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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Contents

REPORT ON 1967 SUMMER SCHOOLS IN ORE MICROSCOPY

The Second International Summer School on Quantitative Methods in Reflected Light Microscopy (a NATO Advanced Study Institute) was organized by the Commission on Ore Microscopy of the International Mineralogical Association. This summer school was held in Bensheim-Auerbach (about 40 miles south of Frankfurt) from 28 August to 2 September. The British Summer School was held in Cambridge from 19 September to 23 September.

Twenty-three countries were represented at the International Summer School. Honorary members were Dr. A.F. Hallimond and Prof. Dr. Paul Ramdohr. The 'staff' included representatives from the United Kingdom, Germany, the Netherlands, Spain, and Malaysia. Observors came from most parts of Europe, Canada, South Africa, U.S.A., and Japan. Students as well came from most parts of Europe, and also from U.S.A., Turkey, South Africa, U.A.R., Australia, Canada, Sudan, and Israel.

The International Summer School emphasized the use and practice of reflectivity and microindentation hardness techniques and the theory of reflected light optics. Newly discovered reflected light techniques and characteristics and their theories as well as improvements in measuring methods and instrumentation were discussed. To achieve this the mornings during the meeting were confined mainly to lectures and discussions and the afternoons were devoted to laboratory practice of the techniques, on equipment provided by Leitz, Zeiss, Reichert and Vickers-EEL. The evenings were opened for informal discussions. The principles, practicability and usefulness of reflectivity are now well-established internationally. About half a dozen national schools are now being planned as a result of the success of the international school. The organizing committee should be congratulated for having done a marvellous job.

The British Summer School was run along the same lines as the international one, except that the students were all from Britain. In addition to the international school, the British School also stressed the importance of reflected light techniques in industry and participants in this school included representatives from mining engineering departments, steel companies, metallurgical and materials departments, ceramics industry, mineral extraction laboratories, building research departments, glass companies, minerals engineering departments, and refractories research laboratories. The success of the British School was in no way any less than that achieved by the international school. The banquet at St. John's was also superb!

Contact was also made for affiliating the Geological Society of Malaysia to the International Mineralogical Association. Relevant information has been transmitted to the Secretary for appropriate action.

- JHL

A VISIT TO INDONESIA

Between 30 July and 17 August 1967 a scientific visit has been paid to Indonesia by B.N. Koopmans, lecturer in structural and photo-geology in the Department of Geology, University of Malaya, on invitation of Professor J. Katili, Director of the National Institute of Geology and Mining, Bandung, Indonesia.

The purpose of this visit was to establish closer ties with the geologists of Bandung; to interchange information regarding lineaments and the structural setting of the Malay Peninsula in its regional framework in South East Asia; and to explore ways and means for organizing geological excursions or combined field work in Indonesia. This trip was made possible as a result of a grant from the Asia Foundation.

The Directorat Geologi (Geological Survey) is situated in Bandung (Java); it is a continuation of the Geological Survey Division of the Netherlands East Indies Mining Bureau, which was established in 1852. The Geological Survey, the Directorate of Mines, an agency dealing with tin and one with coal, are grouped together under the Directorate General of Mines, which latter, together with the Directorate General of Oil are within the Ministry of Basic Industries and Mining. The Director of the Directorat Geologi is Drs Johannas. The headquarters of the Survey contains an extensive library in which nearly all geological literature of this region has been assembled. Fortunately all collections were spared during the Second World War, thanks to Professor Kobayashi, who was assigned to the Survey during the Japanese occupation.

A geological museum, in which the volcanological section takes a prominent position, but which also features other interesting exhibits (such as the skull of the Pithecanthropus erectus found at Trinil, Java), occupies the ground floor of the building. The Survey is subdivided into seven technical divisions. At present most emphasis is put on the work of the Economic Geology Division, the Engineering Geology - Hydrology Division, the Geophysics Division and the Volcanology Division.

