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

The impurities of Southeast Asian tin ore concentrates.

Charles S. Hutchison, Dept. of Geology, University of Malaya,
Kuala Lumpur.

Introduction

During the course of discussions with staff of the tin smelters, I have acquired some general information of the ore characteristics from districts of Southeast Asia. Some of these characteristics have geological significance. However, others simply show the quality of the tin ore purification before being sent to the smelters. Nevertheless the regional variations are of some interest to the geological community and I herewith give a summary.

The tin content

When received by the smelters, either in Penang, Phuket or Mentok, Bangka, the ore has already been carefully concentrated by the mining company. The concentrate is generally of cassiterite with a Sn content usually within the range 70 to 75%. (Note pure cassiterite SnO_2 would have a Sn upper theoretical limit of 78.7% by weight). The price is set by the tin content and the nature and amount of the impurities.

The impurities

a. Tantalum

The smelters have the following approximate scale for Ta_2O_5 :

above 0.40% is considered high
0.20 to 0.40% medium
0.05 to 0.20% low
below 0.05 is very low.

Ore from Burma and North Thailand contains no tantalum (Ta). South Thailand is high in Ta with a ratio of tantalum/niobium about 2:1. However in South Thailand at Yala and Rusoh the ore concentrate is free of Ta.

The ore from the Bujang Valley close to Gunung Jerai, Kedah, is Ta-rich. Here it is associated with columbite.

Near Kulim, southern Kedah, the ore is generally Ta free but a recent supply from the Selama area contains Ta.

In the Kinta Valley, Ta is associated with ore from the Main Range. Mines close to the Kledang Range contain little or no Ta. Mines around Parit towards Pangkor also contain little or no Ta.

The Taiping area generally has very low Ta, with isolated ore occurrences of significant Ta content.

The whole of Kampar district is of high Ta content which tails off southwards and little or no Ta is known from south of Tapah.

The Rawang area, and in particular the Berjuntai field, is Ta low. However in Kuala Lumpur there are isolated areas of high Ta content. The new Kuala Langat field has significant Ta contents. Some Ta content is known from Johore, notably in the Muar region, where there is an association of columbite.

The whole East Coast Belt is characterized by low to very low Ta content.

The Indonesian deposits at Bangka and Billiton are very low in Ta (less than 0.02%) but the tin concentrate contains much more monazite and xenotime than is ever known from Malaysian concentrates.

The ore from Nam Patain in Laos is Ta free and the offshore Thailand concentrates contain much lower Ta than do onshore Thai deposits.

Whenever Ta is found to characterise the tin concentrate of a mining area, it is also generally found that the Ta content varies with depth in the mine. Two adjacent mines may have totally unrelated Ta contents, possibly because of different working levels. In very few cases is the Ta present as tantalite and it seems that the hypothesis of Hosking (1977), whereby the Ta substitutes for Sn in the cassiterite structure, is supported by the smelters' experience. The Ta content is suggested to be the cause of the pleochroic colouration of the crystals.

b. Iron

Generally all Malaysian and Thai ore is low iron (Fe). Ore from Laos is high in Fe. However there is little geological significance in this, and it simply reflects the ore dressing efficiency. Lode ore is generally higher in Fe than alluvial. Ore from the East Belt of Malaysia, especially from Pelepah Kanan in Johore, presents serious dressing problems because of the intimate association of tin (Sn) and iron (Fe) mineralization. After magnetic separation, Sn-bearing iron ore is stockpiled towards some future hope of a successful method for separating the Sn and Fe.

The Indonesian ore concentrates from Belitung, P.T. Koba Tin, Bangkinang, and Singkep Islands all have generally low Fe contents ranging from 0.5 to 2.5%.

However, although a similar situation is found in Bangka, the ore from the Mentok district may occasionally run as high as 7.5%.

c. Sulphur

Within the range of 0.1 to 2.0%, sulphur is widespread. The content is very dependent on ore dressing efficiency. The higher contents are due to uncleaned pyrite. High contents are common in Malaysia from the Jelapang area of Perak and immediately north of Kuala Lumpur. Indonesian concentrate contains sulphur within the range 0.1 to 1.46% except for Mentok in Bangka, where it may go up to 3.81%.

d. Arsenic

Arsenic is widespread with no special highlight throughout the region. In the Kinta Valley it occurs mainly on the Kledang side. It is common in Kuala Lumpur but of variable content, reflecting the efficiency of ore dressing. Isolated pockets can occur at any time in a field of generally low arsenic. For example, the Berjantai area normally produces ore of less than 0.01%, but two or three years ago one dredge produced a great deal of ore containing 0.1 to 0.2% As. Indonesian ore generally contains extremely low (less than 0.005%) arsenic. Again the highest impurity is from Mentok in Bangka, with a record high of 0.02%. Ore from Laos is generally high in arsenic.

e. Copper

Malaysian copper (Cu) content is usually at trace (0.001 to 0.005%) levels, with isolated higher 0.2 to 2.0% levels of local occurrence, showing no distinct geographic pattern. High values are found on the Kledang Range especially at Southern Tuallang Mine, sometimes in Taiping, and in Kuala Lumpur, but its occurrence is sporadic and variable from mine to mine. Indonesian ore usually runs less than 0.001% Cu, with a higher 0.004 value at Karimata on Belitung and up to 0.072% at Pemali in Bangka.

f. Lead

Lead (Pb) is absent from north Peninsular Malaysia.

There are one or two localities around Taiping and along the Kledang Range and in the Kuala Lumpur area with Pb impurities.

The most interesting area is along the Kledang Range, particularly at Southern Tuallang Mine. Here the various levels and benches of the mine can produce variable ore, from native copper, which at one time ran as high as 4% content in the tin concentrate, to large galena contents reaching 4%. At one time, the mine extracted and sold galena. No other mine in the Kledang Range has ever had anything like Southern Tuallang. But all mines along the Kledang Range tend to produce impure tin concentrates.

No definite Pb pattern emerges for the region as a whole.

Indonesian ore contains very low (less than 0.02%) Pb. Higher values of 0.059% occur on Belitung where there is an association with galena. Ore from Laos is generally high in Pb content.

g. Bismuth

Bismuth (Bi) is very rare and very isolated. At present there are only two mines showing Bi higher than 0.5%. One is in the Chenderiang Valley and the other in Kuala Lumpur. Dulang washing from Upper Perak once resulted in an ore delivery to Ipoh containing 30% Bi and 20% Sn. The exact locality has never been confirmed.

h. Antimony

Antimony (Sb) in Southeast Asian ore can be virtually neglected. In Indonesia it occurs always at a level less than 0.001 to 0.005% Sb. Its absence from ore from continental S.E. Asia is surprising because antimony is mined extensively in Thailand, very often not far from the tin deposits (Hutchison and Taylor, 1978). This shows that there is no concordance between the Sn and Sb mineral species.

It is interesting to note that tin ore from Bolivia has widespread high Sb contents that give smelting problems. Ore from Western Australia is associated with Sb and Ta causing smelting problems. Very rarely from Burma is there a high Sb content.

i. Gold

Gold associated with tin ore is found mainly in Bidor Tin Dredging, Tongkah Harbour (Thailand) and a few small mines in Pahang. Recently gold from Kuantan is obtained from dredging of a stream bed.

j. Tungsten

There is little information on the occurrence of various heavy minerals in tin ore, except for wolframite which occurs in ore concentrates mainly in Johore, and in mainland Burma.

