- Mr D. Santokh Singh (Geol. Survey, Ipoh) Ch.11 : Economic geology

The introduction, bibliography and index will be written jointly by the editors (Chung, Gobbett, and Hutchison). For other details, see Newsletter No. 5 (March 1967)

A reminder:

As yet, there has been no response to the appeal for photographs for inclusion in the book (see Newsletter No. 5). Surely many of the Society's members must have at least one good photograph of Malaya which would suitably illustrate a geological or mining feature? We have also been unsuccessful in obtaining

a good photograph of J.B. Scrivenor. If any member can supply information regarding the whereabouts of any of Mr Scrivenor's descendents, or can suggest any means by which we could obtain a good photograph of him, the Society would be most grateful. It is the editors' intention to have a photograph of J.B. Scrivenor as the frontispiece of the book.

- C.S.H.

COMING MEETINGS OF THE SOCIETY

Next ordinary meeting, September 2nd:

It is planned to hold an ordinary meeting of the Society on the evening of Saturday, September 2nd, 1967, in the Library of the Geological Survey building, Tiger Lane, Ipoh. Arrangements for a speaker are being made, and details will be covered in a later announcement.

Field meetings:

A Field Meetings Committee has been formed with the following members:

Dr B.N. Koopmans, Univ. of Malaya (convenor)
Mr D. Santokh Singh (Geol. Survey, Ipoh)
Mr Lee Whye Kwong (c/o Univ. of Malaya)

The Committee will meet soon to draw plans for field meetings of the Society. Suggestions from members as to areas to visit, leaders for trips, or other matters may be addressed to any member of the Committee.

RECENT MEETINGS OF THE SOCIETY

Meeting of 29 March 1967.

This meeting was jointly sponsored by the GSM and the Chemical Society (Malaya Section). The meeting was held at 8.00 p.m. in Lecture Theater 1, Science Faculty, University of Malaya. The speaker was Dr Slade Warne, who spoke on: "Mineral identification by differential thermal analysis".

Mr J.H. Leow introduced the speaker, pointing out that Dr Warne, now a lecturer at Newcastle University in Australia, previously had worked in the oil industry and for the National Coal Board of Australia. He was currently returning from a 14-weeks stay in the U.S.A., where he had helped establish a DTA laboratory in the geology department of Louisiana State University

and had instructed students and staff in the use of DTA equipment.

A brief summary of Dr Warne's talk:

Thermal methods of analysis include all techniques which involve the measuring of some physical parameter as a function of temperature, usually during controlled heating of the sample. To be useful, the parameter must vary significantly and in diagnostically different ways in different substances.

Thermal methods include thermal analysis (temp. vs. time or heat content); differential thermal analysis (DTA; temp. difference between sample and inert control); thermal gravimetric analysis (change in mass vs. temp.); thermoluminescence; and many others, including first derivatives of some of those just listed.

Differential thermal analysis (DTA) is the most used and the most often useful of these methods. In it, the temperature difference is measured between the sample and an inert substance during controlled heating. The inert substance heats at a uniform rate, but if endothermic or exothermic reactions take place in the sample a temperature difference will appear during the life of the reaction, causing endothermic or exothermic peaks in the record. Common causes of such peaks include decomposition reactions, melting (both endothermic), or oxidation reactions (exothermic). Thermobalance data can help distinguish between various reactions - for instance, there will be no weight loss in melting, but would be in decomposition if gases are given off.

Important diagnostic parameters of peaks include the inflection point temperature, peak temperature, peak area, and the shape of the curve.

The basic technique of DTA is not new; it was devised by Le Chatelier in the 1880's, with the invention of the thermocouple. Modern thermograms are not basically different from Le Chatelier's, but easier to read and interpret (and much more expensive to obtain!). During the last two decades a variety of applications of DTA have been explored. Examples in mineralogy include distinguishing carbonate minerals, studying phase relations, and studying the metamorphism of coals. In the last, the maximum temperature the coal has known in its history can be determined.

Discussion: Prof. Huang and Mr Leow asked about the problems of reproducibility. Dr Warne replied that it was extremely important to standardize equipment and procedure so that results

are internally reproducible. It was virtually impossible to standardize between laboratories, but standard substances were available to calibrate one's equipment.

Mr Subramaniam asked why increasing dilution should lower the peak temperature, as Dr Warne's slides showed. Dr Warne replied that it was simply a matter of the reaction finishing sooner. The peak temperature represents the maximum rate of reaction, which occurs in the middle of the process. If the total reaction is briefer, the peak will occur sooner, and hence at a lower temperature in the heating process.