The National Institute of Geology and Mining (Lembaga Geologi dan Pertambangan Nasional) of which Professor J. Katili

is the director is a research institution housed on the grounds of the Institute of Technology, Bandung (ITB). It works closely together with the Department of Geology of the ITB.

The Chairman of the Department of Geology of the Institute of Technology, Bandung, is Dr. Rubini, a petrologist. This Department is a continuation of the Department of Geology of the University of Indonesia, in which the late Professor Klompe (Professor of Geology at the University of Malaya, 1962-3) played a major role in developing and expanding during the period 1950-58. Contributions regarding the geology of Indonesia have been published regularly in the Department's own journal. With the present economic situation in Indonesia the Department has financial difficulties in published reports and in organizing field excursions. Their field station, situated in a geologically very interesting area of Pre-Tertiary rocks in middle Java, is of great benefit to the Department for conducting field courses.

During my visit I was invited to give a talk on the geology of West Malaysia in its regional framework, for the Geological Society of Indonesia in Bandung. Geological excursions were made with members of the Geological Survey and the Department of Geology, ITB, to volcanological areas of the Tangkuban Prahu and Kawah Kamodjan, west Java, and to the Gunong Merapi in middle Java.

With an introduction of the Perusahaan2 Tambang Timah Negara in Jakarta I was able to visit the island of Bangka, one of the tin islands off the southeast coast of Sumatra. My main object here was to compare the stratigraphy of the island with that of the Malay Peninsula. A visit to Permali, where a primary tin deposit is mined from weathered kaolinized granitic material in a deep opencast mine was also of great interest.

Unfortunately my visit was too short to study the many interesting geological features in greater detail.

- BNK

CALLING ALL MINERALOGISTS

In order to maintain the 'World Directory of Mineralogists' as up-to-date as possible, the President of the International Mineralogical Association, in agreement with his Council, has decided to publish a 2nd edition of the World Directory, to be printed before the Prague meeting in 1968. Miss Marjorie Hooker and Professor M. Font-Altaba have been appointed editors for this new edition. Sub-editors from various countries

have been appointed to collect information for the World Directory. J.H. Leow of the University of Malaya has been asked by Professor Font-Altaba to act as sub-editor for Malaysia and the neighbouring countries.

Qualifications for inclusion in the world directory are very broad. The Executive Committee of the IMA has suggested that for inclusion in the 2nd edition a person should be a member of a national mineralogical organization, if such an organization exists in his country, or have published on a mineralogical-sciences subject, or be a graduate student in the field of mineralogical-sciences. These qualifications are not meant to be strict rules, and mineralogical-sciences is taken in its widest sense.

In order to collect information, a questionnaire is enclosed with this Newsletter which all mineralogists and those interested in mineralogy should complete for transmission to the editors of the directory. Since the Prague meeting is now only months away, please return the questionnaires to J.H. Leow by December 31st of this year.

- JHL

GEOLOGY VACANCIES AT UNIVERSITY OF MALAYA

An announcement from the University of Malaya invites applications for two academic posts, both for Lecturer/Assistant Lecturer, in the Department of Geology.

One post is for a Palaeontologist/Stratigrapher, to take the place of D.J. Gobbett, who is moving to Cambridge after a number of years in Malaya. The successful applicant will be responsible for the teaching of palaeontology, and some stratigraphy, at all levels.

The other post is a new one for an Applied Geologist. The successful applicant will work with a mining geologist already coming in building up Applied Geology within the Department. Experience in economic geology, geochemical or geophysical prospecting, and/or engineering geology would be particularly desirable.

Anyone interested in these posts is urged to contact either the Registrar, University of Malaya, or the Head, Department of Geology, University of Malaya, Pantai Valley, Kuala Lumpur.

MEETINGS OF THE SOCIETY

Ordinary meeting on 26 September 1967: Dr. G.E. Wilford

The meeting was held at 5:15 p.m. in the Lecture Room of the Department of Geology, University of Malaya.

The President introduced Dr.G.E. Wilford, who then spoke on "The Bau gold-mining district, Sarawak." A synopsis of the talk follows.

