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GEOLOGICAL SOCIETY OF MALAYSIA

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GEOLOGIC NOTES

Association of Jamesonite with other sulphides at Chenderiang, Perak, West Malaysia

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

The occurrence of jamesonite at Chenderiang has received but scant attention to date. Ingham and Bradford (1960, p.292) note that in 1950 good specimens of jamesonite coated with yellow antimony oxide were obtained from lot 5720 at Sungei Lah, Chenderiang, overlying limestone close to a pegmatite dyke. They also record the following analysis of the sulphide which was made by W.A. Tooke:

	Percent
Pb	39.74
Sb	35.04
Fe	2.63
Bi	0.18
Zn	0.09
S	21.73
Insoluble	0.33
	99.74

Elsewhere Ingham and Bradford (op. cit., p.63) state that the pegmatite mentioned above in this note "is mainly composed of alkali felspar and quartz, and is rich in muscovite, hydromica (probably gilbertite), tourmaline, topaz, beryl, fluorite, zinnwaldite, and cassiterite, and is also associated with various metallic sulphides such as jamesonite and galena".

Jamesonite-bearing material from Chenderiang, which was kindly made available recently to one of us (K.H.) by Messrs. Osborne and Chappell, and which was originally collected (?) and long preserved by Mr Guy Ravenscroft, has enabled the writers to contribute the following additional data regarding the sulphide assemblage of this fascinating deposit.

Mineralogy and Texture

Studies of a number of polished sections of the mixed sulphide 'ore' established the presence of the following species which are recorded in order of abundance: jamesonite (> 30 percent), sphalerite, arsenopyrite, tourmaline, pyrite, cubanite, chalcopyrite, and pyrrhotite. In addition supergene covellite together with bindheimite and possibly other related

