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The Society was founded in 1967 with the aim of promoting the advancement of earth sciences particularly in Malaysia and the Southeast Asian region.

The Society has a membership of about 600 earth scientists interested in Malaysia and other Southeast Asian regions. The membership is worldwide in distribution.

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CATATAN GEOLOGI
GEOLOGICAL NOTES

Resistivity survey in locating historical features: a case study from the Roman Fort's Ditch investigation, Inverest, Scotland

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University of Glasgow

Abstract: Geophysical survey methods provide a fast and efficient reconnaissance solution for archaeo-geophysical surveys especially in detecting a buried ancient stone foundations or ditches. Among those, resistivity and gravity methods are the most common methods. In this paper, a simple 1.5D resistivity survey was used in locating a buried Roman Fort's ditch.

Interpretation of resistivity data is subjected to a lot of ambiguities. To reduce the interpretation error, the resistivity profiles were run through a physical control such as a known man-made ditch. The final result of resistivity profiles shows there were four low resistivity anomalies, two of them directly related to the controls whereas two others can be interpreted as a result of the ditch since it located in the area where the ditch was postulated.

Abstrak: Kaedah survei geofizik boleh memberikan penyelesyaian yang cepat dan effektif kepada kajian arkeologi terutamanya dalam mengesan batu dasar dan parit-parit yang tertimbus. Antara kaedah yang biasa digunakan ialah survei keberintangan elektrik, dan graviti. Dalan kajian ini kaedah keberintangan elektrik 1.5D digunakan bagi mengesan parit Roman Fort yang telah tertimbus.

Pentafsiran data keberintangan elektrik mempunyai banyak ketakpastian. Bagi mengatasi masalak ini, survei keberintangan telah dibuat supaya ia melalui punca kawalan yang diketahui, seperti parit buatan. Hasil kajian ini menunjukkan terdapatnya empat anomali keberintangan rendah, yang mana dua daripadanya adalah berisosasi dengan punca kawalan dan selebihnya ditafsirkan sebagai hasil dari parit Roman Fort yang tertimbus. Ini adalah berdasarkan kedudukannya dalam kawasan yang telah dijangkakan.

INTRODUCTION

In traditional archeological investigation, the works are normally involve trenching and coring a site chosen from historical documentation or surface artifact or morphology, suggesting an earlier human occupation. In the area where the existing evidence is covered by thick topsoil, trenching and coring are done randomly at the most possible places decided by the field archaeologist. This random trenching method is not always a success. Failure to find any clue after several trial pits will cost an archeologist a fortune, and in the worst case, it will lead to the abandonment of the project.

Depending on what the target is, the geophysical methods provide the fast and efficient reconnaissance solution. Furthermore, it is non-destructive which is vital in preserving the spatial relationship between the artifacts. Magnetic and resistivity are the most common geophysical methods applied in archaeology. Magnetic methods are widely used in locating an iron base artifact although, it is also

sometimes being used in locating a buried foundation made of a highly susceptibility rock such as an igneous rock. Resistivity on the other hand is very useful in mapping out the remains of buried foundations of an ancient building or a buried ditch.

Probably the most important geophysical tool in archeology is the ground probing radar (GPR). Since its first appearance in USA in early 1970s, it has become the most essential single geophysical instrument for archeologist (Wynn, 1986). A high renting cost of the GPR equipment however makes this method not very favorable for a small funded projects such as archaeology surveys. In this paper, we are going to discuss the result of resistivity survey — the most common geophysical survey methods applied in archaeological work, in detecting a V shape Roman ditch.

SITE LOCATION

The site chosen at Inveresk is situated at the south edge of Musselburgh town, Scotland (Fig. 1). It lies on a high ground surrounded by the river Esk on three sides and overlooks the Firth of Forth. It is believed that on this site the fort associated with the Roman occupation of Scotland was built during the Antonine period, 142–163 AD. Within the overall Roman military system in Scotland, Inveresk fort may have functioned as a port or harbor at the mouth of the Esk, and perhaps as a storages base (Dennison and Coleman, 1996).

Today, nothing of the fort itself is visible on the ground. The earliest church in Musselburgh and their cemetery reserve area replaced it. However, the discovery of the remains of the Roman hot bath-house in 1780s and 1827 (still visible in the garden of Inveresk House), together with regularly finds of Roman artifacts during grave digging confirm the existence of the Roman fort and their settlement here (Richmond, 1980). Although the evidence of the existence of the Roman fort and their settlement (vicus) around here had long been known, it not only until 1946/7 that the first excavation were carried out by Sir Ian Richmond. From his findings, the plan of the Inveresk fort with a single ditch was drawn. The idea of the Roman Fort has a single ditch is always questionable since the fort usually has 2 or more ditches and sometimes can be very complex.

METHODOLOGY

Resistivity survey is one of the most common geophysical surveying methods employed by the archaeologist simply because it is cheap and easy to conduct. However the interpretation of the resistivity profile can sometimes be very difficult. To discriminate the interpretation's ambiguities it needs a good geological or non-geological control. Here, two resistivity lines — L3 and L4 — were run parallel to each other. As a control, the L3 was design to run through two man made features, a abundant archaeological trench on the Eastern end and an area of stripped top soil on the western end.