The Bau area is in the 1st Division of Sarawak, south of Kuching. Triassic volcanics are overlain unconformably by about 1800 ft. of limestone, locally with a basal sandstone. The limestone is fine-grained and has algal and foraminiferal fossils of Jurassic age. It passes vertically and laterally into shale, about 10,000 ft. thick, most of which is Cretaceous.

Late Cretaceous and mid-Miocene movements folded these rocks into a NE-SW striking anticline, faulted and intruded by quartz porphyry dykes. It was also intruded by larger acid rock bodies probably in Middle Miocene and mineralized, especially at the limestone-shale contact. Gold-bearing quartz bodies near stocks yield about 10 dwts of coarse gold, silicified shale breccia 4-6 dwts and quartz-calcite veins about 2-3 dwts.

Some ore bodies are weathered and allow eluvial gold to be mined. Gold was first found by panning in streams draining the Plateau Sandstone, south of the Bau area, and a few diamonds were also recovered in this way.

Before 1890 gold was panned at Bau, but in that year the Borneo Company installed crushing equipment and pumps and by 1898 the coarse gold was worked out. Then the cyaniding method was introduced and a further 1 million ounces of gold were produced between 1898 and 1921 when the company closed. The Bau field was re-opened by local miners a few years later and produced gold until 1940. After the war mining continued on a small scale. At the present time six mines produce 6000-7000 ounces a year.

The gold is extracted by the cyaniding method. Primary ore is broken into lumps about 1 inch in diameter and put into large concrete vats of 40-70 tons capacity. Over this is placed a layer of residual ore, largely clay. Weak cyanide solution is added and is tapped out over zinc shavings, onto which the gold is precipitated.

In the 19th century cinnabar and stibnite were mined in the Bau area. The cinnabar occurred in a sandstone-shale breccia associated with a line of porphyry intrusions running obliquely to the axis of the Bau anticline. Stibnite was found as eluvial boulders lying between limestone pinnacles.

Dr. Wilford's talk was followed by a discussion, mainly on the relation of the gold in the Plateau Sandstone to that of the Bau field and on the age and relationships of various igneous bodies. Mohammad bin Ayob then proposed a vote of thanks to Dr. Wilford.

The meeting, which was attended by fifteen members, ended at 6:15 p.m.

- DJG

Ordinary meeting on 9 October 1967: Dr. J.J. Veevers

Dr. Veevers kindly agreed to talk to the Society during his brief stopover in Kuala Lumpur on 9 October.

He gave an outline of the history of the Canning Basin and the Bonaparte Gulf Basin in a talk titled "Geology of Northwest Australia." During aeromagnetic and sparker surveys off-shore in 1966, these two basins were discovered to be continuous, the greater part of the Bonaparte Gulf Basin being under the sea at the present time. This connection explains the similarity of their Phanerozoic history.

A magnetic horizon in the late Precambrian or early Phanerozoic part of the sequence allowed the structure of the basins to be inferred from magnetic contours. In the Canning Basin the Phanerozoic is about 13 Kilometers thick and in the Bonaparte Gulf Basin, 8 kilometers.

The Canning Basin is floored by older Precambrian crystalline rocks from which was probably derived the younger Precambrian sediments to the north and south. Later the Canning Basin itself was formed and flooded by a Lower Ordovician marine transgression.

Lower Devonian redbeds with evaporites, including salt beds 1000 feet thick, were succeeded by Middle Devonian - Middle Carboniferous shallow marine deposits including reef limestones, excellently exposed at the present day. In the Upper Carboniferous and Permian, glacial deposits were formed under intermittent marine and terrestrial conditions. Palaeomagnetic studies show a magnetic inclination of $75^{\circ}+$ during this glacial episode and that the inclination remained high until the Cretaceous.

One area of possibly autochthonous Permian rocks in Timor shows some similarity to the extensive Permian outcrops of northwest Australia.