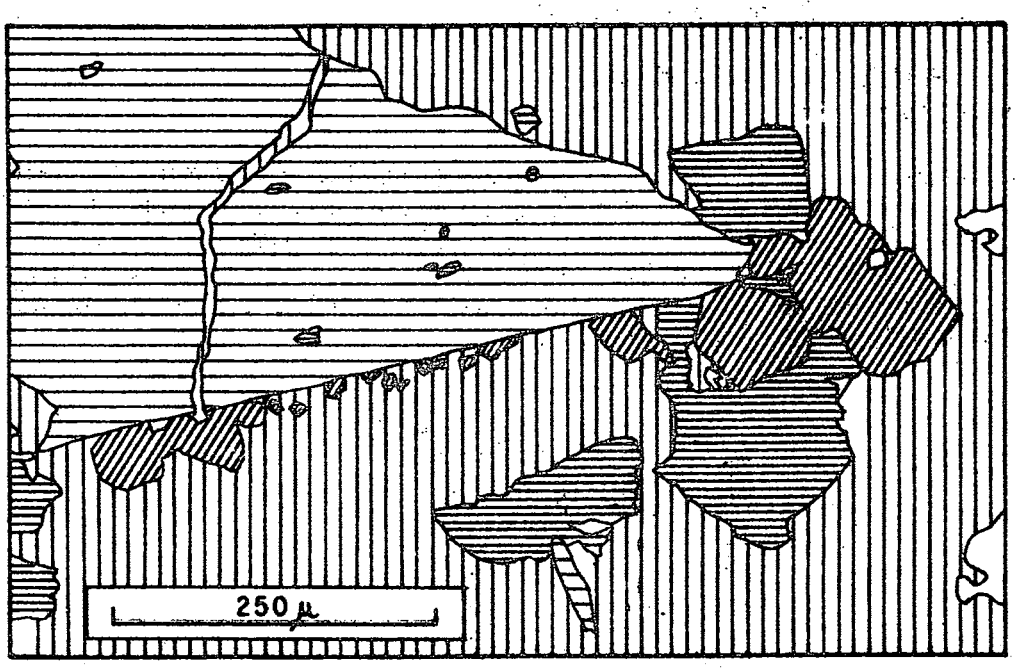


Fig. 1

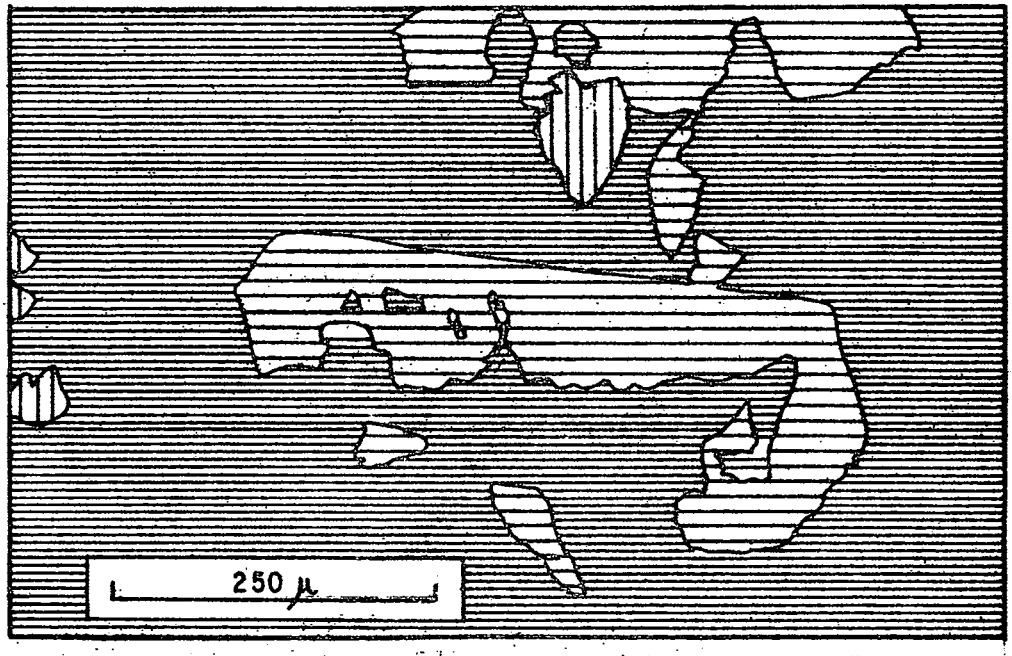


Fig. 2

'oxide' minerals, were also present. It is to be noted that quartz was absent, although in other specimens, consisting of jamesonite and bindheimite, it was the only gangue mineral present.

In polished section, tourmaline was easily recognized by its typical triangular cross-sections which in some instances were core-replaced by jamesonite. Some longitudinal sections of the mineral were partially fractured transversely, and these fractures were healed by jamesonite, which also further replaced the tourmaline along the longitudinal direction of the silicate (fig. 3). In thin section the tourmaline displayed pleochroism from colourless to such a pale blue that the phenomenon might easily be overlooked. Finer-grained tourmaline occurred as inclusions in the arsenopyrite, and was also locally replaced by the latter.

Arsenopyrite was present largely as euhedral diamond- or wedge-shaped grains and was, clearly, very susceptible to replacement by the later sulphides, particularly jamesonite, cubanite, chalcopyrite, and sphalerite (figs. 1 and 2). Jamesonite, which seemed to have a particular penchant for replacing arsenopyrite, for the most part did so in such a way as to produce within the host mineral, either irregular patches or partial geometrical forms, the latter suggesting that on occasion the arsenopyrite exercised a degree of crystallographic control on the metasomatic process. In addition, replacement of the arsenopyrite along irregular fractures was also effected by jamesonite and other sulphides noted above.

In polished section the arsenopyrite, in air, appeared a little more pinkish than usual, which could be simply an optical effect due, in part, to the neighbouring minerals, or, on the other hand, might be due to foreign elements in the species. Reflectivity, micro-hardness, and the usual optical tests indicated that the mineral was arsenopyrite, and this was confirmed by its x-ray diffraction powder pattern which was quite normal.

Pyrite occurred as rather small euhedral grains which in section were mostly square or triangular in shape, and it seems that the species was probably present as cubes and as combinations of the cube and rhombbicdodecahedron. On rare occasions the pyrite was seen to replace the arsenopyrite, but usually it grew on the larger grains of the latter (fig. 1).

Random patches of sphalerite occurred in the ore, and these contained not only numerous minute round ex-solved bodies of both chalcopyrite and cubanite, together with rare, although similar, ex-solved pyrrhotite bodies, but also larger randomly distributed irregularly shaped blebs in which cubanite and chalcopyrite occurred as lamellar intergrowths. Lamellar intergrowths of these two species were also seen in veins transecting the arsenopyrite.

Micro-veinlets of chalcopyrite and jamesonite also locally cut the sphalerite. These were of some particular interest in that often they were composite in character. Chalcopyrite tended to occur in parts of the veins which deeply penetrated the host, whilst jamesonite was confined to those portions of the veins which occupied the more peripheral areas of the sphalerite.

