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

GEOLOGICAL SOCIETY OF MALAYSIA

N E W S L E T T E R

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GEOLOGICAL SOCIETY OF MALAYSIA

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MALAYSIA

GEOLOGIC NOTE:

Sunda - Land Bauxites: Related to Late Cenozoic sea level?

H.D. Tjia, University of Malaya

Grubb (1968) recorded an upper limit of 60 m (200 ft) above sea level for the occurrence of bauxite deposits in southeast Johore. This is strikingly similar to the summit elevations of bauxite deposits in the Riau Islands of Indonesia. Johnson and Marjono (1963) have shown on various exploration maps that bauxite occurs up to about 60 m altitude, with a few deposits reaching about 5 meters higher in the central Riau island group. When the writer was on an exploration assignment on Bintan Island, the main Indonesian bauxite producer, he also observed that workable accumulations only occur from 25 m to about 65 m above sea level, although the topography reaches higher altitudes (Exploration report Bintan, 1967; on file Bauxite Board, Jakarta).

The localities mentioned above are on the so-called Sunda-land, a large part of which is the present Sunda Shelf. The Sunda-land became stabilized by the end of the Mesozoic. During the Tertiary local warpings still occurred and accounted for the development of the Plateau Sandstone formation and isolated Tertiary deposits on the Malay Peninsula. There is evidence that marginal warping, such as along Malaya's west coast, has continued into Quaternary time, but on the whole the central Sunda area is believed to have been tectonically stable since the Neogene.

It is generally accepted that bauxite is formed by prolonged tropical weathering of various types of parent rock and that the deposits are associated with erosion planes. Apparently adequate drainage, but not too rapid percolation, is necessary to dissolve and carry off superfluous iron and silica compounds in order to leave behind the aluminum hydroxides. This prerequisite seems to be corroborated by the moderate to gentle slopes of bauxite deposits, e.g. 25° - 30° in Johore (Grubb, 1968) and generally less than 20° in Bintan.

Studies in different parts of the globe indicate a maximum Quaternary sea level of about 50 m above the present one. The controversy among Quaternary geologists with regard to an early or late Quaternary age of this high sea level has not yet been settled.

The summit elevations of bauxite in Johore and the Riau islands compare favourably with the maximum Quaternary sea level. The evidence appears to indicate a low relief erosion plane at that general level. This erosion plane or peneplain must have taken a long time to develop, even if its formation was speeded up by the tropical climate. Therefore, the previous ultimate baselevel of +50 m altitude is thought to have existed for some time in, supposedly, the Neogene. Once the right drainage conditions had been achieved, bauxitisation may have been a relatively rapid process. The duration of the Quaternary, thought to be 2 to 3.5 million years, was probably sufficient to form the minable deposits. The abraded bauxite concretions below the 60 m contour in Johore probably represent the result of Quaternary sea level changes, a possibility already hinted at by Grubb (p. 49).

In West Sarawak, along the northern margin of the Sunda-land, the majority of workable bauxite accumulations also occur below +60 m height. On Bukit Gebong bauxite exceptionally reaches elevations of over 240 m (800 ft) above sea level. Allen (1954) has explained the high marine terraces on the same hill as the result of isostatic uplift. The marginal position of West Sarawak on the Sunda-land makes young warping highly probable.

References:

Allen, A.W., 1954 - The geology of the Lundu District, West Sarawak; Geol. Surv. Dept. Brit. Borneo, Ann. rept. for 1952, 41-85

Grubb, P.L.C., 1968 - Geology and bauxite deposits of the Pengerang area, Southeast Johore: Geol. Surv. W. Malaysia, District Mem. 14, 1-108

Johnson, R.F. & Marjono, 1963 - Geology and bauxite deposits of the central Riau islands, Indonesia: Dir. Geol. Republik Indonesia, Publ. tekn., ser. geol. ekon. no. 6, 1-54

"SUNDA SHELF" MARINE GEOLOGY COURSE SUCCESSFULLY COMPLETED WITH MALAYSIAN-INDONESIAN CO-OPERATION

An unusual training course in marine geology was completed in Kuala Lumpur in early May. The course, sponsored jointly by the Governments of Malaysia and Indonesia, UNESCO, and ECAFE, involved twelve participants, all graduates in geology or geophysics, from six maritime countries in Southeast Asia: Malaysia, Indonesia, Thailand, South Vietnam, Republic of China, and Korea.