Marine Jurassic and Cretaceous rocks are present in the Canning Basin but the sea retreated by the end of the Aptian. The drowning of much of the Bonaparte Gulf Basin occurred in the Recent.

Nineteen members and guests attended.

- DJG

Field meeting, 14 October 1967: Kinta Valley

This field meeting was attended by 25 members. The party met at Gopeng, and Dr. George Riley, after giving an introductory talk, led a visit to the Fu Tong Seng Mine, about 2½ miles north of Gopeng. At this locality a lens of "Tekka Clay", partly excavated, lies between two highly weathered and partly kaolinized granite masses. The Tekka Clay was poorly exposed but the fine-grained, greenish, white mica - flourite rock which forms laminae within it, could be seen stacked at the side of the path.

The contact between the granite and the southern margin of the Tekka Clay was examined in three places. Against the granite the clay was disposed almost vertically. The nature of the contact was discussed but owing to the highly weathered state of the rocks, it was difficult to decide whether it was faulted or not. Large composite quartz veins, about three feet thick, with cassiterite and arsenopyrite interlayered with barren quartz, were examined on the southern granite mass. Dr. Riley pointed out that these appeared to be continued on the face of the granite on the north side of the Tekka Clay lens, suggesting that the southern granite was down-faulted. Dr. Riley asserted that the mineralization was xenothermal and occurred subsequent to the emplacement and cooling of the granite. Hence it was not directly connected with the granite intrusion. He made the further point that it may be a mistake to assume that Malayan tin deposits are necessarily associated with granites.

After collecting samples of tourmaline, wolframite, and varlamoffite, mainly from loose blocks in the mine, the party returned to the road and drove to Kampar for lunch.

After lunch Mr.Roger Newell led a visit to the S.E.K. Mines, about 1 mile south of Kampar. Here a thick alluvial sequence was exposed overlying a pinnacled dolomite surface. Much of this alluvium closely resembled granite weathered in situ. It consisted of a white kaolinitic clay with quartz and highly weathered granitic clasts. However, locally this

deposit was seen to be stratified. Also, the absence of quartz veins was significant in indicating it was a transported material. Post-depositional slumping into solution hollows in the dolomite was common and in places has resulted in vertical dips in the alluvium.

The granite-derived sediment was divided by two prominent layers of peat and wood. One of these was seen to be best developed where the underlying alluvium had slumped into solution hollows, suggesting a genetic relationship. Three cycles of alluvial deposition could be recognized at the southern end of the mine, each beginning with a coarse gravel.

The party returned to the road and dispersed after expressing their thanks to the leaders.

- DJG

Joint meeting on 26 October 1967: Mr. E. Hamilton-Smith

A joint meeting with the Malayan Nature Society was held at the British Council Hall in Kuala Lumpur at 8:00 p.m. on 26 October. Dr. I.C.T. Nisbet introduced the speaker, Mr. Ellory Hamilton-Smith, who gave a talk on "Caves of Australia." The talk was beautifully illustrated with many color slides of the insides and outsides of many Australian caves. A synopsis of the talk follows.

Limestones in Australia can be roughly classed into 'hard' and 'soft'. The former are the ancient bedrock limestones, ranging in age from Cambrian to Devonian, and occurring in many inland localities, especially along the eastern side of the continent; the latter are the Miocene to Recent limestone deposits fringing the coasts in many places, the largest area being the Nullarbor Plain in south-central Australia. Caves in 'hard' limestones tend to be angular, with sharp bends, straight or jagged walls, and often narrow passages. Caves in 'soft' limestones tend to be rounded, with large passages and great domed ceilings.

Many Australian caves have rich dripstone formations, including delicate stalactites, translucent "curtains" of calcite, curved growing gypsum crystals, and incredibly cantilevered and twisted helictites of calcite and in some places aragonite and gypsum (in one cave all three together on the same wall!).

In addition to the limestone caves, Victoria has some lava tubes. These tend to be rather dismal, being of dark rock and lacking dripstone decorations.