Some regional characteristics

Southern Thai ores are very clean apart from a group of mines around Yala. Here the ore is extremely fine grained and strongly associated with iron, lead and arsenic in the form of mimetite. Rahman Hydraulic mine, not far away, has similar fine grained ore but with lower impurity content and no mimetite.

Northwest Thailand can be grouped with the Tenasserim coast of Burma, where the ore is coarse grained and extremely impure, being associated with galena and bismuth. The bismuth is present largely as sulphide cores surrounded by rims of carbonate and hydroxide. Fair amounts of wolframite are also found.

Further north in Burma, the ore is cleaner with lower Pb and Bi contents but the wolframite contents rise, as expected from the close association of Sn and W (Hutchison and Taylor, 1978).

Ore from Laos is high in Fe, As, Pb, and Cu.

Acknowledgements

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The "Sabah Blueschist Belt" - a preliminary note.

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Abstract

The proposed "Sabah blueschist belt" is partly a shear zone and partly a sedimentary melange. The belt appears to extend across central Sabah and is probably related to the southwest movement of the Sulu Sea plate during the Miocene. The trace of this narrow belt approximates the axis of the sharp bend of the Crocker Formation in west Sabah.

Introduction

Blueschists and related rocks lie along a belt, possibly discontinuous, across central Sabah trending northwesterly from the Dent Peninsula through the Labuk area to the Mensaban-Ranau area, and probably further northwestward in the offshore area. The rock types occurring within this narrow belt, probably less than 1 km wide, are briefly described below, starting from the extreme southeastern end (Fig. 1).

Description

1. Pungulupi River, Dent Peninsula

On the Pungulupi River, a tributary of the Tungku River, the boulder bed facies (sedimentary melange) of the Miocene Ayer Formation contains exotic blocks of coarse-grained, brecciated garnet pyroxenite (formerly described as 'eclogite'), garnet amphibolite and garnet-corundum amphibolite (Reinhard and Wenk, 1951; Haile and Wong, 1965; Wilson, 1965; Morgan, 1974). The earliest formed minerals include pyrope-almandine garnet, tschermakitic augite, pargasite and rutile. The earlier fabric has been extensively brecciated and partly replaced by plagioclase, ilmenite, and a fibrous amphibole (Morgan, 1974). The composition of the garnet in the garnet pyroxenites, as determined by chemical analyses, is quite uniform and may be expressed in terms of pyrope 28-56 mole percent, grossularite (with minor andradite) about 25 mole percent, the rest being almandine. Estimated temperature and pressure for the origin of the Pungulupi garnet pyroxenites are $850 \pm 150^{\circ}\text{C}$ and 19 ± 4 kbar respectively (Morgan, 1974).

2. Segama River

A boulder of glaucophane-talc schist (with minor chlorite and diopside) was found in the Segama River by Haile and Wong (1965). The boulder is probably a block in the chaotic deposit of the Ayer Formation.

3. Koyah Area

Large lenses of slickensided serpentinite over 2 km long occur in the Koyah area as exotic blocks in the Ayer Formation. These blocks are elongated northwest-southeast.

4. Labuk Area

Boulders of glaucophane-quartz-muscovite and glaucophane-amphibole schist occur in the Rundut valley, about 20 km north of Telupid (Kirk, 1963, 1968). Outcrops of glaucophane-muscovite-epidote (including piemontite) schist, apparently in situ, have been found near Bukit Lipaso, the headwater area of the Rundut (Johnston and Walls, 1974; P. Walls, personal communication). The fault-bounded northwest-trending zone of glaucophane-bearing rocks is probably less than 1 km wide, and lies within volcanic-sedimentary rocks of the Chert-Spilitite Formation (Cretaceous-Early Tertiary).

5. Mensaban Valley, Ranau Area

Numerous boulders of coarse-grained, brecciated garnet amphibolite and garnet peridotite occur along the Mensaban River, about 3 km north of Ranau (Choo, 1968). A garnet from a garnet-tremolite-epidote boulder has the composition, in mole percent, pyrope 58, grossularite 20, and almandine 22 (Choo, 1968), which is very similar to the garnet composition of the garnet pyroxenites in the Pungulupi River, Dent Peninsula. The boulders occur within the Mensaban fault zone, thought by Tjia (1974) to be a dextral strike-slip shear with a normal component (downthrown to the south). In situ garnet (almandine) amphibolite and serpentinitized peridotite occur immediately north of this fault zone.

So far, no similar metamorphic rocks - glaucophane schist, garnet pyroxenite/amphibolite - are known outside the narrow belt in spite of the widespread occurrences of the Crystalline Basement rocks especially in the Segama area and ophiolites in the Segama, Labuk and Ranau areas.

Discussion

Most geologists, by using a subduction model, interpret blueschist rocks to be indicative of very high pressure with low temperature conditions, which are thought to be met where rocks are carried quickly downward faster than geothermal equilibrium can be established within a descending lithospheric plate. These rocks are then carried upwards along imbrication planes and later mixed with surficial sediments as exotic clasts in a chaotic deposit (e.g. Dewey and Bird, 1970; Coleman, 1972; Coleman and Lanphere, 1971; Ernst, 1971a, 1971b, 1972, 1973, 1975; Miyashiro, 1973; Hamilton, 1973, 1975; Van Bemmelen, 1974). Although other interpretations may account for the formation of the glaucophane-bearing rocks and garnet pyroxenites/

amphibolites in central Sabah, a subduction model is currently attractive. The relationship of this belt to the plate tectonic framework in the Sabah-Sulu Sea area is discussed below. It should be noted, however, that some geologists (e.g. Gresens, 1970, 1971; Carey, 1975; Krebs, 1975) propose other interpretations for the formation of glaucophane-bearing and other apparently high pressure rocks.

The "blueschist belt" in central Sabah is approximately parallel to the trace of an inactive southward dipping subduction zone in the Sulu Sea, north and northeast of Sabah, a continuation of the inactive trench west of the Sulu Archipelago (Hamilton, 1974). Beddoes (1976) proposed that part of this subduction zone could have been translated into a transcurrent fault or left-lateral strike-slip fault. This postulated large transcurrent fault, Strait Balabac Fault, south of Balabac Island (Fitch, 1961) is assigned a 50 km left displacement by Tjia (1973).

It would appear that at least part of the "blueschist belt" of central Sabah could have been an imbricate zone, major shear or suture related to the southwestward movement of the Sulu Sea plate. The upward transportation of the glaucophane schist, garnet pyroxenite, garnet amphibolite and serpentinite was, in the Dent Peninsula area, followed by deposition of surficial sediments or chaotic deposits (olistostrome or sedimentary melange) during Miocene time. The "blueschist belt" appears to be less than 1 km wide. A renewed southwest compression of the Philippine Sea plate during middle Pliocene through Pleistocene time (Murphy, 1973) could cause further brecciation of the central Sabah shear zone, including extensive brecciation of the glaucophane-bearing and garnetiferous rocks.