In order to obtain the 2D picture of the subsurface, an expending Wenner array with a changing central point @ 1.5D Resistivity Survey (a combination of vertical electrical sounding (VES) and constant separation traversing (CST)) was used. Since the target is less than 4 meters, the readings were read at only 1,2,3 and 4 meter electrode spacing before the central point moved down the line by 1 meter interval.

RESULTS AND DISCUSSION

The resistivity readings were plotted on the Excel graph for qualitative interpretation before it was transfer to The Generic Mapping Tools (GMT) software for presentation purpose. In general the profile for L3 and L4 (Figs. 2a, 2b) shows the resistivity value is following the same pattern as the topography, which is decreasing towards the west of the lines. This is a good example on how the topography can masked the effect of the deeper variations.

The 1-meter electrode spacing profile on both lines shows the most variable profile. The reason is simply that it reads the resistivity values of a highly disturbed topsoil. Since the target is deeper, the variation of this profile is less significant than the variation in the deeper profile. However, this shallow profile is important for checking the validity of the

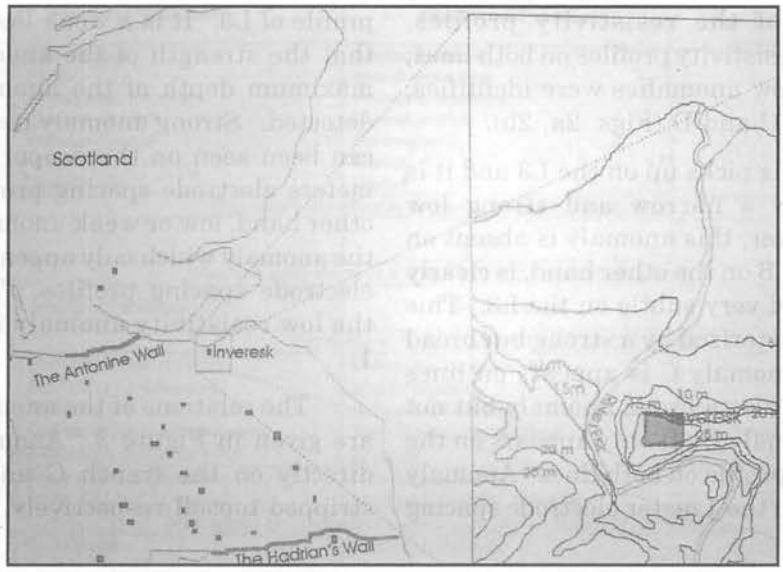

Figure 1a. The study area.

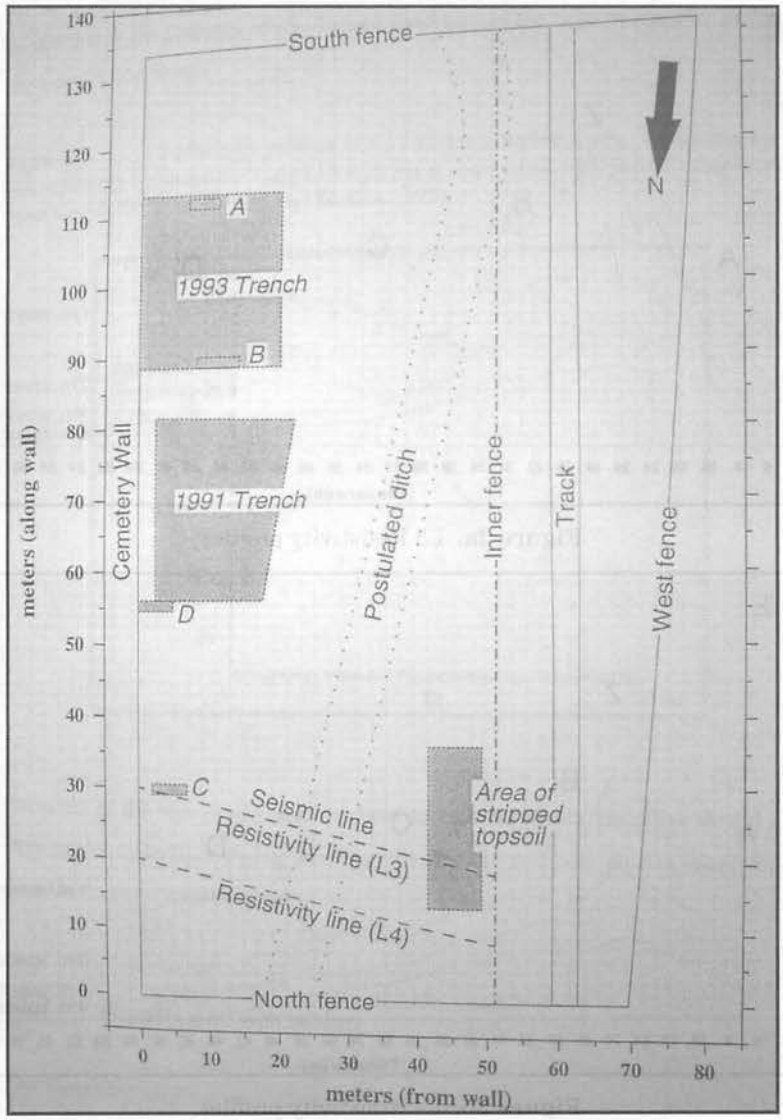

Figure 1b. Detail of the study area.

interpretation of the resistivity profiles. Comparing the resistivity profiles on both lines, four resistivity low anomalies were identifies, namely as A, B, C and D (Figs. 2a, 2b).