The fauna of the caves includes many interesting forms: a cave cricket nearly identical to that of Batu Cave, though of quite different genus; a blind cockroach in the Nullarbor Plain caves, which suggests the caves date back to the Tertiary; a bat family which has no ultrasonic or sonic navigating device - one species found on New Calidonia can see in extremely dim light, well below the human threshold for vision, and is equally helpless in total darkness and in bright light. In one of the caves of the Nullarbor Plain was recently found a well-preserved mummified body of a Tasmanian Tiger, previously thought to have been extinct on the mainland since Pleistocene. A radiocarbon date on this animal is currently pending and eagerly awaited.

The speaker also mentioned the caves of the New Hebrides, where uplifted coral platforms fringe the volcanic islands, and New Caledonia, where in addition to similar coral platforms there is a hard inland limestone formation of Jurassic age.

- PHS

Field meeting, 1-4 November 1967: Muda River Scheme

The Society's third field excursion was made to the damsites, quarries, and tunnel of the Muda Irrigation Project in Kedah, during the 1st to 4th of November, 1967. The trip was a geological success, but was unfortunately marred by a serious accident.

The group met on the evening of November 1st at the Damsite Resthouse, 8 miles east of Nami. Members attending the trip were F.S.E, Chong, K.Y.Foo, Y.K.Shu, S.K.Yong (all of the Geological Survey, West Malaysia), T.M.Kee, C.H.Yeap (both of Associated Mines), M. b. Ayob, J. Bignell, D.S. Dhillon, T.T. Khoo, B.N. Koopmans, S.P. Sivam, and P.H. Stauffer (all of the University of Malaya). Mr. Peter James, engineering geologist with Sir William Halcrow and Partners, consulting engineers for the project, was guide for the excursion. In order to do so, Mr. James delayed his return to England by one week, and the Society is grateful to him for volunteering to lead us at such an inconvenient time. He began the excursion with an introductory talk at the Rest House on the evening of 1st November. A synopsis of Mr. James' talk:

The Muda Irrigation Project is a large scheme designed to irrigate 250,000 acres of rice land to allow double-cropping. The main construction works of the project are two dams and a tunnel. The Muda Dam, on the Muda River, will be a concrete dam 105 ft. high, holding back the Muda River, which has abundant water but a small valley. The 4½ mile long Saiong Tunnel will carry the water into the Pedu Valley to the north,

which has a large storage capacity. A reservoir will be created here by Pedu Dam, a rock-fill dam about 200 ft. high.

The Muda damsite is on interbedded quartzite sandstone and mudstone, gently folded and striking parallel to the dam. The mudstones are much sheared, especially near the margins of the beds, so the angle of friction is only about 18° (vs. about 27° for solid shales). Since such an angle of friction is not sufficient to guard against horizontal failure by sliding on the near-horizontal mudstones, the dam will be held down by slanting cables anchored deep in the bedrock. This was the most serious engineering-geological problem encountered. Though there is an old landslide just above the damsite, the stability of the slopes is now rated as safe.

The tunnel between the two reservoirs encountered an interesting section. The Muda end is in red mudstones, and quickly hit upon a thick mass of conglomerate, with open faults and much water inflow into the tunnel. The other end is in dark mudstone, gently dipping, with scattered conglomerate beds. About 500 yards in the middle are as yet unexcavated.

At Pedu Dam the rocks are steeply dipping and strike across the river. They include conglomerates, sandstones, and mudstones. This geology forms quite a stable site for a dam. The conglomerate was thought to be quite hard on the basis of hillside outcrops, and so is being quarried for rock fill. But in the quarry it is turning out not to be so hard, as commonly happens with tropical weathering. It is hard to find good rock fill in such climates.

Discussion: D.S.Dhillon asked if there was much trouble with caving in the tunnel. Mr. James said there had not been much. The tunnel was now instrumented to see if steady-state creep might occur in the mudstone. If that happened, it would require further strengthening of the lining.

