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P E R S A T U A N G E O L O G I M A L A Y S I A
(Geological Society of Malaysia)

MAJLIS (COUNCIL) 1975/76

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Tujuan Persatuan Geologi Malaysia adalah untuk memajukan sains bumi, terutamanya di Malayaia dan tempat-tempat berhampiran. Sesiapa yang ingin menjadi ahli Persatuan sila dapat borang-borang daripada Setiausaha Kehormat.

The aim of the Geological Society of Malaysia is to promote the advancement of geological sciences particularly in Malaysia and nearby areas. Anyone interested in becoming a member of the Society should obtain the necessary forms from the Hon. Secretary.

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G E O L O G I C N O T E S

Pharmacosiderite and unusual samples of scorodite from
Peninsular Malaysia

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Introduction

Primarily this note serves two purposes. The first is to record the discovery of pharmacosiderite $[\text{Fe}_3(\text{AsO}_4)_2(\text{OH})_3 \cdot 5\text{H}_2\text{O}]$ at Pelepah Kanan tin mine (Johore), earlier this year, and at Sungei Besi mine (Selangor) in 1970. As far as the writers are aware this species has not hitherto been recorded from Peninsular Malaysia. The second is to record and describe some unusual scorodites that were collected from Sungei Besi mine a few years ago.

Pharmacosiderite

At bench number F of Pelepah Kanan mine a thin detached plate was found consisting of a mass of crystals whose emerald-green colour and habit immediately indicated that they were pharmacosiderite: these encrust an aggregate of fractured quartz and loellingite cemented by iron oxide. Individual crystals occur as cubes replaced by a vicinal trapezohedron and so display the habit of the Cornish specimen figured by Palache et al. (1966, p. 996). The edge of the largest crystal is c. 1 mm.

At the mine in question loellingite is the sole primary arsenic-bearing species and so the arsenate component of the pharmacosiderite must have been derived from it by oxidation.

Whilst crusts, etc., of scorodite are not uncommon at Pelepah Kanan, the specimen of pharmacosiderite is the only one that the writers have found there during the course of several visits. Indeed, the fairly common occurrences of scorodite and the rareness of pharmacosiderite in Peninsular Malaysia, and, indeed, in other mining areas where arsenopyrite and/or loellingite have been subject

to oxidation lead, one to the conclusion that a rather special chemical environment is necessary for the development of pharmacosiderite.

X-ray diffraction data for the pharmacosiderite appear later in this note.

In the granitic eastern side of No. 2 opencast of Sungei Besi Tin Mines, Selangor, a number of highly stanniferous and originally sulphidic replacement bodies were discovered some 5 or 6 years ago, Fig. I. These bodies, which have a maximum dip-length of c. 100 ft, and had probably developed more-or-less immediately beneath an impounding marble roof, which has since been removed by denudation, are all strongly oxidised throughout.

One of these bodies, known as the Lee Gossan, provided both the pharmacosiderite and the crystalline scorodite described below.

This body originally consisted predominantly of massive quartz enclosing pockets of cassiterite and locally pyrite, arsenopyrite and pale-green fluorite. Although the quartz has protected some of the unstable minerals from oxidation a considerable proportion of the metallics has been converted to iron oxides whilst the arsenopyrite has locally broken down yielding the arsenate and some, or all, of the iron ions necessary for the generation of both pharmacosiderite and scorodite.

The pharmacosiderite present is in very small amount by comparison with that of the scorodite, and such as has been found occurs as smallish crystals of the same colour and habit as that of Pelepah Kanan. It occupies small voids in limonite in specimens that for the most part consist of scorodite and in one instance scorodite has been deposited immediately on the pharmacosiderite. Not enough pharmacosiderite was found to justify its destruction in order to obtain X-ray diffraction data relating to it.