Anomaly A is picks up on the L3 and it is characterized by a narrow and strong low anomaly. However, this anomaly is absent on the L4. Anomaly B on the other hand, is clearly appear on L4 and very subtle on the L3. This anomaly is characterized by a strong but broad low anomaly. Anomaly C is appears on lines L3 and L4. It is also a broad anomaly but not as strong as anomaly B. It only appears on the 1-meter spacing profile on both lines. Anomaly D is only found on the 1 meter electrode spacing profile of L3. It is a weak low anomaly. Note that the strength of the anomaly is based on maximum depth of the anomaly that can be detected. Strong anomaly means the anomaly can been seen on the deeper profile (2,3 or 4 meters electrode spacing profiles) and on the other hand, low or weak anomaly is refereed to the anomaly which only appear on 1 or 2 meters electrode spacing profiles. The summary of the low resistivity anomaly is given in Table 1.

The relations of the anomalies to the field are given in Figure 3. Anomaly A and D lie directly on the trench C and on an area of stripped topsoil respectively. These were the

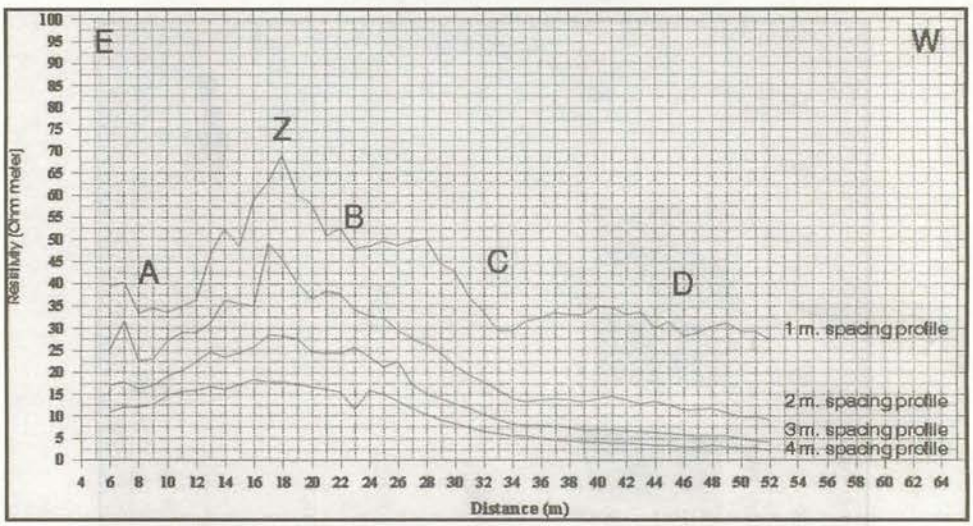

Figure 2a. L3 Resistivity profiles.

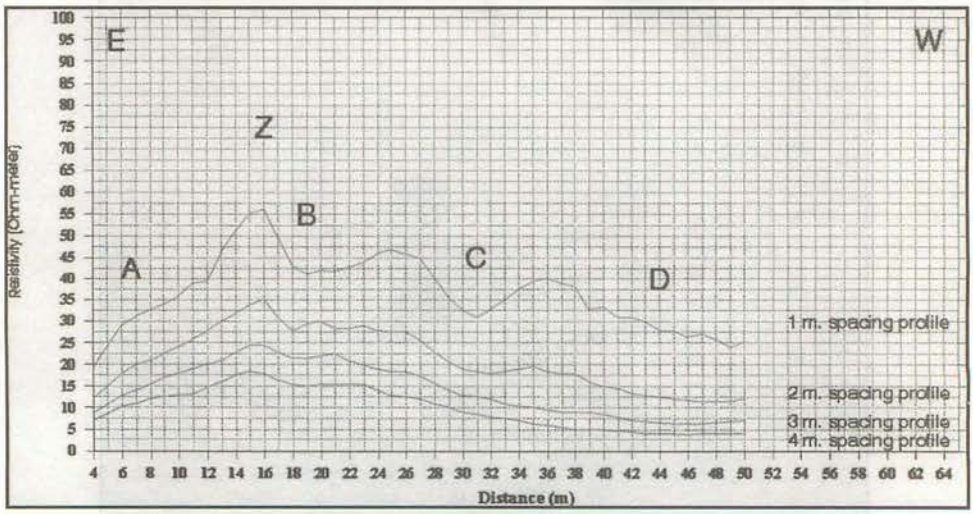

Figure 2b. L4 Resistivity profiles.

Table 1. Low resistivity anomaly, a summary.