P.H. Stauffer asked how the "angle of friction" was determined for the mudstone beds. Mr. James explained that an area of rock was excavated, leaving a square piller in the middle including a mudstone layer. This piller is then given various loads on top and with each the sideways push needed to cause slip is measured. When the results are plotted, as normal vs. tangential stress, they fall on a line whose slope is the angle of friction. The horizontal mudstone bands are the weakest feature of the Muda damsite. The quartzite beds are much jointed, and hence could easily 'raft' on sliding mudstone.

D.S. Dhillon asked if jointing was also a problem at Pedu Dam. Mr. James said it was not serious there, because the main joint set runs parallel to the dam.

B.N. Koopmans asked if the conglomerates were in general permeable. Mr. James said they were, sometimes with fairly large open spaces along faults or joints, and even 'missing' pebbles, which might have been limestone, now dissolved away.

C.H. Yeap asked how the tunnel route was chosen. Mr. James said this was done before he joined the project, but was basically on the topography of the bedrock surface, as determined from boreholes. Actually, there had turned out to be an unexpected stretch of soft material under 60 ft. of overburden near the south end.

C.H. Yeap asked why rock fill was chosen for the Pedu Dam. Mr. James replied that it was basically economics. Also, the rocks might not be strong enough to hold a concrete dam of that size (twice the height of the Muda Dam).

P.H. Stauffer asked if there was much conglomerate in the rocks of the area. Mr. James said there was quite a bit, including many thinner beds (to 10 ft.) at the Pedu damsite as well as the thick mass encountered in the tunnel, which forms a prominent ridge in the area.

Morning of 2nd November: The party examined the Muda damsite, with its interbedded, nearly-horizontal sandstones and mudstones. The sandstone beds are mostly less than 4 ft. thick, have sharp bases, slight grading, and some sole markings. The mudstones are dark, almost black, heavily sheared, and contain some fossils: indeterminate plant remains, burrows, and other trace fossils. Two prominent vertical joint sets occur, of which the east-west set shows much shearing. Open vugs occur lined with quartz crystals, and some mineralization involving pyrite, arsenopyrite, and galena was seen.

Next, the quarry to the northeast of the dam was visited. Here the rocks are almost structureless sandstones, with thin mudstones between. In the mudstones occur abundant enigmatic trace fossils (called "crab tracks" by the party), as well as abundant worm tubes, burrows, and some small pelecypods of Triassic aspect.

Afternoon of 2nd November: Mr. James took the party into the southern end of the Saiong Tunnel. At the working face, about $1\frac{1}{4}$ mile from the entrance, and for some considerable distance south, the rock is laminated dark mudstone/siltstone, dipping gently southward. This is then overlain, here with apparent conformity, by a distinctly younger-looking red-brown

cobble conglomerate, with angular clasts of many rock types, mostly sedimentary. Boulders up to 30 cm.occur, though the dominant size is 2-5 cm. The matrix is a soft sandy clay, poorly lithified. This conglomerate becomes interbedded with red sandstones and mudstones, still dipping south. Then, 2000 ft. from the entrance, a south-dipping thrust fault occurs, across which are rocks of type similar to Muda damsite. Above these rocks appear again red mudstones, with obscure relations, and finally at the entrance the red conglomerate appears again, together with more red mudstone. This tunnel section seemed to show the presence of two successive sequences of rocks, of distinct age and probable unconformable relationship, and of, respectively, 'flysch' and 'molasse' character.

Morning of 3rd November: The party examined the Pedu damsite. Here there was no doubt that we were dealing with 'flysch', and of a fairly rough sort. Pebble-conglomerate and sandstone beds show good graded bedding, sharp bases, common sole markings of flysch type, abundant clasts of shale, and some slump structures. Sole markings are oriented, as is normally the case in flysch; roughly parallel to the strike, which here is about north-south. Small-scale cross bedding indicates the current sense was to the north. Some conglomeratic beds appear to have the characteristics of 'fluxoturbidites' and suggest deposition by mass flow on a slope. Most of the coarse beds here bear the features of turbidity-current deposits. The mudstones between are dark and laminated.

