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GEOLOGIC NOTES

Assumed rocks of Singa Formation on Rebak Islands (Langkawi), Kedah, West Malaysia

S. Sartono, Jabatan Kajibumi, Universiti Kebangsaan

On the geological map of Koopmans' paper (Koopmans 1965 text fig. 1) and also in the geological map of Pulau Langkawi, new series West Malaysia, 1:63,360 sheet 150, it is shown that the Rebak Islands, in the southwest of the Langkawi Islands group, which consist of the islands of Rebak Besar, Rebak Kechil, and Selat Senari (see Fig. 1), are built of rocks belonging to Machinchang formation. However, a specific description of the rocks on these islands has not been given by Koopmans, although he stated (Koopmans, 1965, p. 502):

> "..... the Machinchang formation of Upper Cambrian age as described by Jones (1957), is in Langkawi restricted to the north-west corner of Pulau Langkawi and to Pulau Rebak Besar and Rebak Kechil. The sequence is mostly arenaceous and sometimes even conglomeratic..... Well developed current bedding indicates a shallow water environment".

On the legend of the above mentioned geological map of Pulau Langkawi a description of Machinchang formation is given as follows:

> "Circa 6500 feet of bedded conglomerate, grit, quartzite, subgreywacke, flag, and shale; being essentially arenaceous in the upper part of the succession and argillaceous in the lower part. A thin band of limestone occurs near the top of the formation".

In this legend the age of the formation is also given as Upper Cambrian.

For several hours on 18 December 1971, the author visited Rebak islands. During this visit the author gained the impression that the rocks of these islands occur in a clay-stone and sandstone facies. On Rebak Kechil and Selat Senari the rocks consist of sandstones and siltstones, which have a conspicuous red as well as yellow colour. These same rocks can also be found on the southeastern coast of Rebak Besar. On the south coast of this island whitish-grey to light-grey claystones can be observed. Fossils were not encountered in these rocks during the visit so that their age cannot yet be established. On the east coast of Rebak Besar, opposite Selat Senari, is found a small outcrop consisting of sandstones showing cracks, in many places filled by veins consisting of quartz and iron-oxide. On this occasion, due to lack of time, the northern and the western coast of Rebak Besar were not visited.