If the "Sabah blueschist belt" is extended northwest of the Mensaban-Ranau area, it passes south of Gunong Kinabalu, Gunong Nungkok, Bukit Lugus (a northwest trending granodiorite porphyry dyke) and near the town of Tuaran. The Nungkok and Bukit Lugus granodiorite, which are related to the Kinabalu batholith, could have intruded along the shear or suture during Upper Miocene/Pliocene time. The narrow "blueschist belt" extended to the Tuaran area approximates the axis of the deflection or sharp bend of the Crocker Formation from the dominant northerly trend in west Sabah to easterly in the Sugut area. Its possible extension from the Mensaban-Ranau area to the South China Sea as a (?) transcurrent fault might be tested by study of the offshore geophysical data. It should be noted, however, that according to Ernst (1975) almost all blueschist terranes seem to be characterised by the occurrence of a major post-metamorphic transcurrent fault.

Preliminary studies have indicated that the "Sabah blueschist belt" is a shear zone in the Mensaban-Ranau-Labuk area, and a sedimentary melange (Ayer Formation) in the Dent Peninsula area. An

outstanding problem is the timing of the subduction event which produced the glaucophane schists and associated garnet (pyrope-rich) pyroxenites and amphibolites. It is important to distinguish between the age of the subduction metamorphism and the age of the sedimentary unit in which the blueschist blocks occur, that is, the Miocene Ayer Formation in the Dent Peninsula. If a pre-Miocene (? Cretaceous-Early Tertiary) age for the formation of the blueschists and associated high-pressure rocks is assumed, an explanation for their restricted extent to a narrow belt, as presently known, would have to be given. A pre-Miocene age for their formation would also suggest that the Miocene Sulu Sea plate movement has merely "exhumed" parts of the earlier formed high-pressure terrane. Radiometric age measurements on suitable minerals from the blueschists and associated high-pressure rocks may provide a solution to the problem.

Acknowledgements

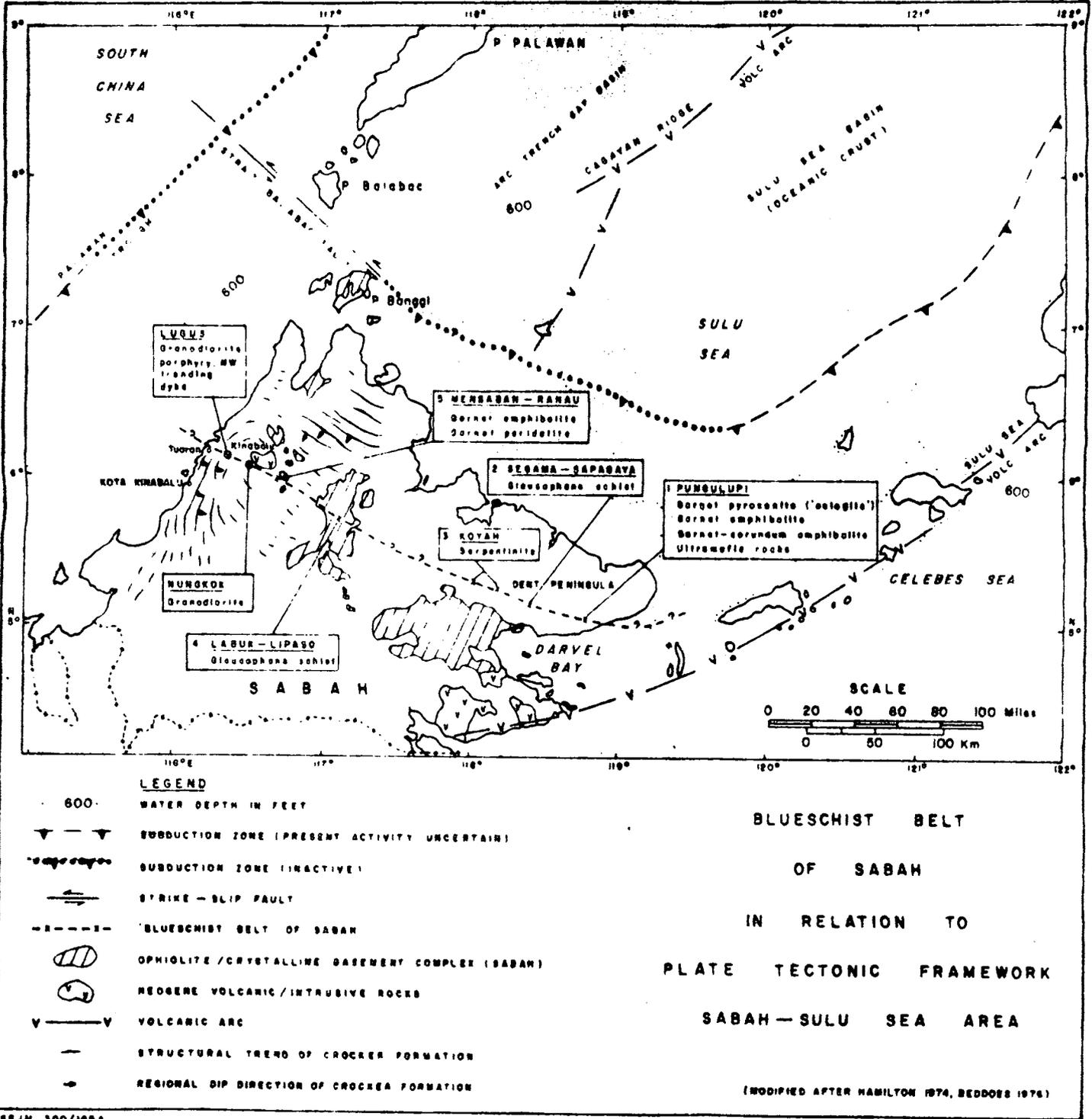
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88JM 300/105A

Figure 1

G E O L O G Y · O N · S T A M P S

6. Volcani and glacial landforms.

N.S. Haile, Jabatan Geologi, Universiti Malaya.
(Photographs: Jaafar bin Haji Abdullah).

Stamps of quiescent volcanoes and volcanic landforms are legion. Named volcanoes to appear include: Citlaltepetl, on a 1934 Mexican stamp whose poor design is matched by drab colour and poor printing:1; Zoquala (Ethiopia, 1947:2; the steep sides would seem to indicate a viscous acid lava); Mayon (Philippines, 1947:3; 1955:4;); Mount Egmont (New Zealand, 1935:5; 1970-76:6); Kilimanjaro (Kenya, Uganda & Tanganyika, 1938:7; Tanzania, Kenya, Uganda, 1968:8;); and Hachijo island (Japan, 1963:9).

Craters make striking stamps, among them, Crater lake, St. Vincent (1965:10), the crater lake of Mount Zao (Japan, 1966:11), Mount Misery, St. Kitts (St. Christopher, Nevis, Anguilla, 1963:12) and the striking breached crater of St. Paul Island in the part of the Antarctic claimed by France (1968:13). This last shows steam, probably from a fumarole, rising on the crater rim at top left.

Columnar jointing of basalt of Staffa Island, Scotland, including Fingal's Cave, is shown on four of six stamps issued by the laird of Staffa, Scotland, presumeably without the sanction of the Post Office, and if so without any postal validity: 14-17. Why does the GPO not depict such geologically interesting beauty spots?