	Anomaly A		Anomaly B		Anomaly C		Anomaly D	
	L3	L4	L3	L4	L3	L4	L3	L4
Appearance	√	X	√	√	√	√	√	X
Center of the anomaly (m)	9	–	23	19	33	31	45	–
Width	narrow	–	wide	wide	wide	wide	narrow	–
Max. Depth of resis. minima (m)	3	–	?	4	1@2	1@2	1	–
Strength	strong	–	?	strong	weak	weak	weak	–

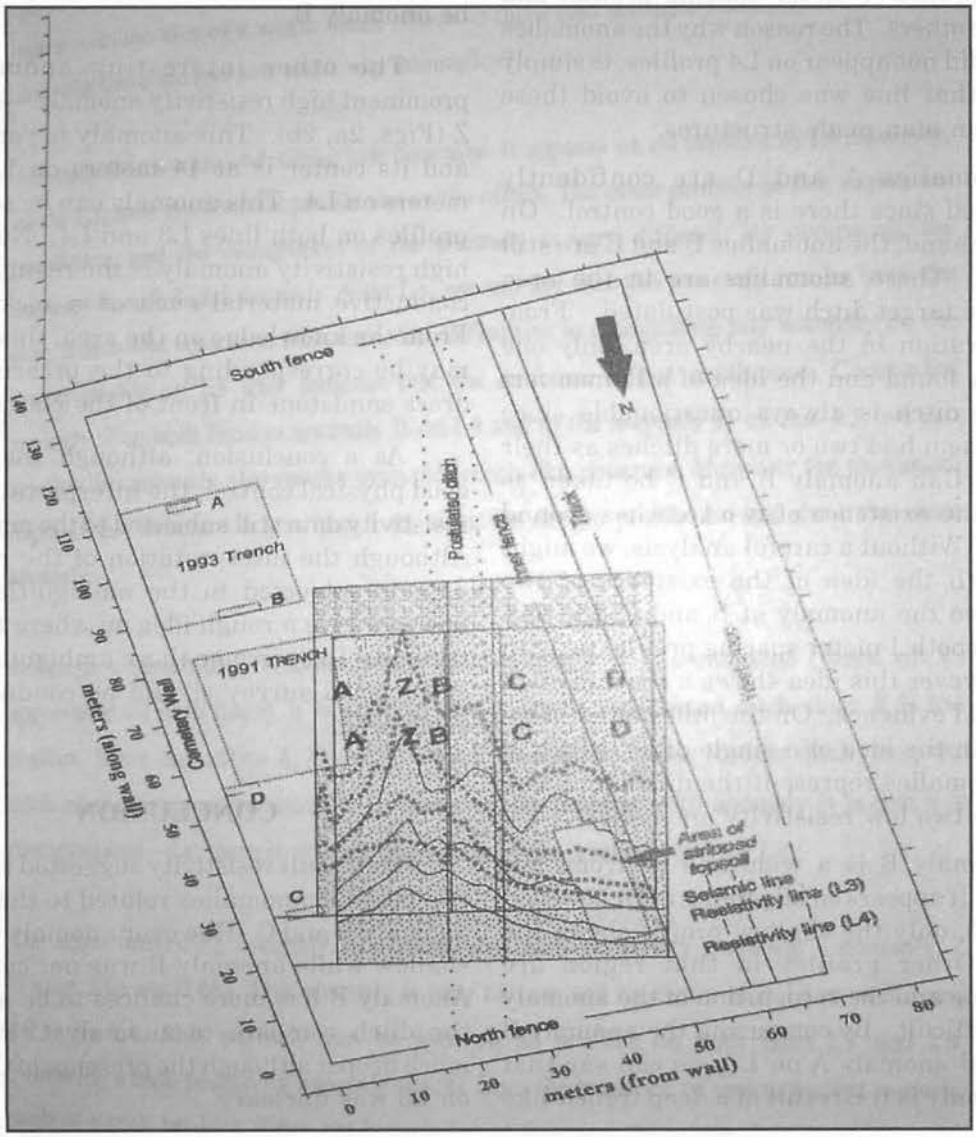

Figure 3. Relation between resistivity anomalies and their near surface features.

control of the interpretation. The trench was 1Ω or 2 meter deep. Anomaly A is very prominent on 1 and 2 meter electrode spacing profiles, however the anomaly is weak on the other two (3 and 4 meter electrode spacing profiles). This anomaly is believed to be a result of the trench C. The appearance of the anomaly on the deeper profile (3 and 4 meter electrode spacing profiles) is an example on how a strong near surface resistivity reading can effect the readings of the deeper section. Anomaly D is also believed to be a result of the stripped top soil area and it was confirmed with the result of the twin probe resistivity survey (Louise, 1996). Since only the topsoil was stripped off, we would expect this anomaly is only picked up by the shallow profile (1 meter spacing profile) and not by the others. The reason why the anomalies A and D did not appear on L4 profiles, is simply because that line was chosen to avoid these two known man made structures.

Anomalies A and D are confidently interpreted since there is a good control. On the other hand, the anomalies B and C are still doubtful. These anomalies are in the area where the target ditch was postulated. From the excavation in the nearby area, only one ditch was found and the idea of a Roman fort with one ditch is always questionable since most of them had two or more ditches as their defense. Can anomaly B and C be taken as proof of the existence of two trenches around this fort? Without a careful analysis, we might agree with the idea of the existence of two ditch since the anomaly of B and C are very strong on both 1 meter spacing profiles on both lines, however this idea shows a contradiction to the field evidence. On the other hand, if we agree with the idea of a single ditch, which of these anomalies represent the ditch, and why there are two low resistivity anomalies?.