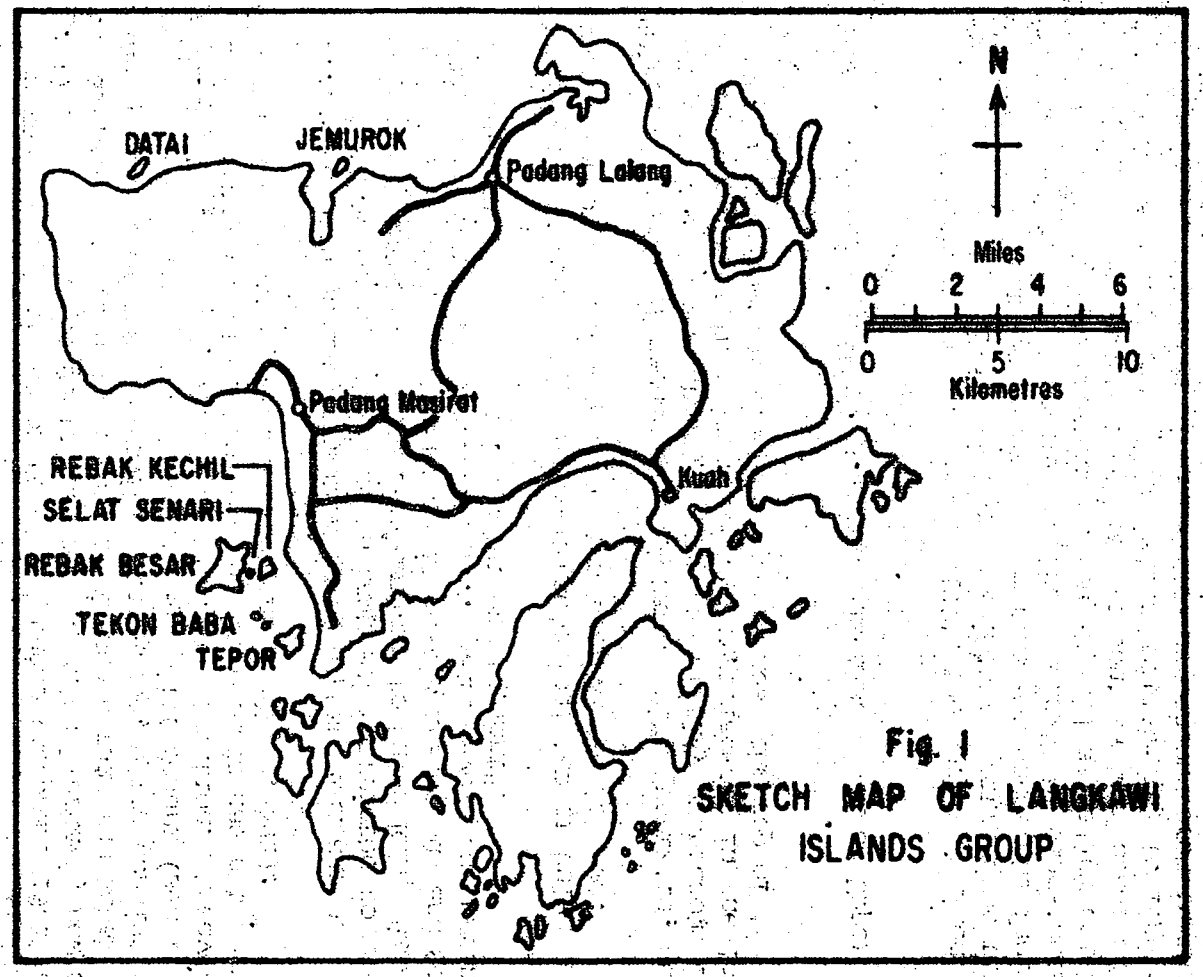

Fig. 1
SKETCH MAP OF LANGKAWI ISLANDS GROUP

The author is of the opinion that the rocks of the Rebak Islands described above, with the exception of the outcrop opposite Selat Senari, do not fit with the description of the rocks of Machinchang formation given by Koopmans (1965), which is taken from Jones (1957), and are also not similar to the description of rocks of the same formation as stated in the legend of the geological map of Pulau Langkawi published by the Geological Survey of Malaysia in 1966. Those particular rocks resemble more closely the description of Singa Formation, especially in its basal and middle part, which consists, as stated in the legend of the above mentioned geological map of Pulau Langkawi, of a "prominent yellow sandstone in its middle part and brick-red conglomeratic mudstone in its basal part".

For the purpose of having a better knowledge of Machinchang formation the author visited several places on the northwest coast of Langkawi, including the islands of Datai and Jemurok, which are entirely build of this formation. At those places visited by the author, quartzite, sandstone, greywacke, slate, conglomeratic sandstone, and cross-bedded sandstone, are found. None of the typical yellow and red sandstone, as well as the light-grey to whitish-grey claystone, can be observed in those places visited.

Based on the results of the visit to the Langkawi Islands group, the author is of the opinion that the rocks of the Rebak Islands are not entirely built of Machinchang formation. The small outcrop on Rebak Besar opposite Selat Senari very likely contains rocks which belong to the Machinchang formation. Those from the southeast and south coast of this island probably belong, lithologically at least, to the Singa Formation. The same is also true for Rebak Kechil and Selat Senari.

On the islands of Tepor, black shales similar to those of Tanjong Meri and Tanjong Sawa on the south coast of Langkawi are found. These lithologically similar rocks can also be encountered at two small cliffs, called Tekon Baba, which occupy a position between Tepor and Rebak Besar. The black colour of the rock formation on Tekon Baba contrasts very sharply to the yellow and red sandstones on Rebak Kechil and Selat Senari.

As has been stated by Koopmans (1965, p. 504) the Setul Formation is absent between the Machinchang Formation on Rebak and the Singa Formation on Tepor, which suggests a structural contact or an unconformity on the base of the Singa Formation. If this assumption is right, then the contact between the Machinchang and Singa Formations, either structural or stratigraphical, in this part of the area, would very likely run somewhere between Tekon Baba and Rebak Kechil. If the author's assumption that there are rocks of Singa Formation in Rebak

Islands is correct then possibly we should not have a structural but a stratigraphical contact between the Machinchang and Singa Formations in this area. This contact should then be found on Rebak Besar, where the author assumes the existence of rocks from both the Machinchang and Singa Formations. The almost regular pattern of strikes and dips of the Singa and Machinchang Formations along the southcoast of Langkawi, Tepor, and Tekon Baba on one hand and on Rebak Kechil, Selat Senari, and on the southeast and south coast of Rebak Besar on the other, may also suggest a continuous sedimentation between the black shales of the Singa Formation and the yellow and red sandstones as well as the light-grey claystones of Rebak Besar. This may also show a stratigraphic gap between the Singa and Machinchang Formations on this island.

The nature of the author's visit to the Rebak Islands made a more detailed geological investigation of these islands impossible. It is hoped that in the near future more rock samples from those islands could be collected, preferably containing fossils, so that more knowledge could be obtained concerning their geology; especially whether it is true that the Rebak Islands consist wholly of Machinchang Formation or that part of it is built also of Singa Formation.