Iceland being virtually all volcano, has a number of views of volcanic landforms, including one of the Lakagigar, a line of small cones over a fissure eruption: 18.

The U.S. stamp of 1962 shows the famous shiprock, New Mexico, an eroded volcanic neck, from which extend radially a number of dykes, forming walls of more resistant rock across the desert floor. A few years ago I described and illustrated in letter to Geotimes (January, 1973), the fantastic volcanic neck of Batu Daya (see photo: 20) in West Kalimantan, suggesting that this, 995 m high, with a sheer rock wall on the southern side about 750 m high, is one of the largest volcanic necks on earth, if not the largest. The Devil's Tower in Wyoming (163 m, and probably not a volcanic neck) and Shiprock (430 m:19) are dwarfed by Batu Daya!

Mount Fuji has certainly appeared on more postage stamps than has any other mountain. Most of these are undistinguished, but they include what is, in my opinion certainly the most beautiful stamp

showing a volcano and among the top contenders for the most beautiful stamp of all: the 1967 stamp "after" the artist T. Yokoyama: 21. Perspective is achieved by subtle changes in tone and subdued colour and the cranes winging their way across the foreground appear miles nearer than the mountain. A stamp worthy of Mount Fiji and of the Japanese artistic genius!

Glacial landforms are very common on stamps, since almost all high-latitude mountains have been glaciated. Arêtes (steep ridges, often formed by coalescence of two cirques) are shown in the Swiss stamps of the Finsthaarnhorn (1966:22) and Matterhorn (1965:23), on the large Czeck stamps of the Tatransky Narodny Park (1969:24) and the Austrian stamp:25. Glacial valleys are shown on the Canadian 15c stamp:26 and the Norwegian stamp (1938:27). A major glacier with lateral moraines is shown on the USSR stamp honouring glaciology (1959:28) and the Tasman glacier is shown on the New Zealand \$1 stamp of 1967 (a too delicately drawn stamp not illustrated here). Most of the stamps showing the Antarctic ice sheet show little of direct geological interest, exceptions including the Australian Antarctic Territory 6c stamp of 1971, showing Sastrugi, a series of dune-like ridges formed by the action of wind on dry snow:29.

Glacial landforms in tropical areas are typified by the Kenya-Uganda-Tanzania stamp of Mount Kenya (1968:30). The various stamps showing Mount Kinabalu, in Sabah (represented here by the handsome 12 cent stamp of 1931:31) might be included here, since the summit, though not now supporting snow or ice, was undoubtedly sculpted by glaciers in the Pleistocene, as shown by Koopmans and Stauffer in 1967 (Borneo Region Malaysia Geological Survey Bull. 8, p. 25-35).

Recently I was delighted to receive from Dr. Ienori Fujiyama of the Natural History Institute of the National Science Museum, Tokyo, (a GSM member) a stamp commemorating the centenary of the museum on 2 November 1977, and illustrated here:32. Dr. Fujiyama also supplied interesting details on the fossil depicted: it is a new species of Elasmosaurid, found in the upper Cretaceous of Futuba district in Fukushima Prefecture, is not yet formally described but will be named Wellesisaurus suzukii Hasegawa et Obata.



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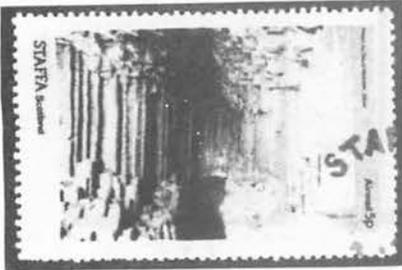
(11)



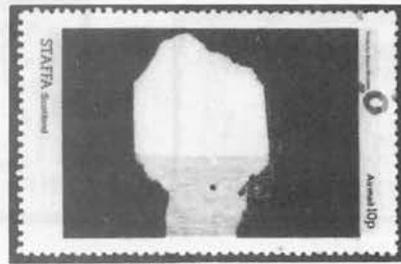
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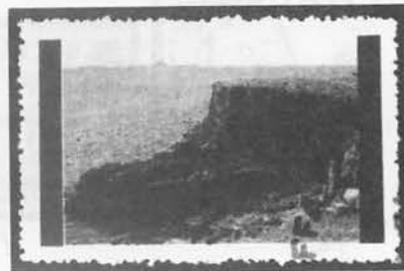
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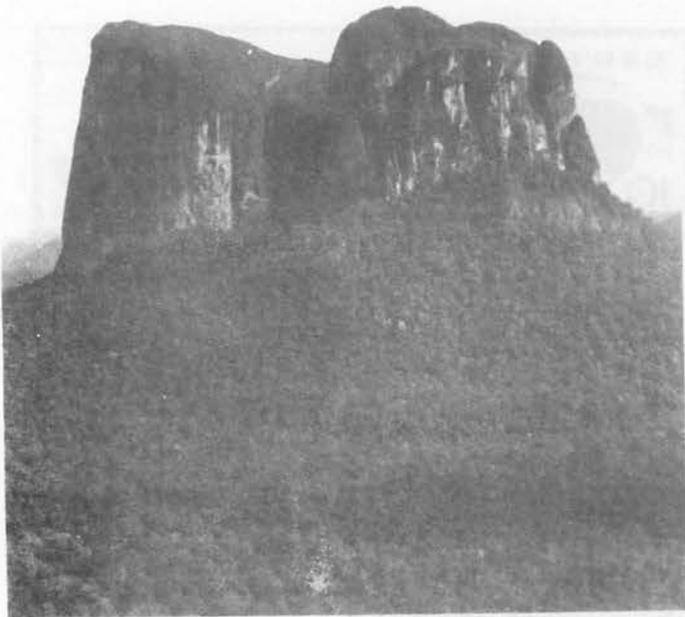
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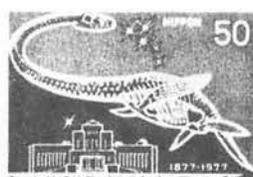
(29)



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(32)

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

International Symposium on "Geology of Tin Deposits"

From 23rd to 25th March 1978, the Society successfully organised the international symposium on "Geology of Tin Deposits" which was opened by the Minister of Primary Industries Malaysia, Yang Berhormat Datuk Amar Haji Abdul Taib bin Mahmud. The Society is honoured and grateful to the Minister for gracing the occasion. A total of 180 geoscientists from 16 countries participated in the interesting and varied presentations and the lively discussions that followed each paper. We, however, missed the Burmese participants who came late but were able to join the tin training school.

Papers which ranged from reviews of tin deposits in their regional settings to detailed field and chemical studies, were presented at the symposium. The papers on Burmese tin and wolfram belt, the tin prospects of India and several others were not presented since the authors could not come.

The stage for the conference was set by Hosking's keynote paper on "Tin Distribution Patterns" which reviewed tin mineralisation on macro and micro scales and pointed out that though we are striking in the right directions, a great deal remains to be done before we can fully understand the genesis and distribution of tin deposits.