Scorodite

In the Lee Gossan scorodite occurs, for the most part, as prismatic crystals displaying the habit figured by Dana (1932, p. 732), and reaching lengths of one cm or more. They may occur in isolation, but more usually they are found as dense aggregates on partially decomposed, cellular and blackened arsenopyrite, or within negative pseudomorphs of quartz after the sulpharsenide, or coating the walls of druses within masses of brown or orange iron oxides. In the last case the scorodite crystals sometimes display a palisade texture and on some occasions those parts of the crystal which are near the iron-

oxide support are brownish, whilst the upper portions are greenish or bluish. Possibly, therefore, these crystals are in the process of being decomposed and yielding, as one product, iron oxide. However, as brown scorodite is known (Palache et al., 1966, p. 764) the brown hue of the crystals noted above may not be due to partial decomposition. Most of the scorodite crystals collected at Sungei Besi are of a rather dull, dark-green colour, but others that are paler green or pale greenish-blue are not uncommon. In addition, on rare occasions sky-blue and violet scorodites are of rare occurrence in the mineral kingdom, and have not been recorded before from Malaysia, they are known from extra-Malaysian areas, and the fact that such coloured ones exist is noted by Palache et al (1966, pp 764-65).

It is also of interest to record that some of the scorodite is encrusted with small cubes of pyrite.

In addition, the neighbouring No. 4 Lode, that is highly oxidised, has provided some beautiful specimens of what in the field might be reasonably called colloform scorodite, but which, as will be apparent from the X-ray diffraction data provided later, is not scorodite ($\text{FeAsO}_4 \cdot 2\text{H}_2\text{O}$) but Iron (III) Arsenate Hydrate ($\text{FeAsO}_4 \cdot x\text{H}_2\text{O}$).

This colloform arsenate (fig. II) locally encrusts the walls of what were originally druses in ore-body material consisting essentially of quartz cemented by light-brown iron oxides. In addition, spherulitic masses, singly or in close association, of the arsenate occur suspended in rather dark-brown iron-oxide, that in the hand-specimen displays a rather ill-defined colloform texture, and fills most of the centre of the original druse. Whilst the wall-encrusting arsenate may well have preceeded the disposition of the dark-brown oxide noted above, it is possible that the spherulitic masses of arsenate may have developed within the oxide when it was in gel state. In the hand-specimen the colloform arsenate is seen to be composed of many thin concentric shells that vary in colour from near-white, through pale olive-green, to dark olive-green. Judging by the distribution of the variously coloured bands, and by the fact that the spherulites now consist of radially disposed crystals that do not extend from the centre to the perimeter, but are confined to a limited number of colour bands, it seems likely that the arsenate developed by the successive deposition of a number of layers of gel, each of which developed Liesegang bands, and each layer subsequently crystallised in such a way that the long axes of the resulting crystals were about normal to the surface of the parent gel layer.

Further observations on the oxidation of the Sungei Besi ore bodies

The Lee Gossan and associated ore bodies of Sungei Besi mine, have, as noted earlier, been subject to oxidation from their tops to their bottoms. Only in the more quartzose ones have the primary sulphides and sulpharsenides been locally reasonably well-preserved. In some instances, however, as in the No. 4 Lode, masses of pyritic ore are seen surrounded by completely oxidised ore. These relict sulphide masses owe their preservation sometimes to the early development of an impermeable iron oxide layer around them, and sometimes to the fact that they occur at points near the hanging wall which were roofed by a dome of locally highly-kaolinised and impermeable granite. The occurrence of these stranded sulphide masses also suggests that during the period of oxidation the water-table must have been lowered rapidly in response to the rapid down-cutting of the river along the granite/marble contact. This event was probably associated with the development of the low sea-level in Pleistocene times. Later, when the sea-level rose, and the Sungei Besi valley became infilled with sediments, and the drainage became very sluggish, the oxidised in situ ore bodies were in part covered by sediments that were locally accumulating in a reducing environment. It was at this stage that the cubes of pyrite locally investing the scorodite, and noted above, were deposited. However, examination of this pyrite/scorodite association under a binocular microscope provides the following data for which a unique answer cannot be offered. Briefly, the pyrite cubes on contact with the scorodites are generally anchored in the outer parts of the scorodite crystals and they are commonly so orientated that they (the pyrite crystals) rest on a cube edge, rather than on a face (Fig. III). Satellite pyrite crystals have grown on these anchored ones. How then can one explain these observations? One might consider the possibility of pyrite crystals being developed in a nearby reducing environment and then being transported and deposited and anchored on the scorodite crystals which were still developing in an oxidising environment. Were this the correct explanation one would expect each pyrite crystal to be resting on one of its faces, that is, in the position of maximum stability, and not, as one often observes, on an edge of a cube. To suggest that the pyrite crystals were rotated into their present position by the force of crystallisation of the scorodite does not provide a very convincing solution. So this explanation of the phenomena is not acceptable.