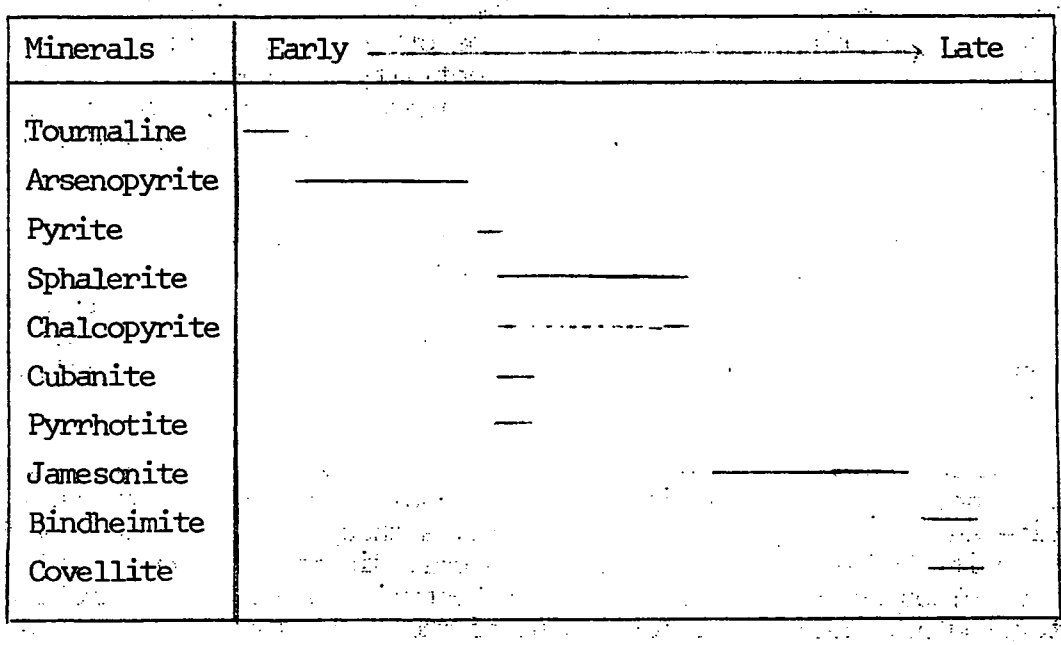
Jamesonite occurred as granular masses displaying fine lamellar twins. As noted above, it veined and replaced the sphalerite (fig.4).

As stanniferous jamesonite is known, and as that under review was derived from a tin-rich area, the possibility that it might contain tin was investigated by the sensitive tin flame test (Feigl, 1954, p.105) and also by means of X R F : both tests gave negative results.

Supergene processes have locally altered the ore and have given rise to covellite and bindheimite (not antimony oxide as Ingham and Bradford reported). Possibly other secondary antimony species were also developed, and studies aimed at testing this possibility are in progress.

Paragenesis

The paragenesis, as revealed solely by study of polished and thin sections of the multi-sulphide ore, is as follows:



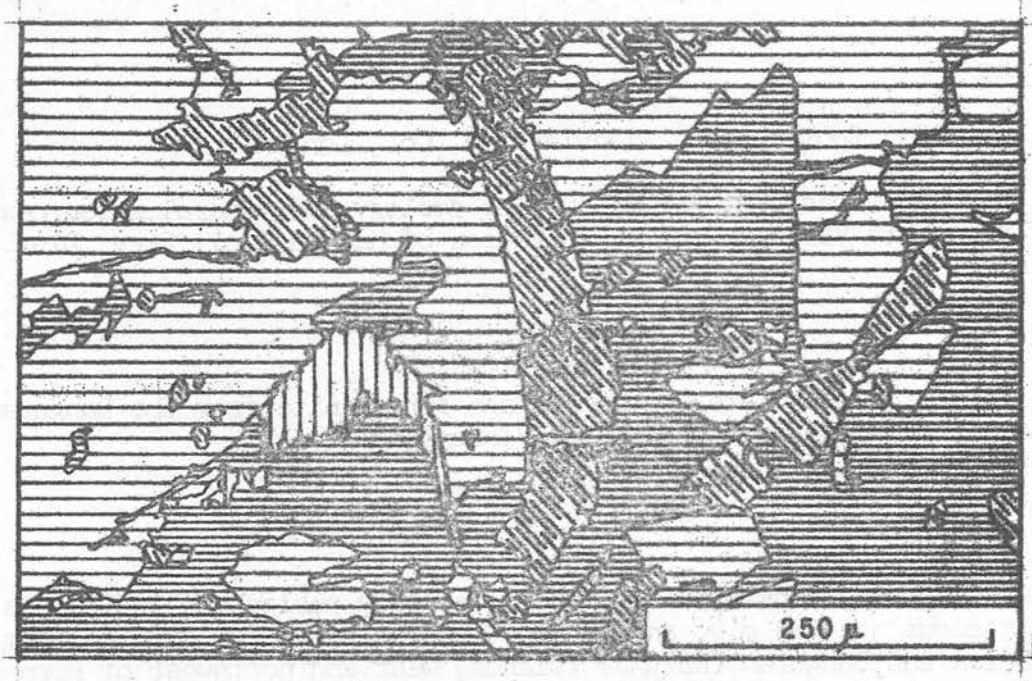


Fig. 3

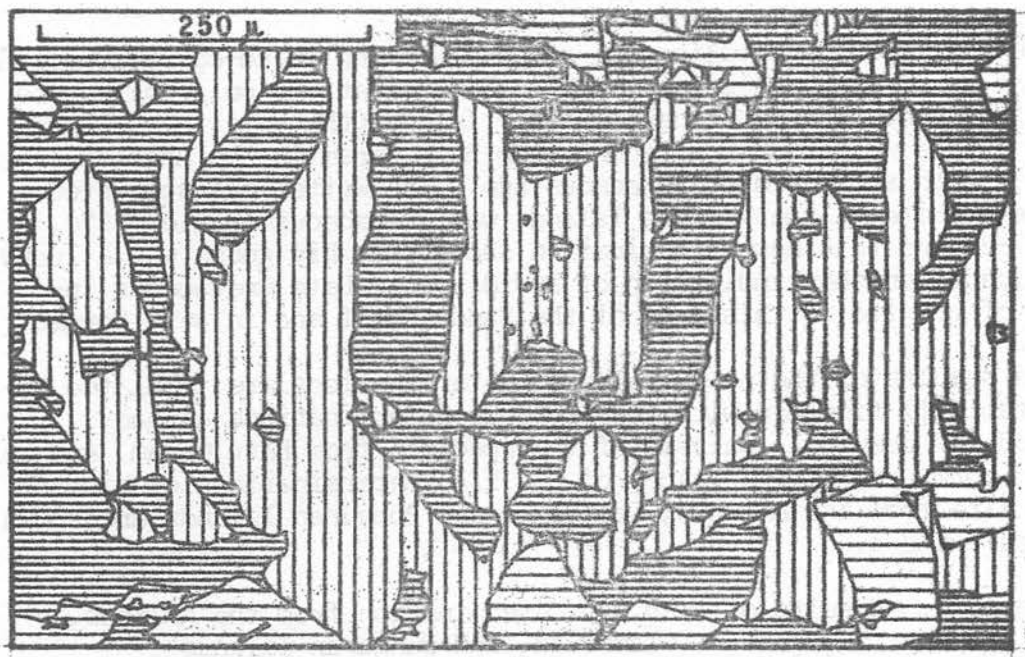


Fig. 4

K E Y

Jamesonite

Arsenopyrite

Pyrite

Void

Sphalerite

Chalcopyrite

Tourmaline

References

Feigl, F., 1954 Spot tests. Elsevier Pub. Co., London

Ingham, F.T. and Bradford, E.F. 1960 The geology and mineral resources of the Kinta Valley, Perak: Federation of Malaya Geol. Surv. Dist. Mem. 9

Confirmation of a Late Cretaceous age for granite from the Bunguran and Anambas Islands, Sunda Shelf, Indonesia.

N.S. Haile
University of Malaya

K/Ar determinations by J.D. Bignell, already published, indicate a Late Cretaceous age (84 m.y. and 73 m.y. respectively) for granite from the Tambelan and Bunguran (Natuna) Islands, west and northwest of Borneo (Haile, 1970; Haile and Bignell, in press).

Recently AGIP, an Italian oil company working in co-operation with Pertamina, has kindly released two K/Ar determinations on granite, one sample from Gunong Ranai, Bunguran Besar Island (the same intrusion sampled by the writer) and a second from Batu Garam in the Anambas I Islands. Both show a Late Cretaceous age. The writer has suggested that the granite on the Anambas Islands was Cretaceous (Haile, 1970, Table IV-2) and this new determination shows that his guess was a lucky one, and adds another indication of a widespread Late Cretaceous intrusion of granite in this area of the Sunda Shelf and in west Borneo.