Anomaly B is a wide and a strong low anomaly. It appears on all profiles of L4 however, on the L3, only the shallow profile shows the effect. Other profiles in that region are undulating and the recognition of the anomaly is very difficult. By comparing the anomaly B on L4 and anomaly A on L3, we can say that this anomaly is the result of a deep trench-like structure. However, the difficulties in recognizing any anomaly on the deeper profile on L3 may indicate that structure is not continuous. Comparing anomaly C (on both lines) to anomaly B (on line L4) and anomaly D (on line L3), we can say that this anomaly is also the result of a trench-like structure. However, the maximum depth of this structure is less than 1 meter since the deeper profile did not shows the same anomaly.

Although a trench like structure which gave the anomaly C is continuous (based on the appearance on both lines), it is unlikely to be the Roman ditch since it is too shallow. Since anomaly A, D and C cannot be the anomaly corresponding to the Roman ditch, then it must be anomaly B.

The other interesting anomaly is a prominent high resistivity anomaly — anomaly Z (Figs. 2a, 2b). This anomaly is very narrow and its center is at 14 meters on L3 and 16 meters on L4. This anomaly can be seen on all profiles on both lines L3 and L4. Normally, a high resistivity anomaly is the result of a non-conductive material such as a rock boulder. From the knowledge on the area, this anomaly may be corresponding to the presence of the dress sandstone in front of the clay rampart.

As a conclusion, although there was a good physical control, the interpretation of the resistivity data still subjected to the ambiguities. Although the interpretation of the resistivity data is subjected to the ambiguities, it can however give a rough idea on where to put the trial pit. To overcome those ambiguities, other geophysical survey should be conduct on the same area.

CONCLUSION

The result resistivity suggested there were two possible anomalies related to the ditch — anomaly B and C. However anomaly C was too shallow while anomaly B was not continuous. Anomaly B has more chances to be a result of the ditch compare to anomaly C since it is much deeper although the presence of C anomaly on L3 was unclear.

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Revised manuscript received 7 May 2003

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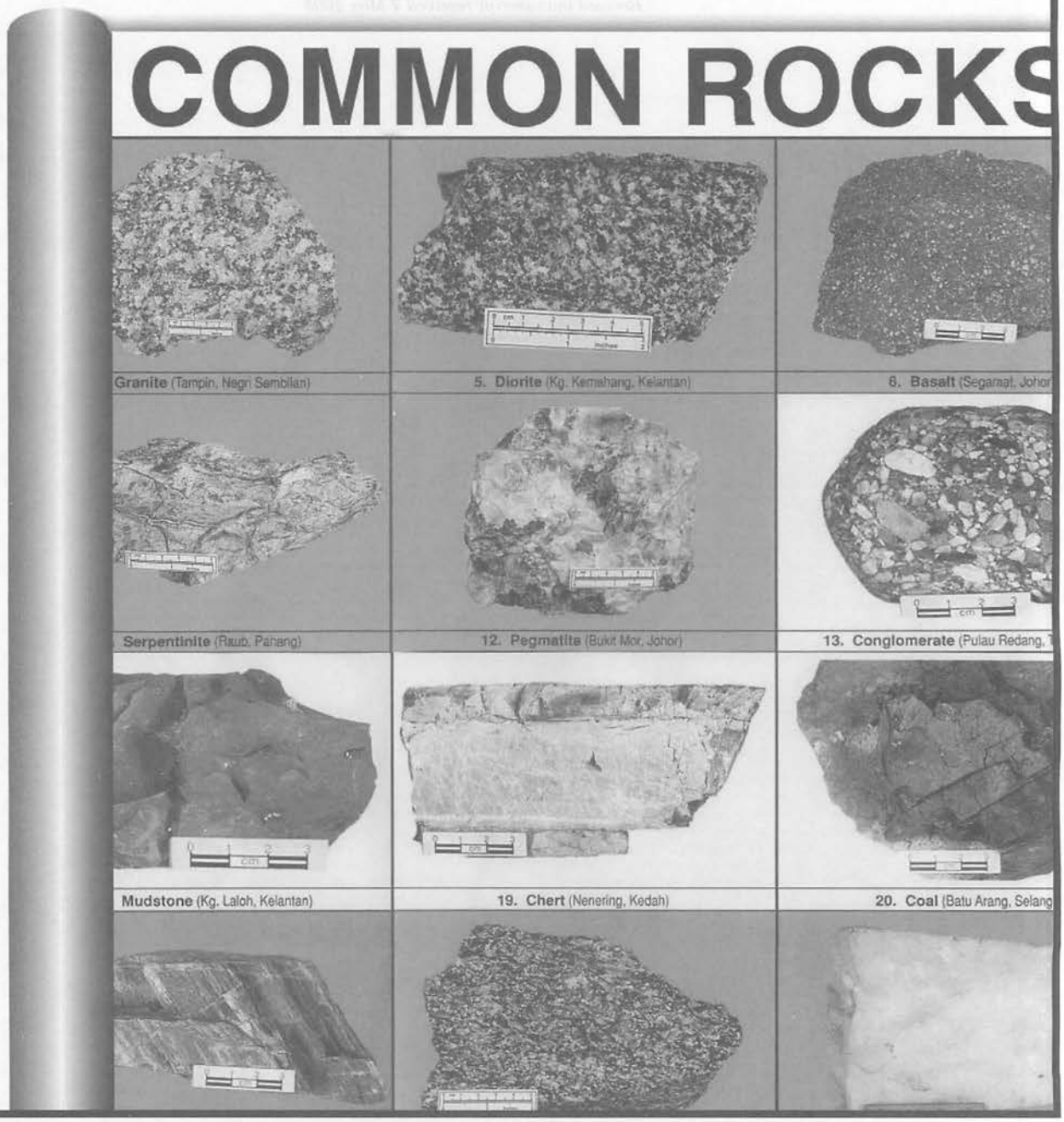