An alternative, and somewhat more acceptable explanation, postulates that at some time after the scorodite had complete its development, the environment, for reasons noted earlier, changed to a reducing one. Biogenically derived sulphide ions and native sulphur entered the system and reacted initially with some of the in situ ferric ions (that would need to be converted at the outset to ferrous ones) of the scorodite, thus initiating the development of pyrite by replacement. What happened to the released arsenate ions is unknown,

but some of them may have been reduced and some of the resulting arsenide ions may have been incorporated into the pyrite lattice. (If this did happen then this pyrite would be likely to be quite anisotropic even when polished by mechanical means. Unfortunately this has not yet been investigated). The further development of the pyrite crystals beyond the scorodite surface may have been effected by all the ingredients necessary for the development of the sulphide being transported to the site of pyrite deposition but in concentrations which were such that the solubility product of the sulphide was not exceeded except at the surfaces of the already established pyrite centres.

Perhaps the most important lesson to be learned from this portion of the note is that crystal development phenomena, similar to the one described above, which are quite frequently encountered in mineral deposits, are by no means well understood by most of us who are concerned with the study of ore-genesis!

X-ray diffraction data

X-ray diffraction data for pharmacosiderite from Pelepah Kanan, and for scorodite and colloform 'scorodite' from Sungei Besi Mines, were obtained by means of a Phillips X-ray generator (PW1011) with the detector coupled to a scintillation counter. X-rays were generated using a copper target, a nickel filter, a voltage of 50 KV and a current of 30 ma. A pulse-height analyser, with the following readings, was set on the scintillation counter:- EHT, 0.7KV; lower level, 260 mV; window, 1.3V; attenuation, 2. Silicon was used as an internal standard. The scan and chart rates were 0.5 degree/minute and 10 mm/minute. Each sample was run from low to high angle and then from high to low angle having first slightly tilted the slide carrying the sample smear (which was deposited from acetone).

The necessary corrections, obtained by using the CuK_α lines of silicon, and ranging from 0.01° to 0.03° of the 2θ values $^\alpha$, were made.

The 2θ values were averaged and the d-spacings were read to two places of decimals, from the appropriate charts.

The resulting d-spacings and intensities data, together with relevant d-spacings and other data from the JCPDS file, are tabulated below. It must be noted that for each mineral a number of peaks that might be expected from the d-spacings recorded in the JCPDS file were not detected: usually those that were missing have recorded intensities in the file of 10 or less.

Pharmacosiderite (Pelepah Kanan, Johore)		Pharmacosiderite JCPDS File No. 17-466		
I/I_1	d-spacing	d-spacing	I/I_1	hkl
100	7.95	7.98	100	100
35	4.63	4.60	40	111
30	4.00	3.99	30	200
50	3.26	3.25	50	211
30	2.83	2.816	50	220
15	2.65	2.653	16	300, 221
30	2.53	2.529	30	310
20	2.41	2.404	30	311
15	1.89	1.877	16	411, 330
10	1.79	1.782	20	420
5	1.60	1.594	16	500, 430
5	1.54	1.533	14	511, 333

Scorodite (Lee Gossan, Sg. Besi Mines)		Scorodite JCPDS File No. 18-645 $\text{FeAsO}_4 \cdot 2\text{H}_2\text{O}$		
I/I_1	d-spacing	d-spacing	I/I_1	hkl
65	5.62	5.65	80	111
10	5.16	5.21	5	200
25	5.03	5.05	40	020
100	4.48	4.50	100	002
30	4.11	4.11	40	211
30	3.82	3.82	40	112
10	3.34	3.35	5	221, 022
80	3.18	3.20	80	122
40	3.06	3.70	60	311
50	3.00	3.01	60	131
10	2.76	2.769	5	113
15	2.68	2.695	40	032
35	2.60	2.601	60	400
30	2.51	2.511	40	040
10	2.32	2.324	20	331
5	2.18	2.190	5	412
5	2.12	2.118	5	322
10	2.01	2.011	5	
5	1.95	1.954	5	
5	1.80	1.805	5	