The results of the newly released determinations are tabulated below (table 1) together with the previous determinations already published. A chemical analysis of the specimen from Batu Garam, Anambas Islands, norm, and Niggli values of the K/Ar determinations of biotite from granite from the Anambas, Tambelan, and Bunguran Islands are shown in tables 2 and 3.

Table 1. Results of K/Ar age determination from the Anambas, Tambelan, and Bunguran Islands

LOCALITY	AGE (M.Y.)
Batu Garam, Anambas Islands	86.5 ± 2.9
Ranai Intrusion, Bunguran Island	75.2 ± ?
Tanjong Senubing, Bunguran Island (Ranai Intrusion)	73 ± 2
Pulau Benua, Tambelan Island	84 ± 2

Note: First two determinations by Geochron Laboratories Inc. for AGIP; last two by J.D. Bignell (Haile and Bignell, in press).

Table 2

Chemical analysis of granite from Bunguran and Anambas Islands (weight percent)

	Natuna 1A	Natuna 1B	Batu Garam 2
SiO_2	73.53	75.68	78.27
TiO_2	0.22	0.52	0.17
Al_2O_3	14.54	12.11	11.77
Fe_2O_3	0.92	1.16	1.11
FeO	1.15	1.19	0.45
MnO	n.d.	n.d.	n.d.
MgO	0.44	0.50	0.06
CaO	1.52	0.96	0.96
Na_2O	3.26	2.19	2.97
K_2O	3.91	5.34	4.56
P_2O_5	0.11	0.04	traces
SO_3	n.d.	n.d.	n.d.
p.a.c. (at 950°C)	0.75	0.61	0.38
	100.35	100.30	100.43

Natuna 1A from top of Ranai Mountain, Bunguran Besar
Natuna 1B from base of Ranai Mountain, Bunguran Besar
Batu Garam 2 from Anambas Islands

n.d. = not detected

Analyses by AGIP on sample dried at 110°C

Table 3

Norms and Niggli values calculated from Table 2

NIGGLI MOLECULAR NORM

	Natuna 1A	Natuna 1B	Batu Garam 2
Quartz	33.5	37.7	39.6
Orthoclase	23.5	32.4	27.5
Albite	29.8	20.2	27.2
Anorthite	6.9	4.6	3.5
Corundum	2.7	1.2	0.8
Hypersthene	2.1	1.7	0.2
Magnetite	1.0	1.2	0.7
Hematite	-	-	0.3
Ilmenite	0.3	0.7	0.2
Apatite	0.2	0.1	-

NIGGLI VALUES

	Si	al	fm	c	alk	k	mg
Natuna Besar 1A	415	48	11	9	32	0.45	0.31
Natuna Besar 1B	479	45	14	6	35	0.62	0.33
Batu Garam 2	549	48	6	5	41	0.50	0.07

References

Haile, N.S. 1970 Notes on the geology of the Tambelan, Anambas, and Bunguran (Natuna) Islands, Sunda Shelf, Indonesia, including radiometric age determinations: Technical Bulletin, ECAFE, Vol.3, pp. 55-90.

Haile, N.S. and J.D. Bignell (in press) Late Cretaceous age based on K/Ar dates of granitic rock from the Tambelan and Bunguran Islands, Sunda Shelf, Indonesia: Geologie en Mijnbouw, in press.

CONFERENCES

Regional geology of Southeast Asia

Planning of the GSM regional conference proposed for 20-25 March 1972 is continuing. With the kind permission of the Vice-Chancellor and Head of the Department of Geology, the conference will be held in the Department of Geology, University of Malaya.

A planning committee has been set up and will start work soon: meanwhile suggestions as to topics, and overseas speakers who might be invited, will be welcome, and should be sent to the Secretary of the Society.

Twelfth Pacific Science Congress

The Twelfth Pacific Science Congress will be held in Canberra, Australia, from 18 August to 3 September 1971, under the sponsorship of the Australian Academy of Science. There will be four sections one of which, Section D: Geological Structure and mineral resources in the Pacific, deals with Geology. The section convenor is Professor M.F. Glaessner of the University of Adelaide. The five symposiums in Section D are:

1. Structure and tectonic history of the Pacific Ocean Basins
2. Island arcs and related structures of the Western Pacific region
3. Evolution of the continental shelves of the Western Pacific
4. Mineral resources of the Western Pacific
5. Petrology and geochemistry of island arcs in relation to tectonic environment

Professor N.S. Haile and Dr C.S. Hutchison have been invited to present papers at the Congress.