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PERTEMUAN PERSATUAN
MEETINGS OF THE SOCIETY

Ceramah Teknik (Technical Talk)

Scientific problems for "Creation Science"

ROBERT C. NEWMAN

Laporan (Report)

Prof. Robert Newman of the Biblical Research Institute gave a very interesting talk on *Scientific Problems for "Creation Science"* to a combined audience of members of the Geological Society of Malaysia and Graduates' Christian Fellowship of Malaysia at the Geology Lecture Hall, University of Malaya on 8.1.2004. The abstract of his talk is appended below.

Abstrak (Abstract)

"Creation Science" is often used as a synonym for young-earth creationism, though the latter is really a better term. Young-Earth Creationism depends very strongly on the idea that most of the geologic record is that of the one-year flood at Noah's time rather than being spread over geologic history. Problems of flood geology are sketched, including the number and type of fossils, the distribution of sediments, and the presence of structures which must have formed slowly. Other problems which face a recent creation but do not involve flood geology concern the rates of various processes and various astronomical evidences.

C.P. Lee

Ceramah Teknik (Technical Talk)

Specialised geophysics for oil and gas industry

DEVA GHOSH

Laporan (Report)

Dr. Deva Ghosh, Custodian of Geophysics, Petronas-Carigali Sdn. Bhd., gave a well-illustrated and very informative talk to about 50 participants, mainly students, on 9 January 2004 at 5.30 pm at the Geology Department, University of Malaya. It was good to see many students coming forward with good questions during discussion time.

Abstrak (Abstract)

Specialised Geophysics is the wing of Geophysical methods where the seismic measurements are used to derive quantitative information about the subsurface in terms of:

a) Velocity-depth structure
b) Reflectivity and impedance profile
c) Reservoir properties d) Fluid and lithology

All these fall under the broad terminology called Seismic Inversion.

Given a Geological model with defined boundaries, structure and petrophysical identifiers one can compute its Seismic response either simulating it in the computer what is known as Forward modelling or actually going in the field (land or offshore) and sending acoustic waves and recording the Seismic response or the echo from the subsurface. This response is then interpreted Inverted to yield the subsurface architecture and properties.

The seismic data can be inverted in a variety of ways giving rise to the following methods i.e.

Seismic Imaging	**Velocity/Structure**
Seismic AVO:	Lithology and Fluid Content
Seismic Inversion:	Imedance and Fluid
Time-Lapse:	Fluid and reservoir Monitoring

Seismic Inversion in terms of reservoir and fluid properties is basically a non unique or in other words there can be a large number of possible solution, hence we have to invoke external controls called 'constraints'. These constraints are bounds that the solution has to honour. The inversion deals with the following parameters: Data Space, Model Space and Solution space and available Technology. The model constantly updated iteratively such that it can explain the data that was collected.

Development in the field of Geophysics, computing and graphics has helped us to attain our goals. 3D Seismic coupled with 3D Visualisation capability and attribute analysis has played a significant role. Also utilising the knowledge and behavior of Shear waves has led to Better Imaging under Gas wipeouts, Understanding fractures and better Seismic illumination below salt domes and on the flanks. These are incorporated in the new acquisition technique coined as OBC where the cable is laid on the ocean bed as opposed to dragging the streamer behind the boat in conventional methods in Marine seismics.

G.H. Teh

Extraordinary General Meeting — Redefinition of GSM

In response to a suggestion at the last AGM, an EGM to discuss the Redefinition of GSM was held on Saturday, 10 January 2004 at the Geology Department, University of Malaya from 2.55 pm to 5.00 pm.

The Vice-President, Mohd Shafeea Leman, chaired the meeting. To start off the proceedings, the Chairman invited K.K. Liew to present his slides on the Action Plans, Schedule of Plans, Status of Plans and update of Action for the Redefinition of GSM. C.K. Lim presented the Website Elements while Abd. Rasid Jaapar presented the Standard Operating Procedures.

On the question of a Permanent Secretariat, the meeting agreed that the Society cannot afford to move to another place (rented or own) now, and the best option is still to stay put in UM and negotiate for a more permanent basis.

The meeting concluded with a vote of thanks for K.K. Liew and his team for their efforts.

MALAM GEO-KEJURUTERAAN JMG
(Engineering Geology DMG Nite)
19 February 2004
Geology Department
University of Malaya
Report

The Society is fortunate to have the participation of the 3 popular speakers from Department of Mineral & Geoscience (DMG) speaking at this Engineering Geology Night. The current topics like hillsite development, landslides and groundwater protection virtually ensured a good turnout for the evening.