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Carboniferous fossils from the "Raub Group" near Cheroh Village, western Pahang, West Malaysia.

Thomas E. Yancey, Department of Geology, University of Malaya

New fossil localities occurring near the base of the "Raub Group" in western Pahang were reported by Tan and Sivam (1971). Collections from these localities contain many invertebrate fossils, mostly species of productid and spiriferid brachiopods, and bivalves, particularly pectenid bivalves. These fossils are of Lower Carboniferous (Visean) age, based on the brachiopod species *Eomarginifera tenuis* and *Punctospirifer pahangensis*, dating the "Raub Group" near its base as Lower Carboniferous. A Carboniferous age for this unit has been suggested by Alexander (1968), based on physical correlation with fossiliferous Carboniferous and Permian strata in the Kuala Lipis region, in northwest Pahang. The discovery of these fossils strengthens the assignment of a Carboniferous-Permian age for this unit.

The sequence of strata called "Raub Group" consists of argillaceous and calcareous shales and limestones, intimately interbedded and containing few stratigraphic marker beds. They overlie a thick sequence of steeply dipping terrigenous rocks containing conglomerates, shales and cherts, which border the eastern edge of the granites of the main range, and underlie a sequence of terrigenous rocks containing Triassic fossils (Alexander, 1968). The name "Raub Series" was first used for this set of strata by Scrivenor (1907) and has been used interchangeably with the term Calcareous "Series" or "Formation" in this area since that time.

Fossils were found at two localities about 200-300 yards apart (see Fig. 1). They are approximately along strike from each other, although the lack of continuous intervening exposure makes a precise correlation uncertain. Both localities lie within several hundred feet of the basal contact of the "Raub Group" with conglomerates of the underlying stratigraphic unit.

University Malaya locality A-53: Fraser's Hill map sheet, grid ref. (Yards) 473,700 y.N.; 463,400 y. E. This locality is in the stream bed of Sungei Chembatu about 2-300 yards above the stream junction with Sungei Cheroh. Fossils occur in strata exposed in the stream bed above and below a bridge crossing the stream in a rubber estate. The fossils have been found within a narrow stratigraphic interval. This locality has produced an abundance of brachiopods and bivalves, both in numbers and diversity, but few other fossils. They are preserved as leached impressions in a soft to hard metashale. Interbeds of this rock contain large volcanic clasts "floating" in a mud matrix.