Malaysian Conference on Alluvial Mining

The Malaysian Branch of the Australian Institute of Mining and Metallurgy is planning to hold a conference on Alluvial Mining in Ipoh in August 1971. Members of the GSM are invited to participate in the conference. Those wishing to present a paper should forward an abstract of about 250 words to the Secretary, Malaysian Conference of Alluvial Mining, AIMM, ground floor, AIA Building, 118 Chamberlain Road, Ipoh, as soon as possible (official deadline is 30 May). The registration fee is M$50.00.

Dr S.H. Chan of the Department of Geology, University of Malaya, has been appointed by the Council to represent the GSM on the organizing committee, at the invitation of the AIMM.

NEWS OF THE SOCIETY

Meeting of 21 May 1971: R.A. Bosschart

Geophysical methods of exploration

Dr R.A. Bosschart, Executive Vice-President of Sintrex Ltd., addressed a meeting of 26 members, with the President, Dr D. Taylor, in the chair, on 21 May 1971, in the Department of Geology, University of Malaya.

Dr Bosschart began with a short review of the various methods used in geophysical prospecting. All depend on some difference in physical property between the ore body sought, and the host rock. Properties used include density (gravity surveys), magnetic and electrical susceptibility (magnetometer and induced polarization surveys), radioactivity (scintillometer surveys).

Magnetic, gravity, and radioactivity surveys are passive methods, in that a pre-existing field is measured.

Conductivity methods, however, are active, since a primary field is created by a transmitter, and detected by a receiver. A conductor (the ore body) in the path will cause a distortion in the electro-magnetic field.

Early methods depended upon measuring changes in the geometry of an induced EM field by a conductor in the path. TVA RAM was one of this type, introduced in Sweden in 1922 and used very successfully into the late 20's. The method, however, is only useful for fairly simple configurations since, if another conductor overlies the target, phase shifting occurs, and the geometry of the field cannot be measured.

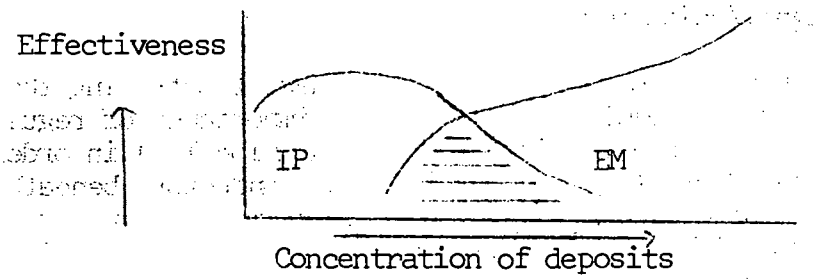
Compensation methods depend on measuring compensated phase differences between the primary and phase-shifted field.

TURAM was an early method, still in use, employing a fixed source and moving receiver.

SLINGRAM uses a moving source connected to a receiver, and both are moved. SLINGRAM is only suitable for penetrating rather thin overburden of the order of 30 m, such as is found over the pre-Cambrian

Shield in much of Canada. It can only be used in areas of gentle topography. For this reason TURAM is more widely applicable. All "active" EM conductivity methods are variations of these two types.

Induced polarization methods measure overvoltage effects and are useful in finding disseminated deposits. The relative use of EM and IP can be shown diagrammatically:



It will be seen that both methods can be effective for certain (moderately concentrated) deposits.

Minor methods include AFMAG (a "passive" method) which uses natural EM fields (100-500 Hz). Results have been disappointing because these fields are weak and may not be detectable. This method is mainly used for structural investigations by people who are not in a hurry(!). VLF (standing for Very Low Radio Frequency) used radio transmissions in the range 15-25 KHz (i.e. very high frequency compared to other conductivity methods). Not much penetration has been achieved.

In airborne surveys, magnetometry, scintillometry, and EM measurements are made simultaneously. EM is the most important, and so the flying height is determined by the optimum height for EM measurements. Ideally, the magnetometer should not be flown too low, whereas the spectrometer gives best results within 100 m of the ground.