Tan Boon Kong
Chairman
Working Group on Engineering Geology & Hydrogeology

MALAM GEO-KEJURUTERAAN JMG
(Engineering Geology DMG Nite)
19 February 2004
Geology Department
University of Malaya
Abstracts of Papers

Guidelines for hill-site development

CHOW WENG SUM

Jabatan Mineral dan Geosains
Selangor/Wilayah Persekutuan
Tingkat 6–7, Bangunan Darul Ehsan
No. 3, Jalan Indah, Seksyen 14,
40000 Shah Alam

In recent years, due to the rapid pace of development in Malaysia, a large number of housing projects are sited on hill slopes, such as in the Cheras, Damansara and Ampang areas in Kuala Lumpur and in Pulau Pinang. In the highland areas such as Cameron Highlands, new holiday resorts have been constructed and forested areas have been cleared for agriculture. These development have led to the cutting of hill slopes and in most cases, the cut materials are just dumped on the sideslopes, leading to serious environmental problems such as occurrence of landslides, erosion and contamination of the river systems.

To control development on hilly and highland areas, various government agencies have proposed guidelines such as that by the Agriculture Department (1993), Town and Country Planning Department Selangor (1997), Land and Mines Department Pulau Pinang (1997), the Institution of Engineers Malaysia (2000), Ampang Jaya Town Council (2003) and the Ministry of Science, Technology and Environment (2003).

The guidelines for development in highland areas as proposed by the Ministry of Science, Technology and Environment were approved and passed by the Cabinet in 2003 and a circular had been sent to all District Offices to implement the guidelines.

Case histories of several major landslides in Peninsular Malaysia

ZAKARIA MOHAMAD

Groundwater protection in Kelantan

SAIM SURATMAN

Ceramah Teknik (Technical Talk)

Chairman's Lecture IV

Saturday, 28 February 2004
Bilik Mesyuarat Program Geologi
Universiti Kebangsaan Malaysia

Deformation history of the Eastern Belt, Peninsular Malaysia

IBRAHIM ABDULLAH

Laporan (Report)

Satu lagi ceramah teknik dalam siri Chairman's Talk Persatuan Geologi Malaysia telah dilangsungkan pada Hari Sabtu 28 Februari 2004, jam 10.00 pagi bertempat di Bilik Mesyuarat Geologi, UKM. Ceramah teknik bertajuk *"Deformation History of the Eastern Belt of Peninsular Malaysia"* telah disampaikan oleh Pengerusi Kumpulan Kerja Geologi Struktur dan Tektonik Persatuan Geologi Malaysia, Prof. Madya Dr. Ibrahim Abdullah. Ceramah teknik telah dipengerusikan oleh Ketua Program Geologi UKM, Profesor Dr. Abdul Rahim Samsudin. Ceramah teknik ini telah dihadiri oleh seramai 21 peserta. Sesi soal-jawab tamat pada jam 11.20 pagi.

Abstrak (Abstract)

It was believed that the oldest rock formation in the Eastern Belt of Peninsular Malaysia are Carboniferous to Permian age; consisting mainly of clastic and volcanic rocks with minor limestone. Continental deposits of the Late Permian and Jurassic-Cretaceous ages unconformably overlie this rock formation. The area was intruded by mafic to intermediate igneous, followed by biotite granite of the Late Permian-Early Triassic, Late Triassic granite and finally by doleritic dykes of Jurassic-Cretaceous age.

The supposed Carboniferous-Permian rocks show rater complex structures and had experienced at least two phases of folding. In certain areas, these rocks show three phases of folding, characterised by inclined to recumbent folds and thrust faults. The late Permian continental deposits were folded into open fold while the Jurassic-Cretaceous sediments are gently tilted. Apart from thrust faults, strike-slip (striking NNW and N-S) and normal faults are commonly observed. Doleritic dykes in this area are aligned in either N-S or ENE direction. Some of the N-S dykes are cut and displaced by the ENE dykes or dextral strike-slip faults. The N-S strike-slip faults are also displaced by the ENE dextral or ESE sinistral faults.

From structural point of view, it is believed that some of the interpreted Carboniferous-Permian rocks, which indicate three phases of folding, are older (pre-Carboniferous age). Based on the structural relationships observed at several areas in this belt, it is interpreted that the rocks in the Eastern Belt were subjected to two major episodes of deformation. The earlier (Episode-A) was dominated by ductile and the later (Episode-B) by brittle deformations. Further, each episode could be divided into three phases. For Episode-A; phase-1 was responsible in the development of inclined to overturned folds in the pre-Carboniferous rocks, trending ENE and probably related to mid-Devonian orogeny. Phase-2 and phase-3 were