The objects of the course were to give theoretical and practical instruction in various aspects of marine geology, including geophysics, in view of the increasing activity in off-shore prospecting in the region and the great scientific interest of the sea floor in Southeast Asia.

The first part of the course, in the Department of Geology, University of Malaya, consisted of 6 days of seminars and practical periods and one field trip to sample an estuarine area.

The Government of Indonesia made available their oceanographic research vessel JALANIDHI, (680 tons gross) operated by the Hydrographic Branch of the Indonesian Navy, on which a voyage of 17 days was made in the South China Sea, visiting the Tambelan and Natuna Islands. While the main purposes of the cruise was training in the principles and techniques of marine geology (including geophysics), the cruise was planned to collect useful research data.

The work done included investigation of the sea bed by echo sounding and transit sonar (side-scanning sonar or "asdic"). Particularly interesting bathymetric results were obtained from the area of the "Singapore Deep" a depression more than 200 m deep in the Singapore Straits between St. John's island and Pulau Batam, where good reflections from the transit sonar indicate outcrops of steeply dipping folded strata in places. Bottom samples were taken using gravity corers, grab samplers, dredges, and underway samplers, and these will be studied sedimentologically, palaeontologically, and chemically.

An area southeast of Pulau Bunguran was surveyed in detail using a 7000 joule sparker source, on loan from the U.K. and operated by Dr Dash. About 170 sea miles (315 km) was traversed in a closely spaced pattern. A penetration of 0.5 seconds was achieved, and layers observed have been provisionally interpreted as:

1) Quaternary sediments;
2) well stratified, folded sedimentary rocks (possibly the ?Tertiary "Natuna sandstone"); and
3) ?Mesozoic basement.

Some major faulting can be distinguished. A more detailed interpretation of the records will be made shortly.

Brief reconnaissance surveys were made of the coasts of two of the Tambelan Islands, and of parts of Pulau Natuna Laut and Bunguran Island in the north Natuna group. With the exception of Bunguran there are no geological records from these islands.

The object of these surveys was:

a) To collect evidence bearing on sea level changes
b) To collect igneous rocks suitable for radiometric dating
c) To investigate the geological formations present with a view to interpreting seismic records

All these aims were accomplished in some degree. Evidence of a slightly higher level of the sea relative to the land was seen on all islands in the form of extensive terraces behind the beaches, about 1-2 m above present high tide level. Convincing confirmation was found on Tambelan Island in the form of dead coral in position of growth and shells of the giant clam (Tridacna) within about 0.25 m of present high tide level. Specimens of the Tridacna shell were collected for radiocarbon dating.

A layer of peat about 10 cm below low tide level was found on Bunguran Island, and probably formed at a period when sea level was relatively several meters lower than it is at present. A specimen of wood in the peat was also collected for radiocarbon dating. This work is in hand. Specimens of granite and basalt suitable for radiometric dating were collected from Tambelan Island and Bunguran Island. These will be dated by K/Ar and Rb/Sr methods by Mr J.D. Bignell of the University of Oxford.

Useful but necessarily very incomplete observations were made on metasediments, metabasites, and granites at Tambelan Islands, and chert, metasediments, granite, and "Natuna sandstone" at Bunguran and Natuna Laut. Evidence of local sulphide mineralisation was seen on Tambelan. The Natuna sandstone, which is unconformable on the other rocks, and only slightly folded, is coarse and appears permeable, and could form a suitable reservoir rock for oil if it occurs in suitable structures offshor . Tests are in hand.

The instructors for the course came from Malaysia, Japan, Britain, U.S., Indonesia, Germany and India. The course was directed by Professor N.S. Haile, of the University of Malaya, and instructors included Dr O. Kappelmeyer and Dr S.I. Sano (attached to ECAFE: Economic Commission for Asia and the Far East), Dr P.H. Stauffer (University of Malaya) and Dr B.P. Dash (Imperial College, London University). In addition individual seminars were given by Dr H.D. Tjia (on sea level changes affecting the Sunda Shelf region), Professor K.F.G. Hosking (offshore tin), Dr R.B.H. Hazelhoff (Offshore geochemical sampling), and Mr D.S. Dhillon (micropalaeontology of marine sediments).