Mr Leow asked if the history of a sample had a strong effect, as it does in thermoluminescence. Dr Warne replied that it apparently did not. Only the chemistry and mineralogy of the sample are involved, and the history is irrelevant except as it might affect these.

Prof. Huang proposed a vote of thanks, and the meeting adjourned at 10.00 p.m. The audience of about twenty was rather evenly split between chemists and geologists.

Meeting of 14 June 1967:

The meeting was held at 5.15 p.m. in Lecture Room C2, Science Faculty, University of Malaya. The speaker was Dr George Riley, who spoke on:

"The cassiterite-stannite occurrence at Tekka Mines, Kinta"

Mr S.K. Chung, Vice-President of the GSM, opened the meeting by proposing a vote of thanks to Dr H.H. Hall who, on behalf of Esso Standard Ltd., had earlier in the day presented the Society with a cheque for M\$6000.00. Mr Chung then introduced the speaker, a Canadian Colombo Plan expert, now on secondment to the Geological Survey in Ipoh.

A brief summary of Dr Riley's talk:

Dr Riley's talk was based on field work at Eu Tong Seng Mine No. 1 situated in a small valley on the edge of the Main Range about 8 miles southeast of Ipoh. This was the first of a proposed series of studies on the occurrence of economic minerals in bed-rock. The present study was developed more fully than those planned for other deposits in order to obtain details about the weathering of such mineral deposits in a humid tropical climate. Detailed mapping was controlled by a 100-ft square grid over the whole mine and a 50-ft square grid over the upper part of the mine. It was found that thin sections of rocks and polished sections of minerals could

be studied with advantage by a low-power binocular microscope as well as by the conventional petrological and metallographic microscopes.

The upper part of the Eu Tong Seng Mine was opencast in highly weathered closely-jointed granite with numerous quartz veins. The granite varied in grain size, its oligoclase was sometimes replaced partly by topaz and in places where closely related to mineralized quartz veins it carried tourmaline, arsenopyrite, and cassiterite. Two sets of joint planes cut, or were cut by two complementary sets of quartz veins. Some of the latter carried cassiterite, metallic sulfides, and tourmaline.

The centre of the mine exposed the Tekka Clay, a red, probably kaolinitic clay with highly contorted fine (grey and white) laminae, some of which are rich in black tourmaline, white mica, and fluorite. The contact of the granite and the Tekka Clay is a narrow complex zone in which relationships are unclear.

The quartz veins were of six types as follows:

1. Quartz with wolframite + arsenopyrite
2. Quartz with arsenopyrite and stannite + wolframite
3. Quartz with arsenopyrite and cassiterite + stannite
4. Quartz with tourmaline and arsenopyrite
5. Quartz with tourmaline
6. Quartz only

Topaz and white mica occurred in all types except the last. Some sequence of intrusion of the various vein types was worked out. Quartz mineralization must have been of long duration.

Quartz swells along the intersections of joint planes and quartz veins were also mineralised. Secondary varlamoffite replaced stannite only.

The paragenesis of this mineral deposit was obscure. Dr Riley concluded that the veins were of the 'loaded' or 'telescoped' type and the deposit was xenothermal, having rapidly cooled from a high temperature.

Discussion: Dr Lambert asked if primary tin was present in the granite. Dr Riley replied that where the granite was silicified some tin might be secondary. So-called primary tin in granite may be due to assimilation of detrital cassiterite from sediments now granitized. This was advanced as a hypothesis for consideration.

Dr Hutchison suggested that the presence of topaz in quartz veins did not necessarily indicate cassiterite. In the Langkawi Islands, topaz was abundant yet no cassiterite had been discovered. Dr Riley said that in Langkawi, it may be that cassiterite lies at

deeper levels in the rock.

Mr Smith asked about geochemical soil prospecting for tin. The speaker said that the dispersal of tin was poor but concentrations of Cu, Zn, and As may indicate the presence of tin.

Mr Chung said that during the formation of a mineral deposit the presence of a gaseous phase may give the resulting deposit the appearance of being formed at a high temperature. Dr Riley replied that at the Eu Tong Seng mine there was an indication of medium and high temperature conditions but no indication of high pressure.

The meeting adjourned at 6.50 p.m.

- D.J.G.

NEW MEMBERS

Many additional members have joined the Society since the List of Members was issued in January 1967. Recent new members are listed below, and also appear with their addresses on a separate sheet with this Newsletter. This sheet lists all current members not on the January 1967 List, and hence serves as a supplement to bring the list up to date.

New members not previously listed in the Newsletter:

Alexander, J.B.
Bryant, R.N. (A)
Coffinier, A.A.E.A.
Darling, A.G.
Eicher, D.B.
Estrada, L.R.
Piazza, P.
Pun Vun Tat
Sevillano, A.C.