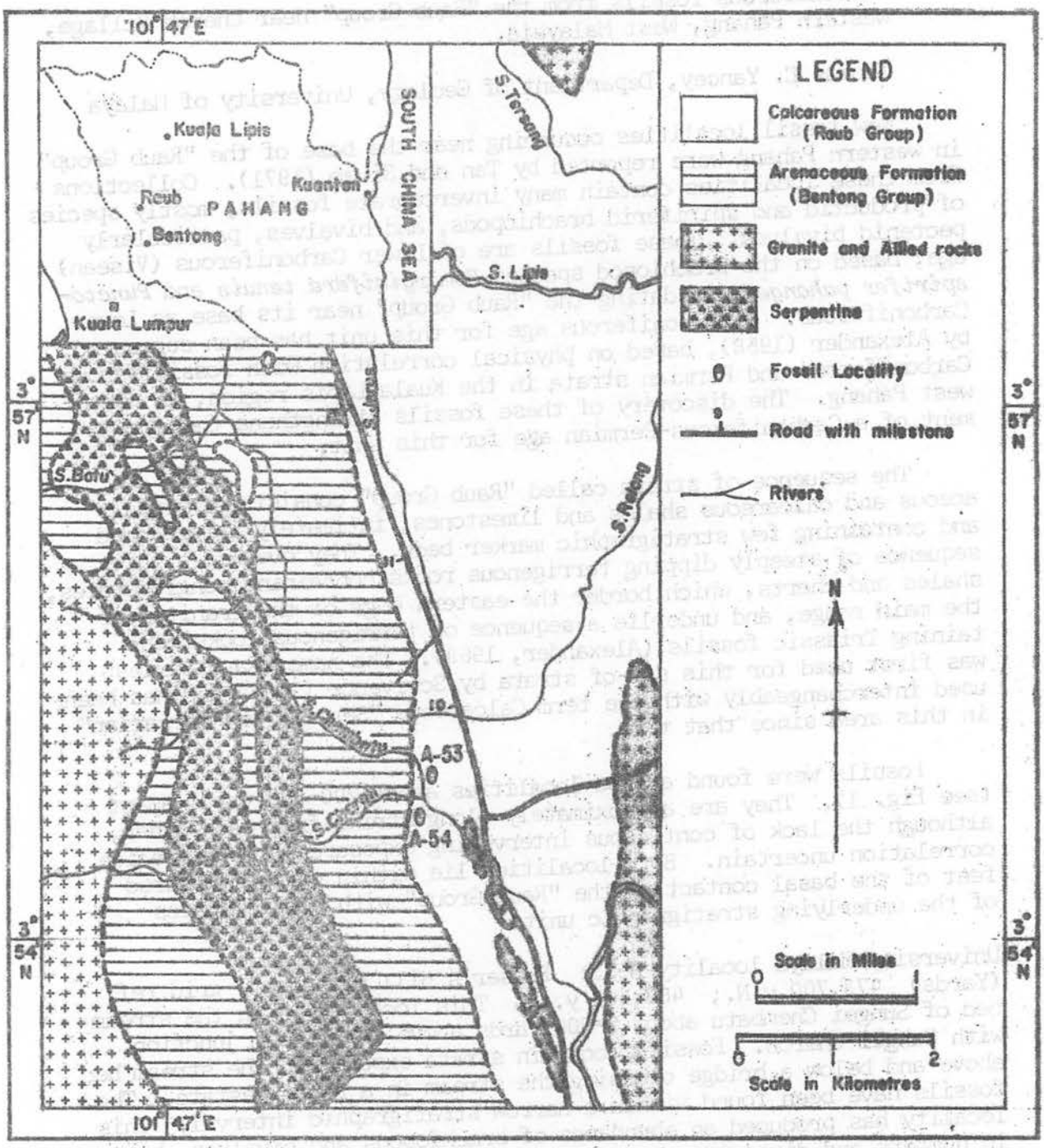

Fig. 1 Geologic Sketch Map Showing the Fossil Localities
(Modified from Richardson 1939)

University Malaya locality A-54: Fraser's Hill map sheet, grid ref. (Yards) 473,500 y.N.; 463,200 y.E. This locality is in the stream bed of Sungei Cheroh, about 10-20 feet above the junction of the stream with its last tributary before it joins with Sungei Chembatu. Fossils occur in strata striking across the stream bed, and over a stratigraphic interval of 5-10 feet. They occur in hard indurated sediments showing rhythmic bedding and graded bedding. A few interlayers contain concentrations of cobbles of various rock types. This locality has yielded only siphonophore and hexactinellid sponge fossils.

The following species have been identified from the collection. Identifications may be changed with further work, and some appear to be undescribed species.

A-53 - Brachiopoda

Leptaena sp?
Linoproductus sp
Eomarginifera tenuis - common
Echinoconchus sp.
Composita sp?
Schizophoria sp.
Punctospirifer pahangensis - common
Spiriferina transversa ?

Bivalvia

Polidevcia sp?
Promytilus sp.
Streblopteria sp. - common
Aviculopecten sp.
Pernopecten sp. - common
Bakevellia sp?
Astartella sp.
Parallelodon sp.
Palaeosolen sp?

Echinodermata

crinoid columnals - common

A-54 - Spongia

hexactinellid sponge

Coelenterata

Plectodiscus sp. (jellyfish) - common

Eomarginifera tenuis: This the commonest species in the collections from A-53.

Eomarginifera is a middle Carboniferous genus widespread in Europe and Asia. The Cheroh material is similar to the type species of the genus, and is identified to a species described by Chi-Thuan (1969) for material from south Laos. Muir-Wood (1948) tentatively identified similar forms from the Kuantan area as *Buxtonia* sp?. *E. tenuis* indicates a probable Visean age.

Punctospirifer pahangensis: This is a common species in collections from A-53. It has been well described by Muir-Wood (1948), and is indicative of Lower or Middle Carboniferous, probably Visean, age.

Composita sp?: Several large, well-inflated, smooth-shelled brachiopods with elongate beaks are present in the collections. These brachiopods appear to be more similar to the genus *Composita* than to *Schizophoria, Reticularia* or any other comparable brachiopod.

Pernopecten sp.: This species is moderately abundant in the collections, and is quite similar to the genotype species, *P. limaformis*. This genus is easy to recognize in faunal collections, and has a geologic range restricted to the Carboniferous and Permian.

Streblopteria sp.: This is the most abundant bivalve in the collections. Species assignments in the genus are so poorly known that it cannot be used for age determinations.

Plectodiscus sp.: This jellyfish fossil is moderately abundant at locality A-54, and is sufficiently well preserved for species determination. The Vellelidae are long ranging but very rarely found as fossils.

The age of the fauna from locality A-53 is well dated as Lower Carboniferous, Visean. The two species from A-54 cannot be dated, but on the basis of stratigraphic position they are believed to be of roughly similar age as A-53. These faunas correlate closely with the lower Carboniferous faunas near Kuantan, in eastern Pahang, reported by Muir-Wood (1948) and Fitch (1951), and with the Lower Carboniferous faunas near Kuala Lipis, northern Pahang (Muir-Wood, 1948).