About one mile west of the damsite a large roadcut was examined which revealed flysch-type rocks cut by a prominent vertical shear zone and tightly crumpled on the west side. As at the Muda quarry, abundant worm tubes and other types of bioturbation occur.

Afternoon of 3rd November: The party went into the northern entrance of the Saiong Tunnel. From the adit entrance to the working face, about 1½ miles, the rocks are all dark mudstones, with occasional beds of pebbly mudstone, containing rounded siliceous clasts (mostly chert) in a dark clay-rich matrix. This lithology continues northward apparently a further mile to the actual northern end of the tunnel. Only at the working face was different rock encountered. Here the tunnel had just cut into what seemed to be a fault, with considerable flowing water and open spaces, across which appeared a loose brown conglomerate. It is quite possible that this is the unconformity between the two sequences mentioned above.

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It was at this point, at the working end of the northern part of the Saiong Tunnel, that an accident occurred which

brought the excursion to an abrupt and unfortunate end. One member of the party, Enche C.H. Yeap, was seriously injured, his left leg having to be amputated as a result. Enche Yeap is now recuperating in a Kuala Lumpur hospital, and I know all members of the GSM join in wishing him speedy resumption of a full life and active career.

- PHS

Added note on geology of Muda Irrigation Project

In continuation of the field excursion of the Society to the damsites, quarries and tunnel of the Muda River Irrigation Project, P.H. Stauffer and B.N. Koopmans have carried out an additional two days of field work in the area.

The roads linking up the different engineering sites provide numerous fresh road outcrops. With the help of a reconnaissance aerial photo interpretation of the area, made prior to the field work, a fairly good idea of the stratigraphic sequence could be obtained. Our main object was to find the relationship between the different types of rocks observed during the excursion and to check certain structures deduced from the aerial photos.

Roughly, the rocks can be grouped into four units:

a) Pedu Dam pebble-conglomerates and flysch-type deposits
b) Muda Dam sandstones with thin mudstone layers
c) Saiong Tunnel laminated mudstone-siltstone sequence, with pebbly mudstone beds
d) Bukit Saiong red boulder-conglomerates, sandstones and reddish mudstones.

The names used here are informal and used only for convenience to refer to localities visited during the excursion. Bukit Saiong is the nearest peak on the prominent conglomerate ridge.

The first three lithological units are relatively closely associated to each other and are pre-orogenic deposits, partly of typical flysch facies. The fourth unit (d) is of an entirely different lithology, deposited in quite another environment, and is typical for a post-orogenic molasse deposit.

The laminated mudstone-siltstone sequence underlies a sandstones of the Muda damsite conformably. This sequence is well exposed in a road outcrop between the Muda Dam camp and contractor's office. Extensive folding and faulting are present. Lineations of fold axes are clearly indicative for at least two subsequent folding phases, with most of the faulting being related to the latter phase. The folds are of an open flexure type, sometimes slightly disharmonic; no cleavages are developed.

The laminated mudstone-siltstone sequence is folded here together with the Muda Dam sandstone in a large syncline which plunges towards the south-southeast.

The Pedu Dam pebble-conglomerates and flysch-type deposits (a) are probably lying conformably underneath (b) and (c), although more field work is required to confirm this and to find out the exact relationship.

The road which links Muda Dam with Pedu Dam cuts several times the contact between sediments (c) and (d). But only in one small road outcrop approximately 2 miles north of the Saiong Tunnel intake, this contact is clearly exposed and proved to be unconformable. The strike direction of both sequences is here the same, but the angle of dip is gently eastwards for the overlying red conglomerates, whereas it is nearly vertical for the laminated sequence underneath. A few hundred meters northwards, just east of the road, a large conglomerate outcrop occurs, representing the base of sequence (d), which is heavily affected by faulting. Brecciation, Fe hydroxide concentration and silicification make the conglomeratic nature of the rock barely recognizable; many open spaces and vugs lined with quartz occur in the rock. Here probably the unconformity plane has been used later as a fault plane. It is likely that this horizon can be correlated with the horizon found at the tunnel face from the north entrance, which shows striking resemblance to this faulted zone.