Colloform 'Scorodite' Lode No. 4, Sg. Besi Mines		Iron (III) Arsenate Hydrate JCPDS File No. 19-603 $\text{FeAsO}_4 \cdot x\text{H}_2\text{O}$	
I/I_1	d-spacing	d-spacing	I/I_1
50	5.59	5.61	70
10	5.16	5.17	5
15	5.02	5.02	30
100	4.46	4.48	100
20	4.09	4.08	30
15	3.80	3.80	15
10	3.38	3.38	5
10	3.34	3.34	15
40	3.18	3.18	90
50	3.06	3.06	75
10	3.00	3.00	45
10	2.68	2.679	40
40	2.58	2.584	60
10	1.64	1.649	5

References

- Dana, E.S., 1932. A textbook of mineralogy (revised by W.E. Ford), 4th edn., Wiley and Sons, Inc., N. York. 851 pages
- Palache, C., Berman, H. and Frondel C., 1966. A system of Mineralogy, vol. 2 (7th edn., 5th printing), Wiley and Sons, Inc., N. York. 1124 pages

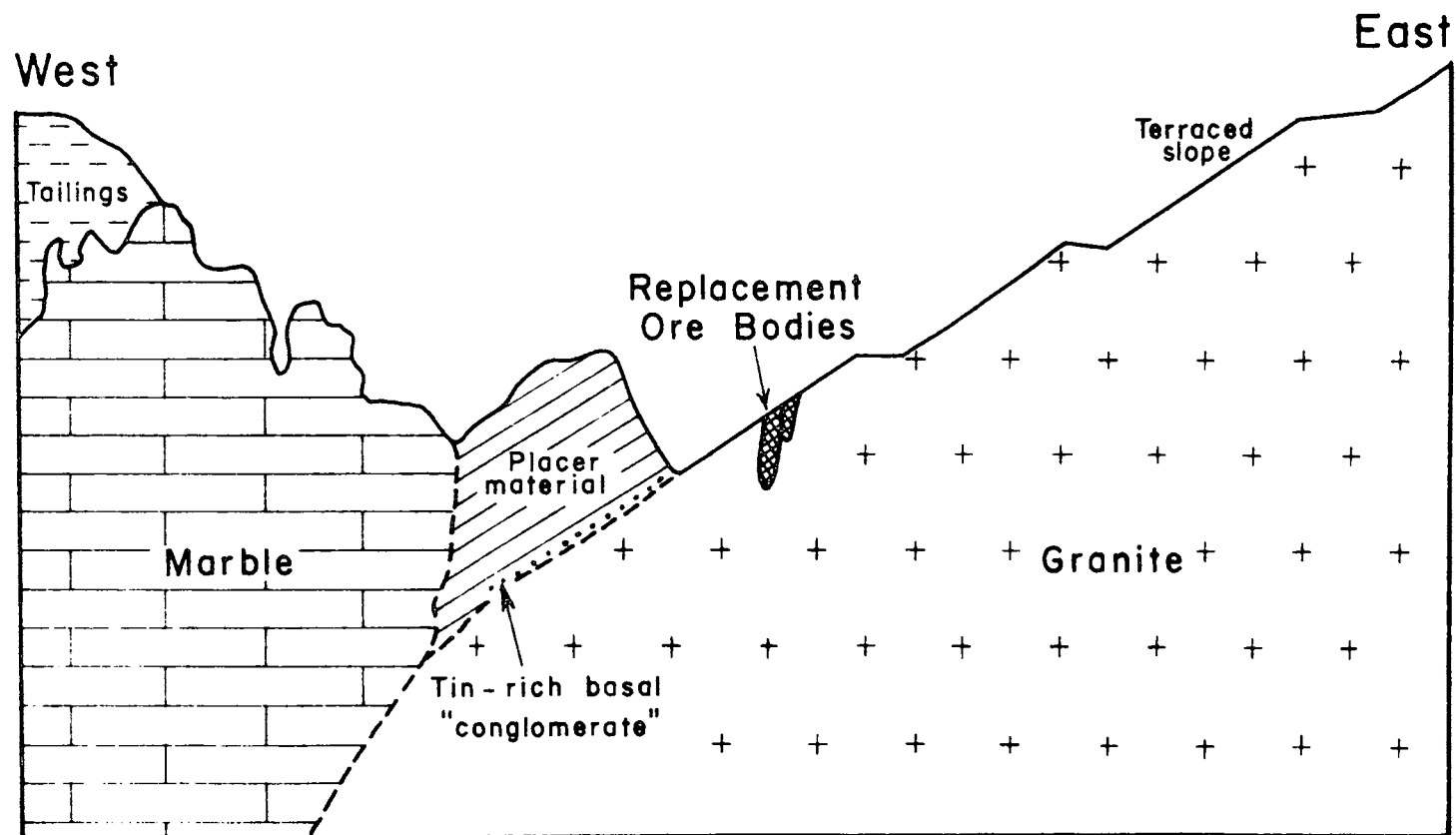


Fig. 1: Schematic section through the No. 2 opencast Sg. Besi Mines showing the approximate location of the replacement ore bodies in the granite. Looking north.

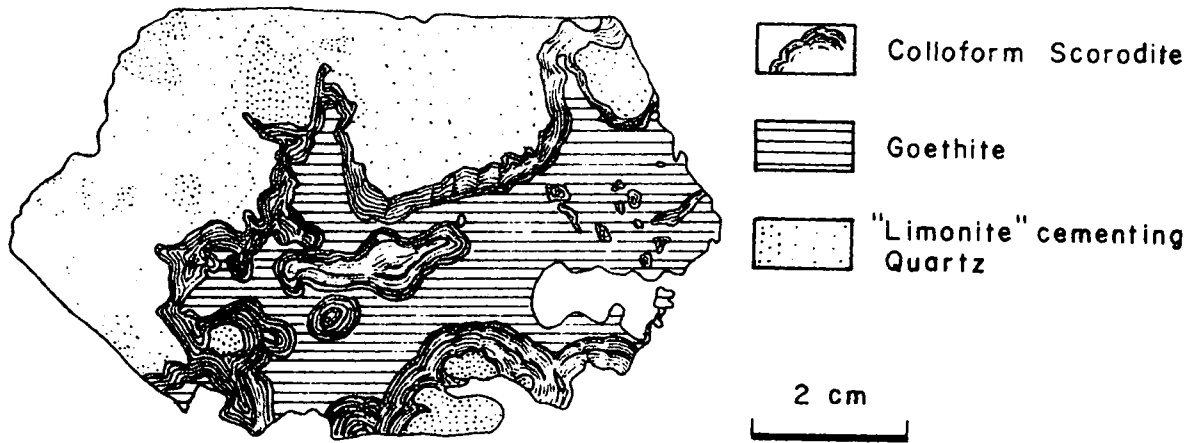


Fig. II. Colloform "scorodite" from Lode 4, No. 2 Opencast, Sungei Besi Mines. Diagram traced from a cut and polished specimen.