The Cheroh faunas are definitely quiet water faunas, and probably of shallow water origin, similar to the environment of deposition of the Kuantan faunas. In the vicinity of Cheroh the sea water was apparently very turbid, resulting in a lack of bryozoa and corals, and very few echinoderms. The shallow water aspect is emphasized by the abundance of large free-living brachiopods and the presence of the bivalves *Promytilus*, *Astartella* and *Parallelodon*. Even the locality with *Plectodiscus* sp. and hexactinellid sponges may be relatively shallow, as indicated by the presence of conglomerate lenses.

I am grateful to B.K. Tan and S.P. Sivam for showing me the material and taking me to the localities to collect more, and to C.T. Tan who collected most of the material from locality A-53, and to E.S. Yancey for helping me collect. Enche Roslin bin Ismail drafted the map.

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Note on the geology of the granite island, Pulau Jarak, Malacca Straits.

N.S. Haile and S.P. Sivam, Department of Geology, University of Malaya.

Abstract

Pulau Jarak is formed of coarse porphyritic and non-porphyritic granite, cut by dykes of medium grained granite, aplite, and tourmaline veins. Tourmaline clots are common throughout the granite. A K/Ar age determination on biotite from the granite gives an age of 55.5±1.5 m.y., possibly reflecting an Eocene tectonic event. No sign of Quaternary volcanic ash was seen in soil overlying granite at the western end of the island.

Pulau Jarak was visited by the authors on 26 February 1970 in the course of a marine geology cruise, with a view to determining the geology, collecting specimens for radiometric age determination, and (following a suggestion by P.H. Stauffer) to seek traces of volcanic ash, such as is found in Perak and Selangor, and is believed to have been derived from Lake Toba in Sumatra.

The island has long been known for abundant friendly rats (of the distinct subspecies Rattus rattus jarak), and for its infestation with scrub typhus, a disease carried by mites which live on the rats, and has been visited by several zoological expeditions. The most complete account is that by J.R. Audy (1951); G.C. Madoc added a note on birds on the island (1957).

From observations on Audy's expedition by J. Wyatt-Smith, it was found that "there were relatively few species of plants, and that some common species (such as meranti), which are characteristic of the mainland forests, were completely absent. Further, many little societies of trees could be found, such as a group of figs or an isolated patch of six trees of the same species, and this is quite unlike a tropical forest, where specimens of any single species are usually widely scattered" (Audy, 1951, p. 43). Audy concluded "This island therefore had a distinctive flora and fauna, very poor in species of trees, and containing rats, land-crabs, skinks, and web-spinning spiders in large numbers, a flying fox, but relatively few birds, no squirrels, ordinary snakes, musangs; while many common insects were absent including cicadas, most grasshoppers, many common ants; and there were no snails...

we were able to agree that this was an oceanic type of island, at one time bare but now populated by introduced flora and fauna, and not a continental type of island which had merely become separated from the mainland so as to carry a representative but relict sample of plants and creatures."

The island is shown uncoloured on the 1963 geological map of Malaya (Alexander, 1965) and so presumeably had not previously been visited by geologists.