Review papers of several important tin producing countries were read. R.G. Taylor discussed the tin occurrences of Australia in terms of their environmental settings and types of deposits and proposed an international classification for tin deposits. The geology of the Cornubian tin field was aptly summarised by N.J. Jackson. An excellent slides show to illustrate the geology and the different types of tin deposits in Bolivia was given by G. Cortez. The slides showed very rugged terrain exists in Bolivia. Associations of tin occurrences with granitoids were highlighted by P. Nutalaya and others in their review paper on Thailand. N.H. Chong gave a review on the tin and tungsten association in the Thai-Malay Peninsula. J.N. Grant and others discussed some aspects of the geochronology, geochemistry and geology of the Bolivian sub-volcanic tin deposits. The Bolivian tin belt, which runs for 800 km down the Eastern Cordillera of the Central Andes, was subdivided into northern and southern parts on the basis of their association with either granitic or volcanic complexes and the types of tin mineralisation. A.H. Clark and R.C. R. Robertson were of the opinion that two epizodes of plutonism and mineralisation had affected the northern Bolivian tin belt and that these were the result of crustal anatexis.

C.S. Hutchison and K.R. Chakraborty endorsed the view that continental crust and not the mantle, was the source of tin through

polycyclic anatexis. A.H.G. Mitchell attempted to show that tin-bearing granites were emplaced in subduction-related settings that include continental margin magmatic arcs, outer arcs adjacent to subduction trenches and continental collision. The two papers on the possible genesis of tin deposits generated a great amount of discussion because as Hosking had pointed out in his leading paper there was yet not enough known for definitive views to be stated.

There were several papers on concepts and methods of exploration. J.G. Wilson showed that tin deposits in the Bushveld igneous complex are related to fluorine rich zones, explaining that this may be because of the fluxing property of the halide in gathering trace metals. S. Ishihara and others tested the granitoids of the Malay Peninsula with a Kappameter UGF-KT3, which measures magmatic susceptibility. Their results showed that magnetite bearing granitoids were not tin bearing whereas those that do not contain magnetite and were ilmenite bearing were associated with tin deposits. G. Matheis discussed the use of trace elements in geochemical exploration around Southwest Nigerian pegmatites. An exploration programme carried out in the Amazon Region was discussed by Borges and others. V.T. Pun described how he explored for tin lodes in Malaysia and W.S. Yim discussed a method for the determination of tin in offshore samples.

Papers on other detailed field studies were given by E.B. Yeap on the primary tin mineralization of the Kuala Lumpur tin field and carbona-type bodies at Sungei Besi Mines and G.H. Tech on geochemistry and mineralisation at the Tekka mines in the very important tin producing Kinta Valley. V.T. Pun and Joginder Singh discussed the geology and mineralisation of the Sungei Lembing underground tin deposit. S. Pitragool and S. Panupaisal gave a detailed account of the tin and tungsten mineralisation of Mae Lama Mine in northwest Thailand. S.S. Rajah reviewed the geology of the Kinta tin field in Malaysia and S. Puwakool did the same for the tin producing areas in South Thailand.

An illustrated description of the geology and mining method carried out at Sungei Besi Mines in Kuala Lumpur was given by N.H. Chong and Kamaruddin Karim.

D. Santokh Singh discussed the prospects for deep-seated alluvial tin deposits which will be the hope of the Malaysian's tin future and B.C. Batchelor underlined how the geological characteristics of coastal and offshore placers may be used as essential guides for tin exploration in the Sunda Shelf area.

The meeting was briefed by R.G. Taylor on the work being carried out by the committee on "Metallization associated with acid magmatism". Two volumes of papers presented at the conferences in Prague, 1971 and Karlovy Vary, 1974 in Czechoslovakia have been published and we were told that the third volume is already in press.

After all the papers were presented, K.F.G. Hosking led the participants into discussion on some of the points raised during the symposium and also into speculation of the source of tin.

Abstracts of papers are attached as an Annex to this issue of Warta Geologi.

CHY

Post Symposium Field Trips

1. Kuala Lumpur Field Trip

On the 26th of March 1978, the Geological Society of Malaysia organized a field excursion to the Sungei Besi and Ayer Hitam Mines for participants of the International Symposium on the Geology of Tin Deposits. A similar trip was also organized, on the same day, for participants of the Tin Training Course. The first stop for the Symposium participants was the Sungei Besi Mine where participants were provided with the general, geological and mining aspects of the Mine by staff of the Company. This was followed by a tour of the Mine during which various geological features were shown. Fresh exposures of the alluvium and their dipping character provided for some discussion. A visit to the Tin Shed followed and participants were able to observe the different stages of the separation of the cassiterite from other grains. The excursion then continued to the Ayer Hitam Mine where participants were first treated to a scrumptious poolside lunch. With full stomachs and a rather slow shuffle of feet, the participants visited the Mine Office where various aspects of the Ayer Hitam Mine were provided. The participants then braved the heavy afternoon downpour to visit one of the dredges where the methods of separation and upgrading were seen in a thorough trip through the dredge.

Both visits proved beneficial to the participants and thanks are due to the Sungei Besi and Ayer Hitam Mines for enabling the visits. **Thanks** are also due to the personnel of both mines for welcoming and guiding the participants during the visit.

JKR

2. Eastern Belt Field Trip

A small international group from Japan, Australia, Saudi Arabia, Holland, Germany and Thailand was led by Professor C.S. Hutchison. It departed by chartered bus on Tuesday 28 March and returned to Kuala Lumpur on Sunday 2nd April. However most participants left directly from Singapore. The following is a brief summary of the tour.

Day 1. Geological cross section of the Peninsula, from selected stops between Kuala Lumpur and Kuantan. In particular, the Main Range Granite, Lanchang rhyolite, Kampong Awah agglomerate and Tembeling redbeds were examined. Tektites were bought at Gambang.

Day 2. Pahang Consolidated Company Limited (P.C.C.L.) underground lode tin mine was visited. Mr. Joginder Singh arranged visits to the working faces in the Willinks mine. Some participants toured the processing plant.

On the return journey to Kuantan a visit was made to the limestone hill at Panching and to the Bukit Ubi quarry to see basaltic dykes in granite. The late afternoon was used for a visit to Telok Chempedak.

Day 3. Journey via Pekan to Bukit Ibam. Stops were made to study the manganese, hematite and barite deposits at Tasek Chini. New exposures indicate the stratiform nature of the mineralization in pyroclastic sedimentary strata. The Bukit Ibam flooded mine was visited and the stockpile of ore examined.

Day 4. The Dara Jade factory was visited. On the way to the coast, the Tembeling Redbeds and the Panti Sandstone were examined. At the coast, the Mersing metasediments were examined near the Sungei Endau and the welded tuffs and ignimbrites at Kampong Penyabong.

Day 5. A morning drive from Mersing stopped first at the Jemaluang granite quarry where hydrothermal alteration of the biotite granite to give muscovite and altered feldspars was studied. The iron/tin opencast deposit at Pelepah Kanan was visited and excellent examples of cassiterite-fluorite in feldspar quartz veins were collected. Good samples of garnet skarn were also exposed. After lunch at the waterfall restaurant, the bus proceeded to Singapore where the tour officially ended in the late afternoon.

CSH

Tin Training Course

The Tin Training Course which was organized by the Geological Societies of Malaysia and Thailand was held from 26 March - 15 April 1978 in Malaysia and Thailand. The Course was supported by AGID, UNESCO, Commonwealth Foundation, Lee Foundation and many other organizations and mining companies listed in the Abstracts of Papers (annex to this newsletter). In addition several mining companies and organizations in Thailand also gave us their support and cooperation such as the Dept. of Mineral Resources, Thailand, Offshore Mining Organization Thailand, Billiton Tin, Aokam Tin, Southern Kinta Cons. and Sethasup Kanrae.