Four of the participants came from Malaysia: Mr David Lee Thein Choi of the Geological Survey Malaysia, Sabah; Mr Eric Toh of Conzinc Riotinto; and Mr S. Panchatcharasivam and Mr Nik Mohamed of the Department of Geology, University of Malaya.

All the participants thrived on the rigours of a crowded work program on the ship and islands (assisted by dead calm sea for most of the voyage). It is a pleasure here to acknowledge the co-operation of the Commander C. Melontige and his crew, whose experience and hard work ensured the success of the expedition.

- NSH

THE SEPARATION OF CASSITERITE FROM SCHEELITE AT KRAMAT PULAI, PERAK

For many years cassiterite and scheelite have been recovered from the superficial deposits (a mixture of natural placers and tailings) at Kramat Pulai (the site of a famous, but now long-abandoned, hard-rock scheelite mine) in Perak State, West Malaysia.

A mixed cassiterite/scheelite concentrate is made by the usual gravity methods employed by Chinese miners and then the species are separated by flotation in a landchut.

A manageable amount of the concentrate is intimately mixed with the solid flotation reagent, that has the consistency of butter, and the mixture is then agitated in water at the upper end of a landchut in much the same way as when a 'normal' cassiterite concentrate is being upgraded. However, in the special case under review the reagent so modifies the surface of the scheelite that it is transported down the landchut whilst the cassiterite

remains at the upper end. In order to make acceptable concentrates the products are so treated three times. A typical analysis of a scheelite concentrate thus prepared is as follows:-

WO_3	-	76.76%
Sn	-	0.71%
As	-	0.03%

Recent cassiterite concentrates made by this method contained the following percentages of tin (Sn):- 74.1, 74.3, 73.9, 74.8 and 74.2

The flotation reagent at present used (and which differs somewhat from that employed when the writer first visited the area in 1955) is prepared as follows:

3 bars (each 12 in. X 2 in. X 2 in.) of Gossages' Brand hard household soap, 2½ pints of coconut oil (using a large beer bottle as a measure!) ¼ kati of washing soda and a half-gallon of water are boiled together for about 30 minutes. The product is allowed to cool and then about ½ lb of engine grease is mixed in.

It is, perhaps, also of interest to note that at the Bukit Mertajam Mine (near Kulim in Kedah) pyrite is separated from cassiterite by floating the former in a landchut, having first conditioned the concentrate by the addition of potassium amylxanthate and acid (J. Wilkins, Esq., private communication).

The writer is indebted to the manager of the Sam Yen Kongsi for details of the Kramat Pulai process.

- KFGH

INTER-CONGRESS MEETING OF PACIFIC SCIENCE ASSOCIATION

During the 11th Pacific Science Congress in Tokyo in 1966 the Pacific Science Council, at the suggestion of Professor N.S. Haile, explored the possibilities of holding an inter-congress meeting at the University of Malaya in Kuala Lumpur. Standing Committee chairmen of the Pacific Science Congress were invited by the Secretary of the Association in October 1967 to consider the possibility of a small meeting at the Malaysian inter-Congress to be held in May 1969. A good response was received to this invitation, and the suggestions were transmitted to the University of Malaya, Dr Bentley Glass, Chairman of the Association's Standing Committee on Science Education, visited Kuala Lumpur in September 1967 and discussed a meeting to be arranged by his Committee as part of the program of the Inter-Congress Meeting.

In January 1968 Mr Harold J. Coolidge, Council Member from the U.S.A., visited Kuala Lumpur and this resulted in an invitation by the University of

Malaya to the Pacific Science Council to hold an inter-Congress meeting in Kuala Lumpur from the 5th to 9th of May 1969.

Two kinds of meetings were organized, namely meetings of the Pacific Science Council and scientific sessions of the various Standing Committees.

The purpose of this meeting in the interim between Congresses was to consider and decide upon the time and place of the next Congress and any proposed amendments to the Constitution and by-laws of the Association. The 12th Pacific Science Congress will be held in Canberra, Australia, in 1972.

Standing Committees which participated in the Malaysian Inter-Congress are Anthropology and Social Sciences: Botany; Communication of Scientific Information; Geography; Population; and Science Education. The Standing Committee on Geology and Solid Earth Geophysics did not organize a meeting at this time.

