

K E S A T U A N K A J I B U M I M A L A Y S I A
GEOLOGICAL SOCIETY OF MALAYSIA

NEWSLETTER

Number 24

May 1970

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GEOLOGIC NOTES

The first record of conichalcite from South-East Asia

K.F.G. Hosking and G.S. Hutchison
University of Malaya

Recently one of us (K.H.) was given a specimen of highly kaolinised, medium-grained muscovite granite which was locally stained by limonite on which 'encrustations' of a green and a blue mineral species occurred. This material had been collected from near a limestone/granite contact about 40 km south of Mae Sariang which is itself to the southwest of Cheng Mai, Thailand.

There is little of interest to report concerning the blue mineral, as it was thought to be azurite and this was confirmed by examination of its powder pattern.

The colour of the other species indicated that it was almost certainly not malachite and, therefore, deserving further study.

Under the binocular microscope this mineral was seen to occur as botryoidal crusts with a fibrous structure. The dominant colour of these crusts was grass green although bands of lighter and darker shades, which were parallel to the botryoidal surfaces, were in evidence.

Investigation of the mineral by means of the X-ray fluorescence spectrometer revealed that it contained calcium, copper and arsenic as major constituents. Iron was also detected but was thought to be due, in all probability, to contamination from the iron-rich matrix.

Subsequently a goniometer diffractogram of the substance was prepared and the data extracted from it agreed excellently with those for conichalcite, $\text{CaCu}(\text{AsO}_4)(\text{OH})$, on A.S.T.M. card 11.306. A detailed comparison of these data is given in Table 1 because the intensities reported on the card are visual estimates whilst those recorded by the writers were measured from the diffractogram and are, therefore, much more reliable.

In view of the fact that there are scores of known deposits containing copper and zinc-bearing sulphides in the vicinity of granite/limestone contacts in South-East Asia it would be most curious if conichalcite were not found in areas other than the one noted above, and also it would be most surprising if its analogue, austinite, $\text{CaZn}(\text{AsO}_4)(\text{OH})$, were not, on occasion, also present in such an environment.

It is hoped to publish further details concerning the optical and other physical properties of the Mae Sariang conichalcite in a later note.

Table 1

A comparison between the data for conichalcite recorded on A.S.T.M. card 11.306 and that produced during the present study

dA ^c		I/I ₁		hkl
This study	ASTM card 11.306	This study	ASTM card 11.306	ASTM card 11.306
5.75	5.77	22	20	110
4.91	4.921	6	10	011
4.09	4.101	20	30	111
3.91	3.905	12	10	120
3.69	3.690	20	20	200
3.43	3.424	19	20	210
3.25	3.246	8	10	121
3.119	3.118	66	90	201
2.885	2.887	26	10	220
2.840	2.842	100	100	130
2.599	2.594	40	50	112,221
2.585	-	32	-	-
2.553	2.551	32	40	131
2.464	2.466	5	10	022
2.379	2.375	15	20	310,230
2.365	-	16	-	-
2.338	2.336	7	5	122
2.309	-	4	-	-
2.289	2.282	8	10	202
2.015	2.047	12	20	222,132
1.957	1.959	7	5	240
1.844	1.845	10	10	312,113
1.827	1.828	18	20	331
1.809	1.806	12	10	042
1.715	1.714	31	30	420
1.608	1.605	33	35	332,133
1.561	1.558	12	10	402
1.527	1.525	10	10	152

There are many other weak lines above 2θ 61° Cu Kα

Note: The present data were obtained by means of a diffraction goniometer which had been calibrated against silicon.

Tin deposits and limestone

K.F.G. Hosking
University of Malaya

In the South-East-Asian tin province the relationships exhibited between primary tin deposits and limestone have not been much emphasized, and yet their study might contribute significantly to a better understanding of the mechanism of primary mineralization generally and of the genesis of primary tin deposits there in particular.