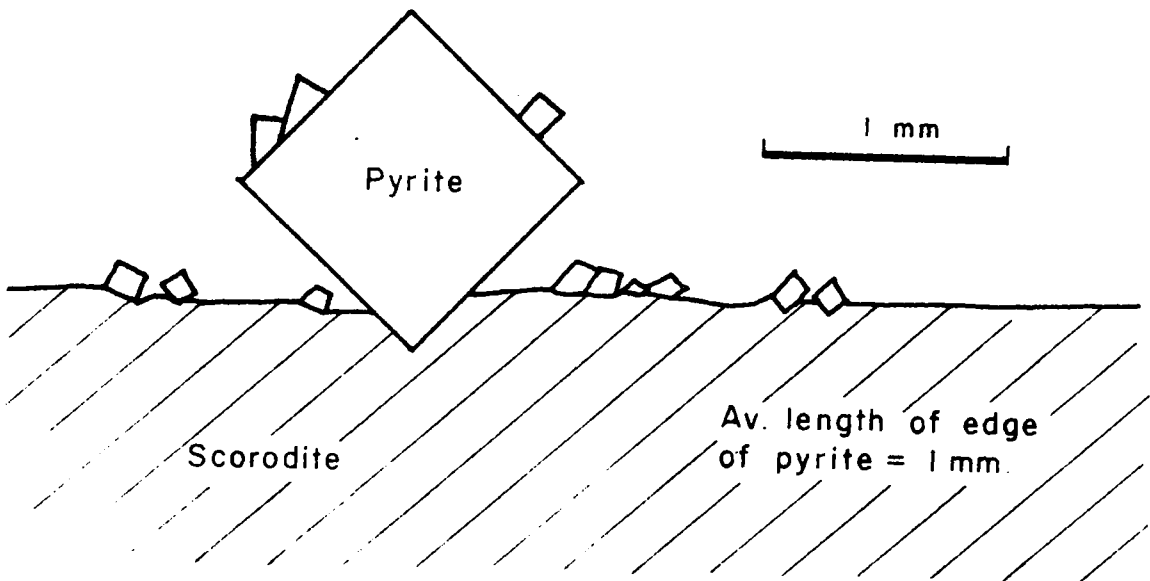


Fig. III. Diagrammatic section through a scorodite crystal from the Lee Gosan, No. 2 Opencast, Sungei Besi Mines, showing the common orientation of the larger pyrite crystals and the distribution of the minor ones.

New ages from radiolarian cherts of the Chert-Spilite Formation,
Sabah

K.M. Leong, Geological Survey of Malaysia, Sabah

A Lower Cretaceous age obtained from a radiolarian chert of the Chert-Spilite Formation indicates that the Upper Cretaceous lower age limit of the formation, at least in Eastern Sabah, should be reviewed and revised.

The age of the Chert-Spilite Formation was, on palaeontological evidence, believed to range from Upper Cretaceous to Early Eocene (Fitch, 1955), Upper Cretaceous to Eocene (Kirk, 1962) and Upper Cretaceous to probably Eocene (Leong, 1973 ms). The Upper Cretaceous ages were mainly determined from foraminiferal calcareous beds of the Chert-Spilite Formation, from various parts of the Upper Segama area, which contain several 'index' species of Globotruncana, restricted respectively to the Lower Senonian, probably the lower part of the Santonian, Turonian to Senonian and Campanian stages. Wilson (1963) in assessing all age determinations available at the time, considered that the formation is mainly Cretaceous to Palaeocene and that it extends well into the Eocene.

Radiolarians in cherts, due to subsequent alteration, are commonly not determinable, so that datings are less reliable than from foraminifera in calcareous rocks. However some success has been obtained from less altered, radiolarian cherts in the Upper Segama area (Leong 1973 ms, table 12). Thin sections of sixty-one radiolarian cherts samples from the above area were examined by G.R. Elliott, who obtained the following results:- Mesozoic, probably Cretaceous (from 16 samples); Upper Cretaceous (12); probably Upper Cretaceous (4); Upper Cretaceous-?Tertiary (1); Cretaceous or later (1); Cretaceous-Eocene level (2); Eocene (2); no age determination (23).

Nine samples of the above, better preserved radiolarian cherts were recently examined by W.R. Riedel and colleagues, who isolated the radiolarians by treating the chert samples (each about 3 cu. inches in size) with HF acid and determined the species from 'whole' specimens. More precise datings from recognizable species or genera of radiolarians from three samples were obtained by this method (see Table 1). The Lower Cretaceous age (Valanginian to

Barremian) for the chert sample J7250 is highly significant as this is the first definite Lower Cretaceous age for the Chert-Spilite Formation in Sabah. The lower age limit for the formation, i.e. Upper Cretaceous, would now seem to require review and revision.

The precise and narrow range of age assignments now possible, as a result of recent advances in Mesozoic radiolarian stratigraphy, show that the better preserved radiolarian cherts of the Chert-Spilite Formation should be systematically collected from various parts of Sabah for the radiolarians to be extracted and examined 'whole', so that, considered together with the ages indicated from foraminifera and other fossil assemblages, the time-stratigraphic position of the Chert-Spilite Formation could be better defined.

Acknowledgements:

The determination of radiolarians from thin sections of chert samples from the Upper Segama area during 1970-71 and from other parts of Sabah over the last 15 years by G.R. Elliott (British Museum, London) is gratefully acknowledged. I thank W.R. Riedel, Annika Sanfilippo and Jean Westberg (Scripps Institution of Oceanography, La Jolla, California) for extracting and determining the radiolarians from the selected chert samples. This note is published with the permission of the Director-General, Geological Survey of Malaysia.