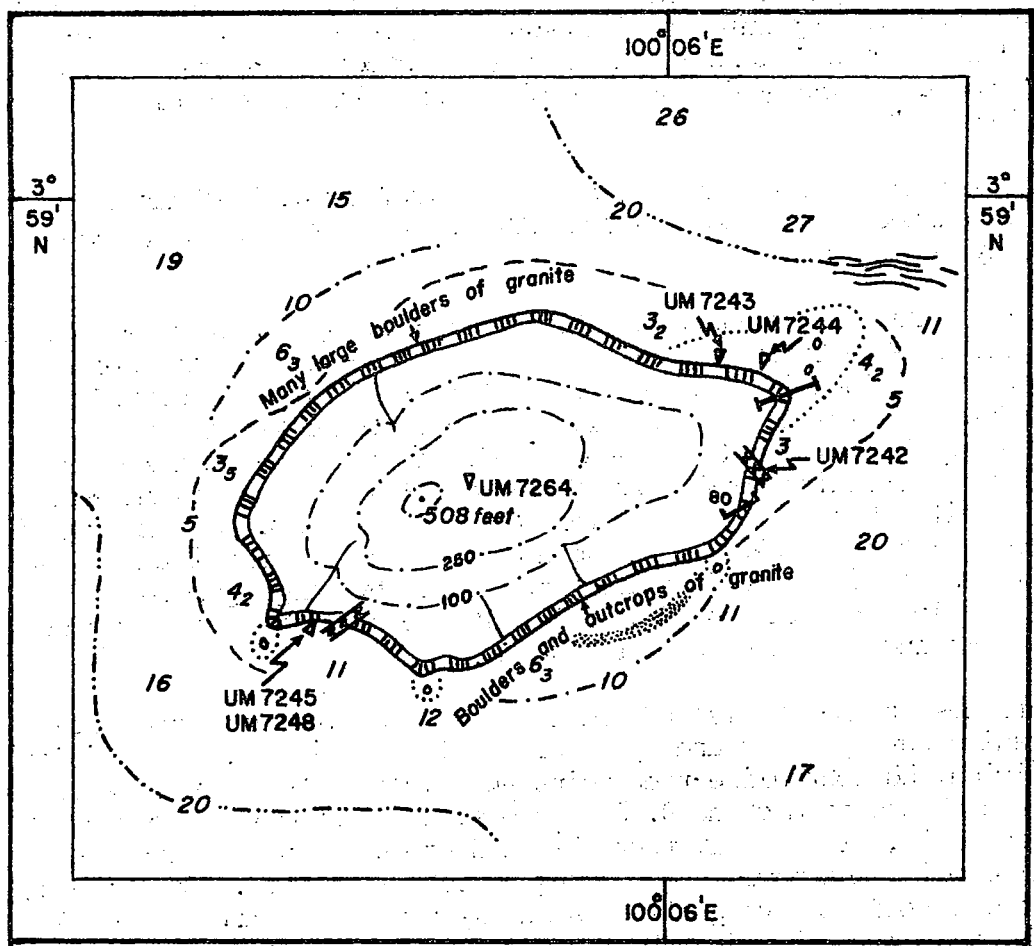
Pulau Jarak is situated at latitude 3°58'.6 N, longitude 100°05'.6 E., in the Malacca Straits about 70 km (43 miles) west of the Perak Estuary. The island is shown as 502 feet (153 m) high on admirality chart 3945. The island is 875 m long in an east-northeast, with a maximum breadth of 725 m (see sketch map). It is situated across a southeasterly trending bank about 16 fathoms (29 m) deep, in an area of the straits which is 22-40 fathoms (40 - 73 m) deep. A sounding of 57 fathoms (104 m) is plotted 250 m east-northeast of the island. The island rises steeply, and is mainly surrounded by large granite boulders or low granitic cliffs, with only two small beaches, at the extreme east and west ends of the island.

Outcrops around the island are of massive medium to coarse biotite granite cut by veins and dykes of granite, aplite, and containing biotite-rich and tourmaline-rich veins and clots. The tourmaline clots, some of which are as much as 0.25 m across, are commonly surrounded by a quartzose rim; in heavily tourmalinized parts of the granite, the tourmaline veins anastomose, enclosing "eyes" of granite. At the east end of the island massive granite is cut by veins of aplite up to 50 mm thick, and dykes of medium to fine-grained more leucocratic granite (UM 7242), some of which is porphyritic. The dykes are themselves cut by later tourmaline-rich veins (10 mm thick) dipping 120/70. At the east end of the island are some large boulders of porphyritic granite, containing feldspar phenocrysts up to 60 mm long, and abundant quartz-tourmaline clots (UM 7243).

The north coast of the island is formed of a jumble of granite boulders, up to 4 m across; most are coarse, non-porphyritic, and contain bluish-grey quartz, whitish feldspar, and biotite. A boulder of foliated gneissose granite with biotite-rich layers up to 40 mm thick was seen towards the eastern end, and contains feldspar phenocrysts aligned parallel to tourmaline veinlets.

Granite exposed at the southwest end of the island is coarse, porphyritic, containing pods of large crystals of feldspar, tourmaline-rich clots, and black pods, up to 0.3 m diameter, composed of more than 90 percent biotite. The coarse granite there is cut by a dyke

SKETCH MAP OF THE GRANITE ISLAND
PULAU JARAK, MALACCA STRAITS



Based on available hydrographic charts by N.S. Haile and S.P. Sivam 1972

0.25 m wide with a central part (0.15 m) of medium-grained granite with tourmaline clots, flanked on each side by 0.05 m of aplite. Among the predominant granite boulders, a block of rhyolite 0.3 m long was seen on the eastern end (UM 7244), and a few cobbles of andesite (UM 7248) occur in the beach at the southwest end. These rocks were not seen in outcrop. They may be derived from the island, from submerged rocks around the island, or have been brought here as ballasts in boats. Abundant cobbles and boulders of coral occur on the few small beaches.