Where the EM transmitter is in the aircraft, and the receiver in a towed bird, the configuration is unstable, because the bird is continually swinging about. Since the in-phase component varies as the third power of the separation between transmitter (T) and receiver(R) it is severely affected by these movements and cannot be measured. Only the out-of-phase component is measured.

Stable airborne systems are possible using a 10m-long bird containing both T and R, towed by a helicopter, or by fixing the T and R at the nose and tail of the aircraft, or on the wing tips.

TURAIR is a system in which a fixed-source rectangular loop of wire (as much as 3 x 5 km) is laid on the ground by helicopter, and the receiver is flown back and forth across it and some distance beyond it. This method gives penetration twice as deep as do other methods - as much as 200 m, with possibilities of exceeding 300 m.

Airborne methods are in general more sensitive than ground surveys because signal/noise ratio is higher.

Dr Bosschart showed a series of slides illustrating the methods. He emphasized by examples and graphs the importance of regulating the parameters (frequency of signal, and separation T-R) in order to focus on the target depth (the top level of the conductors beneath the overburden); unless this is done the target may remain undetected, or masked by the effect of EM noise from the overburden level, giving spurious anomalies.

Society Publications

I. General

Bulletin 4 of the Society is in page proof and should be issued in June.

The editor invites papers on any geologic topic, particularly those related to Malaysia and Southeast Asia, for the forthcoming Bulletin 5, and short notes for the Newsletters.

Under a new editorial policy, papers will be accepted in Malaysian as well as English and these should have abstracts in English and Malaysian. Contributors of papers in English are requested, if possible, to include an abstract in Malaysian. As far as practicable, measurements in Society publication should be metric.

II. Geology of the Malay Peninsula (West Malaysia and Singapore) - Progress Report.

The editors of this Society sponsored book, Dr D.J. Gobbett and Dr C.S. Hutchison, have announced that the complete manuscript is now in the final stages of editing and will shortly go to the publishers - Interscience - a division of John Wiley and Sons Inc., New York, USA. It will be published in their regional geology series under the general editorship of Professor L.U. de Sitter.

Dr Hutchison had talks in Milwankee recently with the editors of John Wiley Inc., editor, and it is expected that the book will be put on sale during the first half of 1972. Regretfully, the minimum sale price will of the order of US$24.00 and the actual price may be higher. Despite the price, Wileys are hopeful that the demand will be high for this volume, which will be the first geology of the Malay Peninsula since the now historic "Geology of Malaya" by J.B. Scrivenor published by MacMillan in 1931. The book will be dedicated to Scrivenor, who was the first government geologist in Malaya and an outstanding student of Malayan geology.

A coloured 1:1,000,000 geological map of West Malaysia and Singapore will be printed for inclusion with the book and for separate sales by the Society. It is expected that the map will go on sale from Kuala Lumpur before the book is published, perhaps by the end of 1971.

The contents of the book will be:

Chapter 1	Introduction	- the editors
Chapter 2	Geomorphology	H.D. Tjia
Chapter 3	Lower Palaeozoic	C.R. Jones
Chapter 4	Upper Lalaeozoic	D.J. Gobbett
Chapter 5	Mesozoic	C.K. Burton
Chapter 6	Cenozoic	P.H. Stauffer
Chapter 7	Volcanic Activity	C.S. Hutchison
Chapter 8	Plutonic Activity	C.S. Hutchison
Chapter 9	Metamorphism	C.S. Hutchison
Chapter 10	Structure	H.D. Tjia & D.J. Gobbett
Chapter 11	Economic Geology	K.F.G. Hosking

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(all Full Members unless stated)

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Kuching, Sarawak
East Malaysia

Death

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(see obituary on page 15)

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Mr S.S. Rajah
Department of Geology
Science Labs.
The University
Durham
United Kingdom

Obituary: Simon MacDonald

The untimely death of Simon MacDonald on 22 April 1971 at the age of 44, has deeply shocked all who knew and worked with him, for one worked alongside Simon, not under him.

Simon came from Fort William, Invernesshire. He gained an Honours Science Degree from Edinburgh University where he also met his wife, Janet. They left Scotland for the East where he worked for some ten years with the Malaysian Geological Survey. During this time Simon made an amazingly large contribution to the Malayan geology, often under conditions that lesser men would not have tolerated. In fact Simon was wounded by terrorists in an ambush while carrying out "routine" mapping.