References:

- Fitch, F.H., 1955. The Geology and Mineral Resources of the Segama Valley and Darvel Bay Area, Colony of North Borneo. Brit. Borneo Geol. Survey Mem. 4
- Kirk, H.J.C., 1962. The Geology and Mineral Resources of the Semporna Peninsula, North Borneo. Brit. Borneo Geol. Survey Mem. 14
- Leong, K.M., 1973 ms. The Geology and Mineral Resources of the Upper Segama Valley and Darvel Bay Area, Sabah Geol. Survey Malaysia Mem. 4 (Revised), in press
- Wilson, R.A.M., 1963. The Chert-Spilite Formation of North Borneo Brit. Borneo Geol. Survey Bull. 4, p. 61-78

TABLE 1. Radiolarian assemblage in selected chert samples, Upper Segama area, Eastern Sabah

SAMPLE NUMBER	RADIOLARIAN ASSEMBLAGE AND AGE	
	Determination by G.F. Elliot from thin sections of chert sample	Determination by W.R. Riedel and A. Sanfilippo from 'whole', isolated and three-dimensional specimens of radiolarian
J7250	<p><u>Adelocyrthis</u> sp., <u>Cenosphaera</u> sp., <u>Dicolocapsa</u> sp., <u>Diplactura</u> sp., <u>Holocryptocapsa</u> sp., <u>Meyenella meyeri</u>, <u>Rhodosphaera</u> sp., <u>Tricolocapsa</u> sp.</p> <p>Upper Cretaceous</p>	<p><u>Staurosphaera septemporata</u>, <u>Sphaerostylus lanceola</u>, and probably <u>Dictyomitra boesii</u> and <u>Acaeniotyle umbilicata</u>.</p> <p><u>Eucyrtis tenuis</u> Zone or <u>Sethocapsa trachyostraca</u> Zone (Valanginian to Barremian, Lower Cretaceous)</p>
J7985	<p><u>Cenosphaera</u> sp., <u>Dictyomitra</u> sp., <u>Melitosphaera</u> sp., <u>Meyenella meyeri</u>, <u>Meyenella</u> sp., <u>Theocyrtis</u> sp., <u>Xiphostylus</u> sp.</p> <p>Upper Cretaceous</p>	<p>Many fragments of <u>Saturnalis</u> spp. and other radiolarians but no species that can be recognized</p> <p>Apparently Upper Cretaceous</p>
J7989	<p><u>Cenosphaera</u> sp., <u>Cyrtocapsa</u> sp., <u>Dicolocapsa</u> sp., <u>Dictyomitra</u> sp., <u>Melitosphaera</u> sp., <u>Meyenella meyeri</u>.</p> <p>Upper Cretaceous</p>	<p><u>Saturnalis</u> spp. <u>Artostrobium urna</u>, and <u>Dictyomitra duodecimcostata</u></p> <p><u>Artostrobium urna</u> Zone (Coniacian to Maestrichtian, Upper Cretaceous)</p>
<p>Note: G.F. Elliott remarked that the samples indicated as Upper Cretaceous contain radiolarians which range from Cretaceous to Recent, but no genera exclusively Tertiary has been recognized.</p>		

M E E T I N G O F T H E S O C I E T Y

On 31 October, Mr L.B. Williams, Jr., Geological Manager of Exxon Production Malaysia Inc. gave a talk to the Society entitled

"Fundamentals of Petroleum Exploration and Production".

About 60 members attended the talk which was very informative and well illustrated.

The talk was the first of a series of talks on petroleum geology which Exxon Production Malaysia will be giving to the Society. These talks will be particularly of interest to our numerous student members and also to members who wish to know what petroleum geology is all about.

The dates and titles of subsequent talks have not been finalized but circulars will be sent to members informing them of any forthcoming talks.

N E W S O F T H E S O C I E T Y

Resignation of the Hon. Secretary

Our Hon. Secretary, Mr S.S. Almashoor, resigned in early September. He has gone to Pennsylvania State University, U.S.A. to continue his post-graduate studies. He has spent a lot of his time for the benefit of the Society even though he has served as Hon. Secretary for only a few months. The Council accepted his resignation and is grateful for his services.

Cooption of new Hon. Secretary

Mr Krishnan Dharmarajan was coopted to fill the vacant Hon. Secretary post. He is a tutor in Jabatan Geologi, Universiti Malaya, Kuala Lumpur.