The meeting of the Standing Committee on Geography dealt mostly with urbanisation and industrialization in the less developed countries. Progress in mapping operations was also discussed. The participants were requested to show sample maps which each country has produced recently.

Another important meeting during the Inter-Congress was the "Asian National IBP Programmes", which reported the highlights of activities in this region in relation to the International Biological Program.

Three geologists participated in the Inter-Congress: Dr N.A. Bogdanov from the USSR Academy of Sciences as Assistant to the USSR Council Member; Dr James F. McDivitt, Director of UNESCO Regional Office for Southeast Asia, and Dr J.A. Katili, Council Member for Indonesia.

- J.A.K.

NEWS OF THE SOCIETY

PRESIDENT's MESSAGE

On behalf of the council of the Society I wish to express our grief that so many people have lost their lives and property during the harrowing period of disorder which broke upon Kuala Lumpur and Petaling Jaya on Tuesday 13th May. We who are proud to call Malaysia our home have been deeply saddened by this terrible event which has caused tension where close harmony had existed. We fervently hope for a quick return of the harmony which was a feature of life in Malaysia.

The Society held an extraordinary meeting in the late afternoon of Tuesday the 13th May. Several attending members, as well as the guest speaker Dr Bogdanov, were unable to return home afterwards because of the outbreak of rioting and the imposition of a curfew. We are sorry that the scheduling of this meeting on the 13th should have involved those members in this inconvenience.

The daily imposition of a late-afternoon and night-time curfew in the Kuala Lumpur district is likely to continue for some considerable time. This will cause an inevitable slowing of the postal service, and Society publications and notices may therefore be later than usual in reaching you.

Until such time as the Kuala Lumpur curfew is relaxed until 7 or 8 p.m., the meeting programme of the Society will undoubtedly be curtailed. The council will keep the situation under review and endeavour to carry on the activities of your Society in as far as the curfew relaxation will allow. This may necessitate the scheduling of meetings earlier in the day than was usual in the past.

- CSH

MEETING OF 13MAY 1969: N.A. BOGDANOV

An extraordinary meeting of the Society was held at 5.00 p.m. on 13 May in the Lecture Room of the Department of Geology, University of Malaya. The President of the Society introduced the speaker, Dr N.A. Bogdanov, who spoke on the topic, "Geology and tin-bearing granites of eastern Siberia." Dr Bogdanov is a Senior Research Scholar in the Geological Institute of the Academy of Sciences in Moscow. He was partly responsible for compiling the beautiful 'Tectonic Map of Eurasia', and was visiting Kuala Lumpur as a delegate to the inter-congress meeting of the Pacific Science Council. A synopsis of Dr Bogdanov's talk follows.

The area under discussion is the easternmost portion of the Soviet Union, referred to as Northeast Asia. It is an area quite opposite to Malaysia in climate, but rather similar to West Malaysia in geologic structure. The similarities include:

1. A transitional position between the mainland of Asia and the circum-Pacific belt.
2. A folded belt of Paleozoic and lower Mesozoic rocks.
3. The main orogeny in Mesozoic time (Late Jurassic in northeast Asia).
4. Belts of granitic intrusions bearing tin and gold.

When the Tectonic Map of Eurasia was being compiled, it was thought these tin and gold belts were part of a circum-Pacific system, because they can be found in Northeast Asia, in the coastal region north of Vladivostok, in parts of Korea and eastern China, and in the Malay Peninsula.

The stratigraphic section in Northeast Asia starts with pre-Cambrian basement - old pre-Cambrian in the Siberian Shield, and younger pre-Cambrian in massifs to the south and east. Immediately on top of this basement is a section, about 14,000 meters thick, mostly of carbonate rocks, from Cambrian to Carboniferous in age. These have a miogeosynclinal character and are mildly deformed. Unconformably over this is a monotonous geosynclinal sequence of sandstone, siltstone and shale, of Permian to

Mesozoic age, called the Verkhoyansk Complex. These sediments are all of shallow-water origin. Although a total thickness of 20,000 meters has been estimated, this is not all present at any one place, the axis of sedimentation having migrated from west to east during deposition, resulting in a gross structure not unlike cross bedding. Below the Verkhoyansk Complex are the folded Paleozoic carbonates or, locally, the pre-Cambrian basement.