Briefly, the following major relationships have been demonstrated:

- i. Primary tin deposits commonly occur in granites and in non-calcareous sedimentary rocks (or non-calcareous meta-sediments) in contact with the granites.
- ii. Primary tin deposits rarely extend from granites into the limestones (or, more accurately, marbles) when these rocks are chemically essentially CaCO_3 . In these same areas, however, later sulphide and other lodes occur in the limestone, and even in their absence the limestone may be locally strongly sheared. These phenomena are well seen in the Melor Syndicate Mines and in some of the mines of Salak South (both near Kuala Lumpur, West Malaysia).
- iii. Originally 'dirty' limestones adjacent to the granites may be converted by the heat, etc., of the invading magma into calc-silicate hornfelses and these may contain malayaite, $\text{CaO SnO}_2 \text{SiO}_2$. In addition, they may have been further mineralised during a later hydrothermal stage and as a result of this contain cassiterite, deposited directly or, as a result of the decomposition of the malayaite, together with a variety of sulphides, such as arsenopyrite, chalcopyrite, galena, etc. Typical examples occur at Pinyok (Thailand) and at Sungei Gow (Malaysia).
- iv. Occasionally cassiterite-bearing veins may follow the limestone contact, as at the Melor Syndicate Mine (near Kuala Lumpur), and whilst these may contain scheelite, indicating a degree of chemical participation by the limestone during the formation of the bodies, it is the granite, in the writer's experience, which is preferentially fractured and replaced.
- v. Occasionally, cassiterite-bearing pipes and veins may occur in the limestone and 20 to 30 of the former have been recorded in the Kinta area of West Malaysia. Generally these do not contain calc-silicates, although the most important one (economically speaking), the Beatrice pipe, did contain a considerable quantity of tremolite. In addition, shear zones containing cassiterite, arsenopyrite and other sulphides, plus calc-silicates, may occur in the

limestones. A typical example is seen at Leong's mine at Tambun, near Ipoh, West Malaysia.

How can one account for these phenomena? In both West Malaysia and Thailand granite has been emplaced on a number of occasions which are separated by considerable periods of time. In West Malaysia, the granites with which tin deposits are associated at Pahang Consolidated Mine are of Upper Carboniferous age, whilst much of the Main Range granite, which is locally rich in tin deposits, is of Triassic age. These granites are mesozone synorogenic granites as is indicated, particularly, by the very limited amount of thermal metamorphism which they have effected. In addition, a few isolated granitic cusps, not only that of Mount Ophir, have been assigned an Upper Cretaceous - Tertiary age, and these, in the writer's view, are probably epizone, post-orogenic granites. Little mineralization has, to date, been found closely spatially related to these.

The mesozone granites were probably emplaced at c. 8-10 km below the surface, and during the following stages of fracture-development and mineralization it is easy to believe that the heavily loaded limestones, unlike the other lithologic units, would behave as plastic bodies and that forces capable of fracturing the granites, etc., would simply cause these carbonate rocks to deform by movement along crystal glide planes, etc.

However, when, as a result of the limestone being impure, a brittle calc-silicate hornfels was developed, a situation was created in which open fractures could develop and hydrothermal mineralization could take place. Due to differences in the coefficients of thermal contraction of the granite and the limestone it is easy to see that even with slight cooling adequate passageways for tenuous ore-forming agents might occur along the contacts of these rocks and so permit lodes to develop there.