Technical Committee on Rocks and Clays, SIM

The Council has appointed Mr Yeow Yew Heng of Exxon Production Malaysia to be the Society's representative in the above-mentioned committee. The Council selected Mr Yeow as he has considerable knowledge of rocks and clays of Malaysia. He has researched several years on Malaysian bauxites and clay minerals and also on tropical weathering of Malaysian rocks.

Membership

The following applicants were elected to membership:

Full members

Cathy L. Connor
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O T H E R N E W S

AGID workshop on "New Directions in Mineral Development Policies,
 Baganda, Nigeria, 8-10 September 1975

The International workshop of the Association of Geoscientists for International Development (AGID) was held in Baganda, Nigeria from the 8th to 10th September 1975. During the three days workshop, 51 participants from 23 countries of which 35 were from developing countries (16 countries) discussed essential problems facing those responsible for the orderly and beneficial development of mineral resources throughout the world. Although no organizations had any official representation at the workshop apart from AGID itself, participants were from govern-

mental, state corporation, company, university and independent consultancy sectors with a roughly proportional balance of representation between them.

AGID was formed in 1974 by a group of concerned geoscientists (geologists, geophysicists, hydrogeologists and others) to bring together a wealth of detailed knowledge concerning mineral resource development. The Association is non-governmental and non-political in nature but draws its rapidly-growing membership from over 50 countries, from every facet of the mineral industry and from those with a wide range of responsibilities. Particular concern is focussed on the socio-economic aspects of natural resource development. The current President of AGID, Dr D. Enilo Ajakaiye of Ahmadu Bello University, Nigeria, stressed in her opening remarks the need to identify the key issues facing the developing world which depends so heavily on proper mineral development to aid the economic growth, and called for a full discussion of the conference theme "New Directions in Mineral Development Policies".

The conference paid particular attention to the role of the multinational corporations which were so prominent in colonial days in the exploitation of mineral deposits in the third world. It was acknowledged that the multinationals possess a wealth of technical expertise and special access to international sources of capital and commodity markets and thus may play an important role today in assisting the developing world. It was stressed that the terms of co-operative agreements must be negotiated by equal partners, thus ensuring full protection of the interests of the developing country. Other views suggested that the long term interests of the developing world were better met without entering into arrangements with the multinationals.

Members expressed concern at the present world economic situation in which developing countries, who were natural mineral resources producers, often found themselves at a grave disadvantage in trading with the developed nations. A new world economic order may be necessary to redress the present imbalances, though much can be done to correct the present system.

The concept of state mining corporations was discussed at length and many useful comparative data were made available to show how these corporations have been established to carry out a wide range of government policies in different countries. The state corporation must operate effectively to achieve its objectives which may include the protection of the nation's economic investments, the development of its own technical expertise, and the ensuring of adequate social benefits from mineral developments.

Other problems discussed included those of educating sufficient geoscientists with the depth of knowledge necessary to ensure that informed advice reached to the highest level of national decision makers. The role of private consultants and companies in mineral development was examined and they were found to have made a useful contribution. The exhaustion of the world's mineral resources was considered and the complex interplay of technological advances on such resources was recognized as having particular importance to the developing world which looks to the industrial nations for the transfer of such technology.

The conference clearly indicated the need for all, both individuals and governments, to have a fresh look at their mineral development policies and resource management practices in the light of present world conditions with particular regard to the interests of future generations.

The conference charged the AGID Committee to proceed with plans for the next full meeting to be held in Sydney, Australia, in 1976 in conjunction with the 25th International Geological Congress.

Footnote:- Dr B.K. Tan of the Department of Geology, University of Malaya and Mr Johannas of the Ministry of Mines, Indonesia participated in the above workshop. GSM members wishing more information on the workshop or on AGID may contact either Dr Tan or Mr Johannas, both of whom are also members of AGID organising committee. Encik Redzwan bin Sumun of the Mines Department in Kuala Lumpur was scheduled to present a joint paper with Datuk Salleh bin Mohamed Majid on some aspect of Malaysian Mining Policies but Encik Redzwan was unable to be present at the workshop due to some unforeseen technical problems with his travel arrangements. The workshop proceedings would be published shortly as AGID Report No. 4. The expected publication date is April 1976.