Twenty one geoscientists from seven tin producing countries (Bolivia, Brazil, Burma, Indonesia, Malaysia, Nigeria and Thailand) participated in the Course. The list of participants is given at the end of this report.

The aims of the Course is to provide a broad and comprehensive knowledge of

- a) the geology of tin deposits throughout the world and
- b) the exploration, evaluation, exploitation and beneficiation of tin deposits particularly in Malaysia and Thailand.

Following the three day tin symposium, the course commenced with a one-day field trip to introduce the participants to the geology of the Kuala Lumpur tin field. A five day lecture and practical course was then held at the University of Malaya. The lectures and practicals were conducted by a team of instructors consisting of mining company personnel and University lecturers. Except for two of the instructors specially brought in for the course, K.F.G. Hosking and R.G. Taylor, the other instructors were Malaysian, experienced in local exploration, mining and beneficiation of tin deposits.

The participants were then taken on mine visits in various parts of Malaysia and finally in South Thailand. In a number of mines, special programmes were arranged to train the participants in the geochemical exploration of tin and other methods of tin exploration including the commonly used technique of Banka drilling.

The Malaysian and Thailand tin fields are ideal for holding such a practical field course as the deposits are varied and a great number of methods are used to exploit the mineral potential of the area. The mining operation range from small scale mining carried out by less than a dozen men to large scale mining involving multinational companies. The deposits include hard-rock tin deposits, worked both by open-cast and underground mining, and both onshore and offshore placer deposits. Many of the exploration and mining methods used have their origin in this area having been innovated during the long history of tin mining to suit local conditions. A visit was also made to a cave placer mine in Kaki Bukit, Perlis.

The participants performed extremely well during the course. They gave the organisers and the instructors their full cooperation at all times without complaining of the long hours and physical hardships they were at times subjected to. For the 25-day programme, only half a day could be spared for sightseeing in Thailand during the Thai New Year day. The instructors, who all volunteered their services freely had ample opportunity during the numerous receptions which were given mainly by mining companies and organizations, and other social activities to get to know the participants and to discuss many common problems faced by the tin producing countries.

All the participants considered the training to be practical and relevant. In particular, the field visits, demonstrations and practical training were found to be most interesting to the participants. The course involved considerable travelling by road in Malaysia and Thailand. This part of the programme was probably the only bad feature of the course but could not be avoided in view of the distances separating the various tin deposits in Malaysia and Thailand.

This course being the first held in this region was received with much enthusiasm in Malaysia and Thailand. Among the benefits of this course were (a) fostering the friendship and goodwill between geoscientists of tin producing countries in the developing world, (b) spotlighting the important role of geoscientists in the mining industry and (c) increasing the confidence of local organizations in holding such courses. This training course was unique in that the Geological Societies of Malaysia and Thailand were involved, and was the first such cooperative venture between geoscientists of these two countries.

The idea for such a course was first conceived at the AGID meeting in Baganda in 1975. Although the financial support by AGID is relatively small, AGID can be credited with the promoting of the concept of such courses whereby geoscientists from developing countries organised courses in their own country for the benefit of their counterparts in other developing countries. The interchange of ideas, goodwill and better understanding resulting from such a course in the end benefits all the countries involved specially the host countries.

The course was organized by a Geological Society of Malaysia committee under the chairmanship of B.K. Tan with T.T. Khoo as the Course Director. The field trips were conducted under the leadership of E.B. Yeap and K.F.G. Hosking (East Coast), Y.F. Wong (K.L. area), S.S. Rajah (North Malaya) and S. Kulvanich (S. Thailand).

List of Participants**Bolivia**

1. Guillermo Cortez, Geological Survey of Bolivia, La Paz.
2. J. Roncal, Casilla 2596, La Paz.
3. J.M.C. Montano, Calle Cordero 257, Casilla 5796, La Paz.

Brazil

1. M.R.C. Borges da Fonseca, CPRM/DEPEM/DIENGEF, Av Pasteur 404, Praia Vermelha, 20.000 Rio de Janeiro.
2. W.S. Fontanelli, Mineracao Oriente Novo S A Rua Jorge Americano, 209-Altoda Lapa, Sao Paulo.

Burma

1. Toe Toe Myint)
2. Aung Gyi) Ministry of Mines.
3. Khin Maung Ngwe)

Indonesia

1. R. Taryat) PT Timah, Jakarta.
2. M.K. Ginting)

Malaysia

1. Daud Mohamad, Dept. of Geology, Universiti Kebangsaan Malaysia, Kuala Lumpur.
2. Raj Kumar, c/o Geological Survey Malaysia, Ipoh, Perak.
3. Tan Kai Soon, Dept. of Geology, University of Malaya, Kuala Lumpur.

Nigeria

1. Y.B. Kwa) Geology Dept., Nigerian Mining Corp., Jos.
2. U.M. Turaki)

Thailand

1. Pongsak Vichit) Dept. of Mineral Resources, Bangkok.
2. Rak Hansawek)
3. Punya Charusiri) Dept. of Geology, Chulalongkorn University, Bangkok.
4. Sompop Vedchakanchana)
5. Charn Tantisukrit, Dept. of Geological Sciences, Chiangmai University, Chiangmai.
6. Thongchai Pungrassami, Dept. of Mining Engineering, Prince of Songkhla University, Haad Yai.

TTK

NEWS OF THE SOCIETY

Ipoh Discussion Meeting

The proposal made earlier this year to have the Ipoh Discussion Meeting sometime in August 1978 has to be cancelled as the Society has been informed by the Director-General, Geological Survey of Malaysia that it would not be possible to have such a meeting during the period proposed. The Society is at present looking into the possibility of having this meeting at a later date.

BKT

Editor's Note

After each symposium/discussion meeting, there are several papers offered to the Society for publication in either the Newsletter or the Bulletin series. This is encouraging but a more constant flow of manuscripts is required to ensure that publications can be brought out regularly. It is indeed heartening that there is presently more short notes and progress reports coming in for the Newsletters, but as yet there is insufficient number of papers for the next Bulletin (No. 10). Would you and your colleagues have something in mind that you could set down on paper and submit in quickly. If your manuscript is submitted soon and accepted by our reviewers you can be sure that your paper is published in a very short time.

Several papers have been submitted for the Special Tin Symposium Bulletin (No. 11) and the committee has been actively reviewing and editing the papers. There are some participants however who had presented papers at the Symposium but have yet to submit their papers. It is hoped that they can do so soon before it is too late.

From our Calendar you may note that a Symposium on "Geology and Paleontology of Southeast Asia" is being held in Tsukuba, Japan in October 1978. It is difficult to understand why a meeting on Southeast Asian geology is to be convened outside of the region. We hope that this will not be a trend for future such symposiums.

CHY

New Library additions

The following works have been added to the Society's Library and are available to members at the Klompe Reading Room of the Department of Geology, University of Malaya.