In due course, removal of the superincumbent load on the limestones by weathering, plus a general decrease in the local crustal temperature as a result of the cooling of the granites, would cause the limestones to behave as brittle bodies when subject to stress and so to fracture, thus permitting 'late' mesothermal deposits to develop in them. It may be that those calc-silicate-free stanniferous pipes and lodes which appear to be most strongly represented in the Kinta Valley limestone (see Ingham & Bradford, 1960, pp. 128-129), although genetically related to the mesozone granites, originated comparatively late and developed in the carbonate rocks for the same reasons as the mesothermal deposits, noted above, developed in them. This solution, however, is not a satisfactory one when applied to those tin-bearing pipes, etc.,

which contain calc-silicates. Could it be that these, at least, are genetically related to small and late epizone granitic cusps? Under such circumstances the limestone, being comparatively lightly loaded and subject to comparatively modest heating, would always be prone to fracture. The problem is, how does one test this hypothesis? Possibly a study of the trace element content of the cassiterites might help as the results might suggest that the cassiterite of the calc-silicate pipes, at least, had a different parentage from that in veins, etc., confined to the granites and the schists.

Reference: Ingham, F.T., & Bradford, E.F., 1960. The geology and mineral resources of the Kinta Valley, Perak. District Memoir No. 9, Geol. Survey Fed. of Malaya

DISCUSSION MEETING IN KUCHING, SARAWAK: July 27-31

Preparations are going ahead for the Society's discussion meeting in Kuching. It will be the first meeting of the Society ever held in East Malaysia, and we are confident it will be a very successful one.

Plans are to have two days (July 27-28) of indoor sessions, including presented papers and discussions, centered on the general topic of the meeting - "Geology of the Sunda Shelf and its environs." This is a timely subject for discussion, in view of the increased interest in both petroleum and mining possibilities of the area. It is hoped that Kuching can become for those few days the meeting ground of geologists whose work concerns all the countries which share the Sunda Shelf.

All persons with relevant information or ideas to present are urged to give papers at these sessions. The Society is in addition inviting papers from geologists known to be working in the Sunda region (some of whom are not GSM members). Suggestions of other possible speakers will be welcomed.

Following the discussion sessions, three days (July 29-31) are given to field trips. Kuching is ideally situated for examining the stratigraphy of Sarawak, especially the pre-Tertiary of West Sarawak, portions of which surely occur beneath the South China Sea as well.

Because of the large expense involved in travelling from West Malaysia (where most of our members are) to Kuching, the Society plans to arrange special air transport between Singapore and Kuching for the convenience of members (members wishing to avail themselves of this must find their own way to Singapore). This Society air transport will either be partly or wholly subsidised, depending on how much support for the cost is provided by outside donors, now being solicited.

Planning for the meeting is being done by a committee appointed by Council. Dr. B.K. Tan of the Geology Department,

University of Malaya, is chairman of the committee. Because of the large amount of work which needs to be done before the meeting in preparation, members are urged to fill out and return (to Dr. Tan) the form attached with this Newsletter as soon as possible and in any case by June 25th. Those persons who wish to give papers are urged to send abstracts as soon as possible to Dr. Tan (deadline for abstracts is July 15th).

We hope that many members will be able to attend what promises to be an important and interesting meeting.

RECENT MEETINGS OF THE SOCIETY

January 29, 1970: Dr. W.R. Dearman

(No report of this meeting was ready for the March issue of the Newsletter, and so the report has been included here in the May issue)

Dr. W.R. Dearman, of the University of Durham, England, and External Examiner in Applied Geology for the University of Malaya, addressed a meeting of the Society at 8:00 p.m. on the evening of January 29th, in the Geology Department Lecture Room at the University of Malaya. Dr. Dearman's talk was entitled -

"The other occurrence of Malayaite"

A synopsis follows.

During a field excursion connected with a geological congress in U.K. in 1948, two geologists found a yellowish mineral coating joint planes at Red-a-ven on the north side of the Dartmoor granite in Cornwall. The mineral was thought to be sphene, but was found to contain tin and hence became referred to as tin-sphene. By 1956 the same material had been found in Malaya and named "malayaite". Though the mineral is the same, the mode of occurrence in Malaya and Cornwall is quite different.

In the late 1950's a graduate student working under Dr. Dearman made a geochemical study of the rocks at the Dartmoor site and found that tin occurred in a number of different minerals there.