In 1963 he left Malaya to take up lecturing in the University of Canterbury, Christchurch, New Zealand and spent two years there. Again his exuberance, vision and professional excellence made him a well-remembered figure. He came to Australia in 1965 to join Australian Development N.L. in Tennant Creek as Chief Geologist and after two years joined Newmont Pty. Ltd. with whom he spent a considerable time in Western Australia over the following three years. Early in 1970 he accepted an appointment as Exploration Manager of Australian Ores and Minerals Limited in Sydney. Here he again excelled and his passing is greviously felt by all in this Company.

Simon belonged to many professional societies, the most notable being the Geological Societies of London, Malaysia, New Zealand, and Australia, the Institute of Mining and Metallurgy, and the Australian Institute of Mining & Metallurgy.

He is survived by his wife and four boys and to them we extend our deepest sympathy.

NEW JOURNAL: "PACIFIC GEOLOGY"

Professor M. Kato, Secretary of the Editorial Board writes that "Pacific Geology" would welcome papers of regional interest from Malaysia and Southeast Asia generally. Papers can be sent to Professor Kato at the Department of Geology and Mineralogy, Faculty of Science, Sapporo, Japan.

RESIDUAL DEPOSITS by "Kaksa"

"Session I was fairly short, and was, no doubt, affected by the last-minute withdrawal of Professor G.P. Woollard, who was programmed to give the opening address." - Commonwealth Geological Liaison Office, March 1971.

We always thought some of these geophysics professors must have computer-like minds.

From the academic world:

"Tektites is commonly known as blackjack."

"Landslides are mass movements of the soil down a slope, especially when it is inclined."

"Statistics in geology has reached such a state that it is taught in the University curriculum."

"There are two kinds of Hawaiian lava: one is Aha! Aha! and the other is Hohoho!"

"There is also a peculiar self-imposed serfdom, which has become a sort of competitive cult in recent times. The blackmailing of intellectual freedom by expensive, specialized, fixed installations is one of the dangers of the current financial plenty for research. Not too infrequently an apparatus of considerable cost is built to carry out certain unusual measurements, only to doom the servile scientists to a life of repetitive measurements. Soon the machine assumes the directorship of research. No longer is the mind of the researcher the determinant of experimental plans. Concern for the capability of the equipment becomes the overriding consideration. The more exorbitant the price, the higher the ransom. When the value exceeds a million dollars the mental slavery may run into generations. It takes rare courage to junk the facility after it has served the human purpose for which it was originally built. It is often easier to drivel along in a litany to the mechanical idol. It is a puzzle of the times that scientists so outspoken against thought control by other men would so unwittingly embrace thought control by money and machines."

Sid: The Tao of Science

THE COPPER MOUNTAIN OF TIMOR - PART II

A day was then fixed to "open the mines". Captain Hart accompanied Mr. Geach as interpreter. The Governor, the Commandante, the Judge, and all the chief people of the place, went in state to the mountain, with Mr. Geach's assistant and some of the workmen. As they went up the valley Mr. Geach examined the rocks, but saw no signs of copper. They went on and on, but still nothing except a few mere traces of very poor ore. At length they stood on the copper mountain itself. The Governor stopped, the officials formed a circle, and he then addressed them, saying, - that at length the day had arrived they had all been so long expecting, when the treasures of the soil of Timor would be brought to light, - and much more in very grandiloquent Portuguese; and concluded by turning to Mr. Geach, and requesting him to point out the best spot for them to begin work at once, and uncover the mass of virgin copper. As the ravines and precipices among which they had passed, and which had been carefully examined, revealed very clearly the nature and mineral constitution of the country, Mr. Geach simply told them that there was not a trace of copper there, and that it was perfectly useless to begin work. The audience were thunderstruck! The Governor could not believe his ears. At length, when Mr. Geach had repeated his statement, the Governor told him severely that he was mistaken; that they all knew there was copper there in abundance, and all they wanted him to tell them, as a mining-engineer, was how best to get at it; and that at all events he was to begin work somewhere. This Mr. Geach refused to do, trying to explain, that the ravines had cut far deeper into the hill than he could do in years, and that he would not throw away money or time on any such useless attempt. After this speech had been interpreted to him, the Governor saw it was no use, and without saying a word turned his horse and rode away, leaving my friends alone on the mountain. They all believed there was some conspiracy - that the Englishman would not find the copper, and that they had been cruelly betrayed.

A.R. Wallace
The Malay Archipelago, 1869
(concluded)

---oooOOooo---