1. Annales Academiae Scientiarum Fennicae, Series A, III, Geologica-Geographica, no. 122, 1977.
2. Journal of Research of the U.S.G.S. v. 6, no. 1, Jan-Feb 1978.
3. University Museum, University of Tokyo, Bulletin No. 9, 1975.
4. Geosurvey Newsletter, vol. 10, no. 4-8, 1978.
5. Commonwealth Geological Liaison Office, Newsletter, no. 2 & 4, 1978.
6. IMM, Transaction/Section C, vol. 86, Dec. 1977.
7. IMM Bulletin no. 856 & 857, March & April 1978.
8. Mineralogia Polonica, vol. 7, no. 1 & 2, 1976.
9. Het Eoceen in de Lokaalmoraine van Losser by G. Spaank, et. al. Staringia no. 4, 1978.
10. IMM, Transactions/Section A, vol. 87, Jan. 1978.
11. The University of Kansas, Paleontological Contributions, papers 88 & 89, 1978.
12. Early Tertiary spores and pollen grains from the coastal region of Bohai, 1978.
13. Oklahoma Geological Survey, Bulletin 123, 1977.

Student Loan Fund

Due to the poor repayment of loans given out in previous years by the Society to some geology students who needed financial help, the Council has decided to give loans this year only to the really needy students. Students applying for loans must satisfy the Council that they would not be able to complete their undergraduate course if they were not aided. No loans have yet been approved this year.

The Council is at present contacting all those whose loans are due to repay their loans and is also considering taking more drastic action to recover the loans that are due.

BKT

Membership

The following persons have joined the Geological Society of Malaysia:

Full members

Tay Thye Sun
96 Jln. Sultanah
Batu Pahat, Johor.

Razman Ariffin
c/o Malaysia Mining Corp.
8th Floor, MOCCIS Bldg.
Jalan Melaka, K.L.

John M. Clema
30 Pirie Street
Kent Town
South Australia.

John N. Grant
Billiton International Metals
P.O. Box 190
The Hague, Netherlands.

Justians M. Sitanggang
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National University of Malaysia
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Guillermo Cortez
P.O. Box 3767
La Paz, Bolivia.

Natee Bungbrakearti
P.O. Box 45
Amphoe Muang
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Thailand.

Dr. Norman J. Jackson
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Jeddah, Saudi Arabia.

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Chulalongkorn University
Bangkok, 5, Thailand.

Rendana Taryat
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Institute of Earth Science
Fac. Sc. Kagoshima University
Kagoshima, 890 Japan.

M.K. Ginting
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Kawasaki-shi, Japan 213.

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8000 Munchen 50, W. Germany.

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Casilla 5796
La Paz, Bolivia.

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 Chiang Mai University
 Chiang Mai, Thailand.

Rak Hansawek
 Economic Geology Division
 Dept. of Mineral Resources
 Rama 6 Road
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Wilson S. Fontanelli
 Rua Joaquim Guarani, 151
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 Brazil.

Surapon Arrykul
 Dept. of Mining Engineering
 Prince of Songkhla University
 Hat Yai, Thailand.

M. R. C. Borges Da Fonseca
 CPRM-DEPEM/DIENGE
 Au Pasteur 404 Bloco A-Y
 Praia Vermelha
 20.000 Rio de Janeiro, Brazil.

Obituary

With the untimely departure of Dato Y.S. Leow on April 16 1978, the Society has lost one of its most active and oldest member. Dato Leow, the President of the All-Malaya Chinese Mining Association was the most outspoken representative of the gravel pump mining community and was an active participant in many meetings such as the GSM's sponsored National Seminar on the Mining Industries last year.

Although Dato Leow had no formal geological training, he showed great interest in many of the Society's activities and assisted the Society in soliciting donations for some of its conferences and symposia. Many Society members will remember Dato Leow's warm welcome when they visited his marble factory in Chemor, near Ipoh, following the Ipoh Discussion Meeting in 1976.

Dato Leow was born in New Zealand and after his education in the Maori Royal College, he returned to China to teach in the Kwantung Province. In 1937 he migrated southwards, first to Haadyai, Thailand and then to Ipoh, Perak where he began his life in the mineral industry. After several years of hard work he established himself as an authority in gravel pump mining operations and also became one of the best known miner in this country. He had also written several papers on the tin mining industry in Malaysia particularly on gravel pump mining.

BKT

Change of address

The following members have informed the Society of new addresses as indicated:

Foong Yin Kwan
4/41 Peter St.,
Box Hill Nth., Vic. 3129
Australia.

B. Biswas
123 Jalan Hitam Manis
Chip Bee Gardens
Singapore 10.

Dr. Patrick J.C. Ryall
Dept. of Geology
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Halifax, Nova Scotia B3H 3J5
Canada.

Brian W. Hester
Texasgulf Inc.
Project Evaluation Dept.
11005 Ralston Rd., Suite 201C
Arvada, Co. 80004, USA.

Dr. J.H. Bennie
107 Leslie Avenue
Hamilton, Ontario, L9C 1M4
Canada.

Hubert van Wees
c/o UNDP
P.O. Box 1423
Accra, Ghana.

Abdul Ghani Rafek
c/o Goethe Institut Freiburg
Welhelmstr. 17
D7800 Freiburg/Brsg
W. Germany.

Abdul Aziz bin Hussin
Jab. Kejuruteraan Petroleum
Univ. Teknologi Malaysia
Jalan Gurney
Kuala Lumpur 15-01.

Prof. Thomas W.C. Hilde
Department of Oceanography
College of Geosciences
Texas A & M University
College Station, Texas 77843
USA.

Say-Lee Kuo
5, 1528-28 Ave. S.W.
Calgary, Alberta T2T 1J2
Canada.

Miss Lim Peng Lai
963 Lorong Sena Tiga
Pekan Sari
Banting, Selangor.

Dr. S.H. Chan
15 Jln. SS2/40
Petaling Jaya
Selangor.

Address wanted

We would like the current addresses of the following members:

Nasiman b. S'apari
formerly of I.T.C.
P.O. Box 6
Enschede, Netherlands.

Ecole Polytechnique
Bibliotheque
Formerly of C.P. 501
Snowdon, Montreal 248
Canada.

O T H E R N E W S

Lecturer in Geology

The University of Malaya has two vacancies for (a) Lecturer in Applied Geology and (b) Lecturer in Engineering Geology in Soil Mechanics and/or Rock Mechanics in the Department of Geology.

Salary scale: A14 - M\$1285 x 60 - 1405/1465 x 60 -
1585/1705 x 100 - 2205.

Revision scale A10 - M\$2305 x 120 - 2425.

Applications could be made through the Deputy Registrar, Staff Section, University of Malaya, Kuala Lumpur 22-11, Malaysia.

Siamos

An international symposium on "Water in Mining and Underground Works" will be held in Granada, Spain on 18-22 September 1978. This symposium is aimed at people concerned with water in mining and underground works and hopes to bring together specialists of different countries to discuss and evaluate the new developments in the field.

For additional information please write to the Secretary of SIAMOS:

Prof. Dr. Eng. Rafael Fernandez-Rubio
Director of the Work Group of Hydrogeology
Universidad de Granada
Apartado de Carreos, 556
Granada, Spain.