Red mudstones are interbedded with the red conglomerates. Higher in the sequence (d), above the conglomerate, we found also some reddish mudstones near the confluence of the Sungei Che Song and the Sungei Muda, upstream from the Muda damsite. The relationship with adjacent rocks which appeared to us as being older, was not clear, but was probably a fault contact. The presence of a wrench fault zone, running ENE-WSW along the course of the Muda River is also featured on the aerial photos and represented by a few minor wrench faults in the exposures of the Muda damsite.

From fossils found previously near Kuala Nerang and Nami and from a few Posidonia found during the excursion at the quarry of the Muda Dam, it can be concluded that the rock units (a), (b), and (c) belong to the Triassic, and are probably of Carnian age. The red boulder-conglomerates and red mudstones are younger, but no fossils have been found in them during our short survey. How far these can be correlated with the Tembeling Formation of Pahang has to be found out by future field work.

- BNK

Coming meeting: 4 December 1967

The next scheduled meeting of the GSM will be on Monday 4 December 1967, in the Department of Geology, University of

Malaya at 5:15 p.m. (tea at 5:00). Dr. F.G. Purdy, of Esso Exploration, will speak on "Carbonate diagenesis."

NEWS OF THE SOCIETY

Annual General Meeting, 1968

The Geological Society of Malaysia will hold its next Annual General Meeting on Friday, 26th January, 1968, at 8:00 p.m. in the Lecture Room of the Department of Geology, University of Malaya, Kuala Lumpur. The business meeting will be followed by a Presidential Address by N.S. Haile. Further details will be circulated later.

A Discussion Meeting is being organized for the following morning, Saturday 27 January, at 10:00 a.m. It is hoped to hold discussions on the Society's Code of Stratigraphic Nomenclature and also on the general problems of Malaysian granites and their relation to mineralization. Again, full details will be circulated at a later date. Proposals and suggestions for the Discussion Meeting will be welcome.

Lost members

The following members have moved without informing the Hon. Secretary of their new addresses, so that mail is being returned undelivered. We would be grateful for any information on their whereabouts.

Mr. W. Reynolds, formerly of Associated Mines
Mr. J.F. Roberts, formerly of Rompin Mining Co., Ltd.
Mr. C.W.E.H. Smith, formerly of Pahang Consolidated Co., Ltd.

New members

At its meeting on 22nd November 1967, the GSM Council elected the following to membership (A = Associated Member, others are Full Members).

T.G. Carson
W.N. Cho
Miss C.B. Cruz
Miss G.J. Garcia
Miss F.R. Gonzaga
H.H. Khoo
A.P. Madrid
Moh'd N. b. Othman
A.P. Ng
Miss C.J. Pizarro
D.H. Roberts
Miss S. Thambypillai
A.A. Watson (A)
F.H. Wessman
E.H. Yin

In addition, the Bureau of Mineral Resources in Canberra, Australia, has affiliated as an Associate Member.

- DJG

RESEARCH IS AN INTRANSITIVE VERB

In GeoTimes a research geologist is quoted as describing his daily duties in the following words: "I research and research all day long." This left his listeners as ignorant as before, and it left at least one reader puzzled about the use of "research" as a verb. How these Americans make verbs out of nouns! So I researched in the dictionary and, blow me down, it is a legitimate verb, from the French rechercher. I have researched for decades without knowing it. I had thought in my sweet innocence that I was doing research or even perpetrating research. But no, I have been researching purely and simply. Do I hear you ask: What was I researching? Don't be silly! You can't research anything because research is intransitive. You just research. This is just another way of saying: if you know what you are doing it is not research.

from the Quarterly News Bulletin of the
Geological Society of South Africa

INTERNATIONAL MINERALOGICAL ASSOCIATION

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