Much granite, some of it tin-bearing, was intruded into this region in the Mesozoic. It was first thought that all the granites were Upper Cretaceous, but many Jurassic granites are now known.

The tin-bearing granites occur in belts along the cores of anticlinal upwarps and also, as recently shown, along the centers of synclinal downwarps. Tin-rich granites are generally small bodies much younger than the main mass of granite. Only those granites which have intruded the Palaeozoic carbonates possess tin and gold. Granites with gold occur along faults and shear zones; those with tin occur along zones of extension.

The volcanic belt which separates the Mesozoic and Cenozoic folded belts contains little mineralization, compared with the Mesozoic belt.

In the coastal region north of Vladivostok occur typical eugeosynclinal sediments. The tin-bearing granites here are mainly post-orogenic Upper Cretaceous bodies along the marginal part of the volcanic belt. In Central Asia, Korea, and China, also, much of the tin is related to small post-orogenic granites. This belt of post-orogenic granites becomes lost in southern China, and there is not enough information to establish its continuation, if any.

The Malay Peninsula is geologically part of Asia, intermediate between the mainland mass and the circum-Pacific belt. The geology is very similar in North Vietnam: geosynclinal development finished in early Triassic, the main orogeny was in middle Triassic, and there are later Mesozoic (mostly Cretaceous) molasse deposits on top.

It is likely that when enough Malayan granites have been dated, they will fall into three groups: 1) Triassic, synorogenic; 2) later Jurassic, almost synorogenic; and 3) Upper Cretaceous, post-orogenic. In Australia it has also been found that the tin deposits are associated with Upper Cretaceous post-orogenic granites.

The volcanic belt in Northeast Asia cuts across all the geologic structures. It continues down through Korea and eastern China and then becomes lost in Southeast Asia. More data may allow tracing it through this area. One should look for post-orogenic volcanic rocks. Perhaps it is under water in the South China Sea?

In the circum-Pacific belt the mineralization is quite different from that in the Mesozoic belts, being characterised by mercury and the absence of tin and gold.

Just as the Mesozoic folded belt in Northeast Asia surrounds and wraps around several pre-Cambrian massifs, the Mesozoic folded belt in Southeast Asia wraps around the Indochina massif. Tin deposits in the former are concentrated near the edge of the massif; if the same is true here, parts of the South China Sea floor should be tin-rich.

Discussion:

N.S. Haile: What are the characteristics of the volcanic belt that might continue under the South China Sea?

N.A. B.: The volcanic rocks are mostly of Upper Cretaceous age, up to 4000 meters thick, with the lower part andesitic. It includes some intrusions, both the same age and younger.

C.H. Yeap: Are there chemical differences between the synorogenic granites and the post-orogenic ones? And also between the tin-bearing and tin-barren granites?

N.A.B.: There are major differences between two geographic groups of granites: those in the central and in the western parts of the region. This is probably because one set has come through Paleozoic sedimentary rocks, the other has not; tin is found only in the former.

There are also differences between tin-rich and tin-barren granites, but I don't have any analyses with me.

W. Bush: Are the economic tin deposits connected only with the major tin-bearing granites?

N.A.B.: Yes

K.F.G. Hosking: What is the nature of the tin deposits?

N.A.B.: Alluvial. The orogeny finished in Cretaceous: by the end of the Cretaceous the country was a high plateau with little relief (no Tertiary continental sediments are known, apart from two tiny basins). All the rich tin alluvium is early to middle Quaternary in age and thought to have been formed in the first period of erosion of the area, which now has rugged relief and peaks to 3000 meters. There is little or no hard rock mining.

S.S. Rajah: Do you have older volcanic rocks as well?

N.A.B.: In most of Northeast Asia there are very few. In the eastern part, and also in the coastal region north of Vladivostok, there are abundant basic volcanic rocks of Triassic and Jurassic age.

S.S. Rajah: Are your 'granites' true granites?

N.A.B.: I use the word in the broad sense; most are really granodiorites.

K. Ganesan: Is the tin associated with granodiorites or true granites?

N.A.B.: With granodiorites and coarsely porphyritic granites.

C.S. Hutchison: It's interesting that much of the Main Range in Malaya consists of such porphyries, with large regular feldspar phenocrysts and a rather fine-grained groundmass which by itself would be called a microgranite.