The speaker then gave a brief description of the geology of Southwest England and a more detailed account of the area just north of the Dartmoor granite. At Meldon, just north of the granite, malayaite was found. Tin was recorded and it was thought that it occurred as cassiterite.

The speaker then discussed the effects of contact metamorphism and metasomatism in the surrounding rocks. In the early stages joints were mineralized but not with metallic minerals. With more advanced alteration the veins were broader, until the rock was completely altered. Black cherts, tuffs,

and limestones were all converted to rocks bearing grossularite, wollastonite, and sometimes axinite. Though the original rocks were different, the resulting rocks are all the same; thus it is difficult to tell whether the calc-silicate hornfels is a result of metamorphism of cherts or limestones.

Tin was introduced into the rocks during the metasomatism. The higher the degree of metasomatism the higher is the percentage of tin in the reaction zones. Thus with decreasing distance from the granite the content of tin increases.

Malayaite in Southwest England has so far been found only at the northern end of the Dartmoor granite, though similar rocks and rock associations occur elsewhere in Cornwall. In Dartmoore within and outside the granite are found Sn-rich, Cu-rich, and Pb-Zn-rich areas.

Wrench faults in Cornwall are mostly of Tertiary age. Most of them are dextral faults and individual displacements are up to 8 miles. Some of the faults are still active.

Discussion: Discussion centered on comparisons between the Malayan and Cornwall occurrences. The speaker pointed out that malayaite and cassiterite do not occur together. The malayaite is the product of metamorphism of impure calcareous rocks, and the relative purity of Malayan limestones may explain the fact that the mineral is so much less common here than cassiterite, in spite of the abundance of calcareous rocks in contact with granites.

In response to a question by C.S. Hutchison, the speaker said that the tin in the garnets in Cornwall appeared to occur as minute crystals of malayaite.

J.H. Leow pointed out that in Malaya the malayaite seems to come out during early mineralization stages whereas the cassiterite comes out at a later stage.

After a vote of thanks for the speaker's most interesting talk, the meeting adjourned. Forty three members attended.

- SPS

April 3, 1970: Mr. Al Rashid bin Mohammad Ibrahim &
Mr. Law Wei Min

At 5:15 p.m. on April 3, 1970, a meeting of the Society in the Department of Geology, University of Malaya, heard two short talks:

"Archeology of the Bujang Valley" by Mr. Al Rashid bin Moh'd Ibrahim of Muzium Negara, and

"Geology and soil formation" by Mr. Law Wei Min of
Soil Survey, Ministry of Agriculture

The meeting, held during the University's vacation, was rather sparsely attended, and regretfully we have no report on the two talks, which were said to be interesting.

COMING MEETINGS OF THE SOCIETY

June 9: Dr. T.P. Thayer

Dr. Thayer, of the U.S. Geological Survey, is a world authority on ultrabasic rocks, especially the podiform chrome deposits. He is visiting Malaysia partly to examine the ultrabasic rocks of the Darvel Bay area of Sabah. During his brief stay in Kuala Lumpur, Dr. Thayer has agreed to address the Society on the evening of June 9th. The meeting will be held at 8:00 p.m. in the Geology Department of the University of Malaya. Dr. Thayer's topic will be :

"Petrology of peridotites and related rocks"

July 22nd: Mr. R.E. Stanton

Mr. Stanton was formerly Reader in Applied Geochemistry at Imperial College of Science and Technology in London, and is now with industry. He is the author of a standard reference work in applied geochemistry. Mr. Stanton has consented to address the Society during a very brief visit to Kuala Lumpur arranged by the Analytical Laboratories, Singapore. The meeting will be held at 8:00 p.m. in the Geology Department of the University of Malaya. Mr. Stanton's topic will be :

"The colorimetric determination of molybdenum and tungsten"

July 27-31: Discussion meeting in Kuching

Plans for this meeting are outlined elsewhere in this Newsletter, and a form for those who wish to participate is attached.