Tungsten Meeting

The Institution of Mining and Metallurgy will hold an extended ordinary general meeting on 14 December, 1978, for a discussion of tungsten. This is the third 'commodity' meeting held for the discussion of a single mineral, and is planned to follow the general pattern of the meetings on "Tin: mining, metallurgy and economics", held in December, 1976, and on "Fluorspar", held in December 1977.

Seapex Publication

Thirteen papers recently presented at the 'SEAPEX Offshore Southeast Asia Conference in Singapore, are available for sale. These come in sets with attractive folders. Orders may be made from SEAPEX, Tanglin P.O. Box 423, Singapore 10.

Open Earth Publication

A new international non-profit magazine is to be launched by the Open University, as a quarterly during the second half of 1978. One of the aims will be to report and comment on important issues and advances in the solid Earth Sciences. It will review all English language books published on the Earth Sciences since 1st January 1978, something which no other journal has claimed. The publication is to cater to busy practitioners and teachers of the Earth Sciences at all levels, in language comprehensible to members of all sub-disciplines.

The standard price for personal subscribers is £5.00 in Britain or US\$13.00 outside Britain (US\$17.00 Air Mail) for four issues. However, founder-subscribers who place their orders before 10 August 1978 need pay only £4.00 in Britain or US\$11.00 outside Britain (US\$15.00 Air Mail).

Those intending to subscribe should write to:

Subscription Department
Open Earth,
32 St James Close
Hanslope, Milton Keynes MK19 7LF, England.

Calendar

Under this column the Society will note coming events on meetings, courses and symposia of interest to members. Date in parentheses gives the issue of Newsletter containing more information pertaining to the event.

Geological Society of Malaysia1978

December : Seminar on 'The Petroleum Geology of the Sunda Shelf', Kuala Lumpur. Secretary, GSM, c/o Dept. of Geology, University of Malaya, Kuala Lumpur 22-11. (Nov-Dec 1977).

Other Events1978

- May 6 - 12 : Eleventh Commonwealth Mining and Metallurgical Congress in Hongkong. Secretary, The Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, England. (Mar-Apr 1977).
- May 8 - 11 : Offshore Technology Conference, Houston, USA. 6200 N. Central Expressway, Dallas, Texas 75206, USA.
- Jun 6 - 7 : Seventh Annual Convention of the Indonesian Petroleum Association in Jakarta. Chairman: I.P.A. Lecture Committee, Jalan Menteng Raya 3, Jakarta, Indonesia. (Jan-Feb 1978).
- Jun 23 - 28 : International Symposium on World Oil and Gas Occurrence, sponsored by Canadian Society of Petroleum Geologists: Facts and Principles of World Oil and Gas Occurrence. Calgary, Canada. Information: J. Browning, General Chairman, International Symposium '78, c/o 612 Lougheed Bldg., Calgary, Alberta T2P 1M7, Canada. (Jan-Feb 1978).
- Jul 2 - 4 : Fifth Southeast Asian Conference on Soil Engineering, Bangkok, Thailand. Dr. A.S. Balasubramaniam, Secretary, 5SEACSE, Asian Institute of Technology, P.O. Box 2754, Bangkok, Thailand. (May-June 1977).
- Jul 5 - 6 : International Symposium on Soft Clay, Bangkok, Thailand. Dr. R. Peter Brenner, Secretary ISSC, Asian Institute of Technology, P.O. Box 2754, Bangkok, Thailand. (May-Jun 1977).
- Jul 18 - 22 : 3rd Inter-Congress of the Pacific Science Association in Appropriate Technology, Bali, Indonesia. Miss Sjamsiah Achmad, Indonesian Institute of Sciences, Tenka Cik Ditiro 43, P.O. Box 250, Jakarta, Indonesia. (May-Jun 1977).
- Jul 30 - Aug 4 : Second Circum-Pacific Energy and Mineral Resources Conference, Honolulu, Hawaii, c/o AAPG, P.O. Box 979, Tulsa, Okla., 74101, USA. (May-Jun 1977).
- Sep 18 - 22 : Siamos, International Symposium on Water in Mining and Underground Works, Granada, Spain. Prof. Dr. Eng. Rafael Fernandez-Rubio, Director of the Work Group of Hydrogeology, Universidad de Granada, Apartado de Carreos, 556, Granada, Spain.
- Oct 2 - 9 : Geology and Palaeontology of Southeast Asia Symposium, Tsukuba, '78. Dr. Hisayoshi Igo, GPSEA Symposium Tsukuba, '78, c/o Inst. of Geoscience, University of Tsukuba, Ibaraki, 300-31, Japan. (Jan-Feb 1978).

- Oct 11 - 13 : Gulf Coast Association of Geological Societies (Gulf Coast Section, AAPG and Gulf Coast Section, SEPM) - Annual Meeting - New Orleans, Louisiana (Jules Braunstein, Shell Oil Company, Box 60775, New Orleans, Louisiana 70160). (Jan-Feb 1978).
- Nov 14 - 17 : Third Regional Conference on Geology and Mineral Resources of Southeast Asia, Bangkok, Thailand. Conference Secretary, IIGEOSEA, Division of Geotechnical & Transportation Engineering, Asian Institute of Technology, P.O. Box 2754, Bangkok, Thailand. (Jul-Aug 1977).
- Dec 14 : Tungsten Meeting of the Institution of Mining and Metallurgy, London. Secretary, Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, England.

1979

- 1979 : 14th Congress of the Pacific Science Association USSR. B.G. Gafurov, Chairman of the Soviet National Pacific Committee, Academy of Sciences of the USSR, Moscow. (Jul-Aug 1977).
- May 10 - 26 : Ninth International Congress of Carboniferous Stratigraphy and Geology, Washington, USA. President or Secretary-General, IX-ICC, 1979, Museum of Natural History, Washington, D.C., 20560, USA. (Sept-Oct 1977).
- Oct 8 - 12 : Tenth World Mining Congress, Istanbul, Turkey. Dunya Madencilik Kongresi Turk Milli Komitesi, Ziya Gokalp Cad. No. 17, Kat 8, Ankara, Turkey. (Jan-Feb 1978).

1980

- Jul 7 - 17 : 26th International Geological Congress in Paris, France. Secretariat General du 26eme Congres geologique international, Maison de la Geologie, 77-79, rue Claude Bernard, 75005, Paris, France. (Nov-Dec 1977).
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**PERSATUAN GEOLOGI MALAYSIA
(GEOLOGICAL SOCIETY OF MALAYSIA)**

Tujuan Persatuan Geologi Malaysia adalah untuk memajukan sains bumi, terutamanya di Malaysia dan tempat-tempat berhapiran. Sesiapa yang ingin menjadi ahli Persatuan sila dapatkan 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.

Annual Dues

The annual dues of Full Members and Associated Members shall be M\$15/- if paid in advance before the first day of each calendar year, M\$16/- if paid between 1 January and 1 March or M\$17/- thereafter. The annual dues for members elected after June 30 shall be M\$7.50 that year. An entrance fee of M\$5/- shall be payable on election.

Some Bahasa Malaysia (Malay) geographical terms

Bukit (Bt)	- hill	Kuala (K)	- mouth of river
Genting (Gtg)	- pass	Pulau (P)	- island
Gunung (G)	- mountain	Sungai (S)	- river
Jalan (Jln)	- road, street	Tanjung (Tg)	- cape
Kampung (Kg)	- village	Teluk (T)	- bay