P.H. Stauffer: Your Mesozoic folded belt wraps around some pre-Cambrian massifs. What was the geography when the sediments were laid down?

N.A.B.: The Siberian Shield was on the west, bordered by younger pre-Cambrian massifs to the east and south; all of these served as a platform and received shallow-water sediments. The folded belts developed both on the boundary between older and younger pre-Cambrian and also surrounding the younger massifs. The folded belts carry over into the Brookes Range of Alaska.

K.J. Pocock: Is the difference in mineralization between the tin-bearing belts and the circum-Pacific belts a result of their different structural positions or their different ages?

N.A.B.: Their structural position. This is the most important factor; the age is a little different everywhere.

Professor N.S. Haile proposed a vote of thanks to the speaker for an interesting and enlightening talk, and the meeting adjourned. About 30 members attended.

Note: Dr Bogdanov was at a restuarant with some of the members on the evening of the 13th after his talk, when the disturbances began and the curfew imposed. He spent most of the night in a Petaling Jaya police station, and the rest of it at Professor Haile's home. Later he was able to be escorted back to his hotel and then to the airport.

- PHS

New Members

At its meeting on 5th May 1969, the Council elected the following to membership in the Geological Society of Malaysia.

Full Members:

Estoque, Melecio C., Geology Department, ACMDC Lutopan, P O Box 223, Cebu City, Philippines

Hayden, Arnold C., P O Box 2158, Brunei Town, Brunei

Roth, Jim C., 5000 Stockdale Hwy, Bakersfield, California U.S.A.

Sakdejayont, Kiet, Economic Geology Div., Department of Min. Resources, Bangkok 4, Thailand

Stach, Leopold W., United Nations, ECAFE, Sala Santitham, Bangkok, Thailand

Full members promoted from student membership:

Lum Har Chi, 33 Dunearn Close, Singapore 11

Quah Pheng Hai, Hong Kong and Killinghall Tin, Ltd., Puchong, Selangor

Student members: Lee, Roland M.S. 14 Hubert Henderson Place, Remuera, Auckland, New Zealand

Rafek, Mahillan B. (Miss), 21 Jalan Davis, off Pasar Road, Kuala Lumpur

CHANGE OF ADDRESS

Mr W.E. Bush advises that his new address is Pacific Oriental Minerals, 3rd Floor, Straits Trading Building, Leboh Pasar Besar, Kuala Lumpur, Selangor (tel. 21201).

Mr Chan Seng Hon is no longer in Ipoh and his new postal address is P O Box 242, Kuala Lumpur, Selangor.

Mr P. Collenette has joined a large exploration project in Arabia, and until further notice his address is c/o Directorate of Mineral Resources, P O Box 345, Jeddah, Saudi Arabia.

Dr J.F. Lambert's new address is the Anglo American Corporation of Australia Ltd., 13th Floor, 60 Market Street, Melbourne, Victoria, 3000, Australia.

Mr Lum Har Chi advises that his address is now 33 Dunearn Road, Singapore 11.

Mr S. MacDonald advises that his address is now 48 Pine Ridge, Donvale, Victoria, 3111, Australia.

Mr P. Muthu Veerappan advises that he is now at the Laboratory Division, Conzinc Riotinto Malaysia Sdn. Bhd., Gopeng Estate, Kampong Kepayang Post, Perak.

Mr H.W. Oliver advises that he is leaving Malaysia, and after 1st August 1969 his address will be "Minstead", Blakemere Lane, Norley, Warrington, Lancs., U.K.

Mr S.R. Rexworthy is no longer with Ocean Mining, and his new address is 1225 Sheridan Boulevard, Denver, Colorado 80214, U.S.A.

Mr C.W.E.H. Smith notes that his office of Associated Mines (M) Ltd. in Bangkok, Thailand has moved to a new address, 604 Kasemkij Building, 120 Silom Road (tel. 38991-0, ext. 54).

Mr M.J. Sweet has moved to 21-H Taman Serasi, Singapore 10 (tel. 646598).

Mr Wan Hassan Mahmud advises that his address is now No. 64-66 Malayan Finance Building, Room no. 1, 1st Floor, Jalan Yang Kalsom, Ipoh, Perak.