A radiometric determination on biotite from UM 7245, using the K/Ar method, gave an age of 55.5±1.5 m.y. (Determination by Dr N.J. Snelling, Institute of Geological Sciences, London; personal communication from Mr J.D. Bignell). J.D. Bignell comments that this indicates that the Jarak granite has been involved in the earliest Eocene (or latest Paleocene) tectonic activity, which has had a marked effect on K/Ar ages from the Phuket area of Thailand and Gunong Jerai in Kedah (northwest West Malaysia).

The soil (mostly less than 1 m thick) overlying the granite at the west end of the island was examined and pitted in three places. No sign of volcanic ash was seen in the field, and two soil samples collected showed on microscopic examination no trace of volcanic ash consisting of quartz, mica, and tourmaline, and clays obviously derived from granite.

The peculiarities of the flora and fauna remain unexplained. It is to be supposed that the Malacca Straits were dry land during the glacio-eustatic falls in sea level in the Pleistocene, and it would be supposed that there would have been ample opportunities for it to be populated with mainland species. The following are possibilities:

a) The island was never connected to the mainland. Perhaps, in the Pleistocene, that part of the Malacca Straits was relatively deeper, so that the island was always separated by sea or wide rivers;

b) the island rose out of the sea by "neotectonic" uplift, only in post-glacial times - but in this case one would expect an even more impoverished flora;

c) the flora and fauna were destroyed by some catastrophe (such as fire or volcanic ash fall) after the main sea level lowering. P.H. Stauffer (personal communication) suggested that volcanic ash, found in Perak, and probably coming from Lake Toba in Sumatra, might have blanketed the island, and destroyed most of the life on it. However, the present investigation failed to find any traces of ash (although the search was not exhaustive), and the Toba

ignimbrite has recently been dated at 73 000 ± 12 000 (Ninkovich, Hays and Abdel-Monem, 1971), which is earlier than the last glacial lowering of sea level. Perhaps, after an unusually long drought, the island, being small and steep, could be swept by fires (started by lightning, or, in more recent times, by man) which might destroy much of the life on the island. This theory could be tested by a search for charcoal in the soil of the island.

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CONFERENCES

Regional Conference on the geology of Southeast Asia - Progress Report.

Preparations for the above Conference have reached an advanced stage. Between 150 and 200 participants are anticipated, drawn from countries of Southeast Asia and from oversea locations as far as London, Canberra and Denver. Academic, commercial and government organisations are represented. This is the first time that a gathering of so much geological experience, talent and local knowledge has been possible in Southeast Asia and the Society is confident that the result will be a significant advance in our geologic understanding of the region.

An extensive programme has been planned by the Organizing Committee. The Conference would be officially declared open by the Deputy Prime Minister of Malaysia at 9.30 a.m. on Monday, 20 March 1972 at the Lecture Theatre 3, Faculty of Science, University of Malaya. Two evening parties are also planned. A satay party will be held on the evening of Tuesday, 21 March 1972 and a Conference dinner is scheduled for the evening of Friday, 24 March 1972.

More than 50 papers are expected to be presented during the six days of the Conference. In addition, members of the UNESCO Committees concerned with regional stratigraphic correlations and the construction of a Tectonic Map of Southeast Asia will be participating in a number of discussion sessions which will be open to all Conference participants.

Response to the Society's appeal for funds for the Conference has also been encouraging. Donations at present total around $9,000 and were sought for two purposes:

1. To help to finance the publication of selected papers presented at the Conference, and

2. To allow the Organizing Committee, with discretion, to subsidise the travel and accommodation of earth scientist from Southeast Asia who would not otherwise be able to attend.

Companies or individuals supplying funds for either of the above uses will be clearly acknowledged in due course.

Silver Jubilee of the Birbal Sahni Institute of Palaeobotany, Lucknow, India

Twenty-five years ago on 10 September 1946 in a corner of the Department of Botany and Geology of Lucknow University, India, began the embryonic life of the present Birbal Sahni Institute of Palaeobotany which has since then grown into an autonomous Institute of international reputation. The late Professor Birbal Sahni was the Founder Director of the Institute. Professor O.A. Hoeg of the University of Oslo, Norway, was the director of the Institute (1951-1953) under UNESCO Technical Assistance Programme. The Institute has built a rich museum by regular collection of fossil plants from different parts of India and also by exchange from foreign countries. The collections include algae to pteridophytes, gymnosperms and angiosperms. In the berbarium the system of classification by Bentham and Hooker has been followed. The Institute published a journal - "The Palaeobotanist", the first volume of the journal was published in 1952 as the Birbal Sahni Memorial volume. The journal has now three issues per year.

In the Silver Jubilee Conference held from 5-11 December 1971 about 140 papers were presented from India and various foreign countries. Some special lectures were delivered and the following symposia were held: Stratigraphical palynology, Origin and phytogeography of Angiosperms, Morphological and stratigraphical palaeobotany, Late Quaternary vegetational developments in extra-European areas, Structure, Nomenclature and Classification of pollen and spores.