November or December: Discussion meeting in Ipoh

The Society, with the cooperation of the Geological Survey of Malaysia, plans to repeat the Ipoh discussion meeting which was such a success last year. The exact date of the meeting will be fixed to coincide with the end of the Survey's annual week-long conference. The Council has decided that there will be two discussion sessions this year, centered on the topics:

1. "Plutonic and volcanic rocks of Malaysia (East and West)"

2. "Mineral deposits closely associated with
plutonic or volcanic rocks in Malaysia"

More detailed plans will be announced later. All those who would like to contribute to this meeting are invited to do so. If you wish to present a paper, or if you can suggest someone else who could give a paper, the Secretary would appreciate hearing from you.

A CORRECTION

In the March issue of the Newsletter was a list of the GSM Library holdings. Through an inadvertant error, one of the most important items was omitted. It is now listed here, with an apology for the earlier omission.

Kobayashi, Teiichi (editor). Geology and Palaeontology
of Southeast Asia. University of Tokyo Press.
Current holdings: Volumes 5, 6, 7 (1968-69)

DISTRIBUTION OF BULLETIN 3

The Secretary/Treasurer reports that the Society's Bulletin No. 3 ("Papers in geomorphology and stratigraphy, with bibliography supplement", 146 p., 6 plates, numerous photographs and drawings) has been dispatched to all financial members of the Society.

As members have been previously informed, the Council decided last year to withhold issue of new publications to unfinancial members. This policy has been only loosely applied in the case of the Newsletter but will be rigorously enforced in the case of the Bulletins.

Unfinancial members (approximately 120 in number!) are therefore requested to forward their dues to the Secretary/Treasurer, whereupon Bulletin 3 will be immediately sent to them.

NEW MEMBERS

The following persons have joined the Society, and their class of membership was approved by the Council at its meeting on May 29th. A = Associate member; others are Full members.

Mr. Peter F. Burgess, Forest Research Institute, Kepong, Selangor (A)

Mr. Robert Campourcy, Schlumberger Overseas S.A., 6th floor, MSA Building, 77 Robinson Road, Singapore 1

Mr. Brian E. Cornish, 25 Pentara Road, Bayview, NSW, 2104 Australia

Dr. Franco Di Cesare, c/o AGIP Indonesia Branch, P.O. Box 339, Djakarta, Indonesia

Mr. J.J.H. Evans, c/o EMMCO, Bukit Besi Mine, Dungun, Trengganu

Mr. Gan Kim Shin, c/o Johore Mining & Stevedoring Co., Sdn. Bhd., P.O. Box 102, Pengerang, Johore

Mr. Jacques Gueneau, Exploration Group, BSP, Seria, Brunei

Mr. Dennis I. Holliss, 37 Jalan Tupai, Singapore 10

Dr. Ken W.B. Iten, P.O. Box 247 MCC, Hakati, Rizal, Philippines

Mr. Lee Mun-Kit, 11 Lahat Road, Menglembu, Perak

Dr. Lester R. Loudon, c/o Dresser Magcobar, P.O. Box 6504, Houston, Texas, U.S.A.

Mr. Albert L. Richardson, 6108 South Lakeview St., Littleton, Colorado, U.S.A.

Mr. Wilford L. Stapp, 904 Milam Building, San Antonio, Texas 78205 U.S.A.

Mr. Wong Yoke Fah, Vallentine Dunne & Co., P.O. Box 242, Kuala Lumpur

In addition, Mr. Choy Kam Wai has been transferred at his request from student membership to full membership.

It is hoped to have the new list of members, which normally is issued at the beginning of each year, ready soon.

CHANGES OF ADDRESS

The following members have changed their addresses as indicated below:

Mr. J.O. Carter - to Gulf Oil Corporation, P.O. Box 1166, Pittsburgh, Pennsylvania, 15230 U.S.A.

Mr. J.R. Fletcher - from Associated Mines, K.L., to Quaker Lodge, Melverton, Taunton, Somerset, U.K.