I attended the Silver Jubilee Conference and was admitted as a foreign delegate of the University of Malaya by the Institute of Palaeobotany, India. I presented a paper entitled: "On *Gangamopteris kashmirensis* Seward 1908". On the examination of the two syntypes of this species stored in the Geological Survey of India, Calcutta, I have concluded that *G. kashmirensis* shows a close resemblance to *Gangamopteris cyclopteroides var acuminata Feistmantel* 1886, all the syntypes of which were also examined by me in the GSI, Calcutta. Apart from the resemblance in apical outline in the two species, both the species show curved lateral veins. Both the species occur in the same geological horizon of Permian and have been reported to occur together in the Salt Range. In *G. kashmirensis* the lateral veins are more curved and in that species a gradual decrease of the breadth of the frond has taken place. These observations suggest that the two species belong to the same group where a specific intergradation has taken place.

On the other hand the recognition of *G. kashmirensis* as a different species and the very occurrence of it in Kashmir, which is situated far away from the classical Gondwana formations of India, have led to consider it as an independent stock. The present study draws a close affinity between the *Gangamopteria* of Kashmir with the main *Gangamopteris* flora of Talchir and Karharbari. The Malayan flora might also indicate Gondwana element as several authors have drawn close affinity between the Upper Palaeozoic of Kampar, Perak with the Agglomeratic Slate of Kashmir and between the Permian of Malaya and the Productus Limestone of Salt Range. A detailed paper on the *Gangamopteria kashmirensis* Seward 1908 will follow.

S.S. SARKAR

NEWS OF THE SOCIETY

Annual General Meeting

The Sixth Annual General Meeting was held in the Department of

Geology, University of Malaya, on 4 February 1972. Reports of the President, Secretary, Hon. Auditor, Assistant Secretary and Editor are being sent with this Newsletter. The meeting was followed by the Presidential Address. The outgoing President, Dr D. Taylor, spoke on "The liberation of minor elements from rocks during plutonic igneous cycle and their subsequent concentration for workable ores with particular reference to copper and tin". This Presidential Address will be published by the Society shortly.

Geology of the Malay Peninsula (West Malaysia and Singapore) Progress report.

The 1:1,000,000 coloured geological map of West Malaysia and Singapore, compiled by Dr D.J. Gobbett, printed for inclusion with the above book, will be on sale by the Society in early March 1972. The price is not yet fixed but is expected to be around $3.00 a copy.

The Wiley-Interscience "Geology of the Malay Peninsula" edited by Drs D.J. Gobbett and C.S. Hutchison, should be on general sale by August 1972. It will include one of the above maps. Copies may be purchased from John Wiley or through any book dealer. The price is yet to be fixed.

Donation to the Society

The Society was recently presented with a check for $6,000.00 from Esso Exploration Malaysia Inc. towards its Publication Fund. The Society has over the past few years, received similar donations annually from Esso as their contribution towards the publication and dissemination of information on the geology of Malaysia. In a letter accompanying the donation, Mr M.M. Tonglish, the President, Esso Exploration Malaysia Inc., expressed confidence that the Society will continue to be of great service not only to those in the profession but also the country. The Society is extremely grateful for Esso's substantial and continuing support.

Membership

New Members

1. Dr T.E. Yancey
   Department of Geology
   University of Malaya
   Kuala Lumpur

2. Mr Ponnambalam Loganathan
   Analytical Laboratories
   17 Jalan Lembah Kallang
   Off Bendemeer Rd., S'pore 12

3. Miss Dayangku Noralam Mahmood
   P O Box 1057
   Pejabat Penyelidekan Kajibumi
   Bandar Sri Begawan, Brunei

4. Mr Veijayaratnam Malavarayar
   Department of Geology
   University of Malaya
   Kuala Lumpur (Student Member)

5. Dr J.F. McDivitt
   UNESCO Field Science Officer
   for Southeast Asia
   Tromol Post 273/DKT
   Djakarta, Indonesia

6. Mr K. Narayanamoorthy
   Geological Survey
   Bentong, Pahang
   Malaysia

Resignations

1. D.B. Eicher
   Continental Oil Co.
   1290 Sixth Ave
   New York, USA

2. M. De Rham
   GeoAsia Ltd.
   2 Jalan Changkat Ceylon
   Kuala Lumpur

3. B.M. Douet
   Schlumberger Overseas S.A.
   Ming Court Hotel Office Bk.
   Tanglin Road, Singapore 9

4. A.S. Broun
   Esso Exploration Inc.
   89/93 New Zealand Ave
   Walton-on-Thames
   England, U.K.