Mr. G. Jacobson - from Kota Kinabalu to 27 Norman Street, Deakin, ACT, Australia

Mrs. M. Long - from University of Tasmania, Hobart, to the Analytical Laboratories, 17 Jalan Lembah Kallang, Singapore 17

Mr. L.P. Masion - from Jalan Venning, K.L., to Mauritsweg 176, Dordrecht, Holland

Mr. W. Reynolds - retired from Associated Mines to 158 Cheriton High Street, Cheriton, Folkestone, Kent, U.K.

Dr. M. Ridd - from Bangkok to BP Development Ltd., Crosby House, Robinson Road, P.O. Box 2814, Singapore 1

Mr. R.D. Stewart - from Buenos Aires to Union International Oil Division, Union Oil Center, P.O. Box 7600, Los Angeles, California, U.S.A.

EXPLOSIVE VOLCANISM

"We can say that the first cause of explosive volcanism is the sudden release of pressure. There is always pressure present in the earth's layer. When there is a fissure in the rock the sudden release of the pressure will cause and explosive action to take place. Say we take a plastic bag and fill it with water. After tying it up we jump on it. The sudden release of the pressure of the water will force the plastic bag to burst and water will spurt out. Here the pressure placed on it is more but we can roughly get the idea."

- a First Year geology student

JOLLY GEES

'Jolly gees? Why, they're yon fellows who hammer little bits off the hills and then fancy they can tell the Lord Himself how the earth was made,' Morag replied.

'Geologists!' I exclaimed. She nodded.

(This definition of geologists by a woman of the Inner Hebrides is from p. 112 of Lillian Beckwith's "The hills is lonely", Hutchinson, London, 1959. It has been brought to our attention by Prof. K.F.G. Hosking)

** Addendum to the geological note "Tin deposits and limestone" by K.F.G. Hosking, which appears earlier in the Newsletter.

The following paragraph should immediately precede the references:

Finally, as the tin-bearing bodies in the limestone are now abundant in the Kinta Valley, where the most intensive tin mineralisation of the metallogenetic province occurred, it may be that there the forces were of such magnitude and duration that locally the 'deepseated' limestone behaved as a brittle body and fractured. If this were so then, the stanniferous bodies in question would have developed more or less contemporaneously with those of the other lithologic units.

DISCUSSION MEETING IN KUCHING

To help us plan this meeting, please fill out and return the form below as soon as possible if you are likely to come to Kuching. If you wish to present a paper, partake of the Society's subsidised transport, or have the Society arrange accomodation for you, you MUST notify Dr. Tan by the deadline dates given.

To: Dr. B.K. Tan, Department of Geology, University of Malaya, Kuala Lumpur, Malaysia

1. I plan to attend the GSM Discussion meeting in Kuching in late July. I wish to attend

Discussion sessions July 27-28

Field trips in Kuching area (& farther?) July 29-31

2. I would like to present a paper on an aspect of the meeting's general topic - "Geology of the Sunda Shelf and its environs". The tentative title of my paper is :

NOTE: I will send you an informative one-page (or less) Abstract by July 15th at the latest.

3. Please arrange accomodation for my party of _____ persons in Kuching for the following nights: July _____.
I wish (state number and type of rooms - double, single, etc.)

I am coming alone and am willing to share a double room.

My first preference on price range is (check one; single rooms will be slightly less than doubles):

A. M\$ 40-55 (Air Conditioned double room)

B. M\$ 25-40 (AC double)

C. M\$ 15-25 (double rooms, some AC)

D. less than M\$ 10 per person (hostels, etc.)

4. I wish to reserve _____ places on the Society's air transport Singapore-Kuching and Kuching-Singapore. I understand that I will probably have to pay a large portion of the fare myself.

Name _____ Signature _____
(please print) Address _____

Date _____ 1970 _____

RETURN THIS FORM BY JUNE 25th, 1970