GEOLOGICAL MAP OF BORNEO

Persatuan Geologi Malaysia
Geological Society of Malaysia

Compiled by
Robert B. Tate
Year 2002

Scale 1: 1,500,000

LEGEND

- Q — Quaternary Holocene coastal and river alluvium etc.
- Q — Quaternary-Holocene High-level alluvium
- Nv — Pliocene or younger basalt East Sabah
- N(p)(d) — Middle to Late Miocene volcanics - East Sabah
- Ng — Pliocene sediments
- Ngv — Neogene acid/basic volcanic lavas & tuffs
- Nma/b — Miocene andesite/basalt plugs, dykes & lavas
- Nmi — Miocene I type intrusives
- Nm(B) — Miocene Broken Formation (melange)
- Nm — Miocene sediments
- Ml — Melinau Limestone (Eocene - Oligocene)
- Nmg — Miocene alkali rock granite
- Nmv — Miocene volcanics
- Po — Oligocene sediments
- Pox — Oligocene deepwater sediments
- Pe — Eocene sediments
- Pp — Paleogene sediments
- Pev — Paleogene volcanics
- Px — Paleogene deepwater sediments
- mélange - undeformed
- mélange - sheared
- limestone
- fault
- structural trend lines
- Kuu — Cretaceous ultrabasic rocks - harzburgite, serpentinite etc.
- Kx — Cretaceous deepwater sediments
- Kpx — Cretaceous-Paleogene deepwater sediments
- C's — Cretaceous "crystalline basement" (E. Sabah)
- Kat1 — Upper Cretaceous granite - granite, diorite
- Ka3 — Upper Cretaceous ultrabasic rocks - gabbro, minor diorite
- Ka2 — Upper Cretaceous volcanics - dacite to basalt lava, breccia, tuff etc.
- Ka1 — Upper Cretaceous granite - granite, quartz monzonite, alkali granite
- K21 — Lower Cretaceous volcanics - andesite lava, breccia, tuff etc.
- K13 — Lower Cretaceous granite - granite
- K12 — Lower Cretaceous granite - granodiorite, granite, tonalite
- K11 — Lower Cretaceous granite- tonalite, granodiorite; locally foliated
- K — Cretaceous sediments
- Jk — Jurassic - Cretaceous sediments
- JKm — Jurassic - Cretaceous metamorphic rocks
  (chlorite-sericite schists, hornblende schist, garnet-mica schist etc. at Mount Mas.)
- JKx — Jurassic - Cretaceous deepwater sediments
- Jx — Jurassic deepwater sediments
- Js — Jurassic sediments
- TrJ — Triassic - Jurassic sediments
- Trv — Triassic volcanics
- Trg — Triassic granites
- PTr — Permo-Trias metamorphics
- CP — Carbo-Permian sediments
- P2M — Pre-Carboniferous Pinoh Metamorphics

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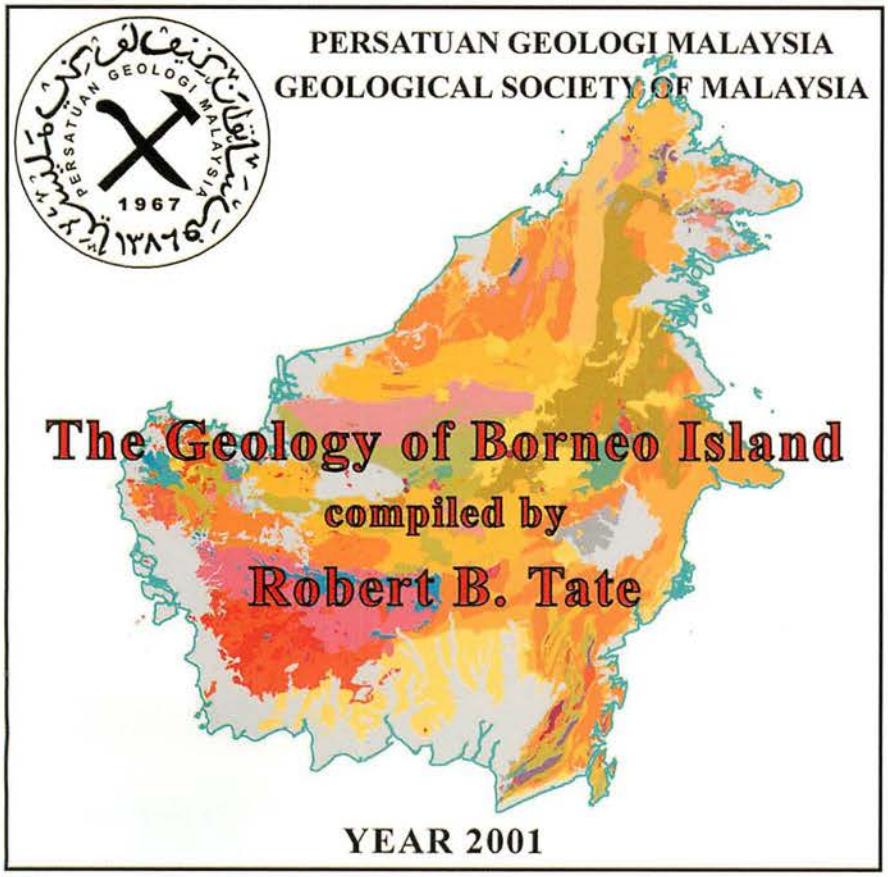

The Geology of Borneo Island

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related to the Permo-Carboniferous and Triassic orogeny respectively, producing inclined to recumbent and open folds, both trending approximately to NW-NNW. For Episode-B; Phase-4 was related to the formation of NNW to N-S dextral faults. Phase-5 corresponds to the formation of conjugate ENE dextral and ESE sinistral faults. Phase-6 was related to the displacements of the doleritic dykes and the Jurassic-Cretaceous continental deposits by the SSE sinistral or NE-SW reverse faults. The post Jurassic-Cretaceous stress system was also responsible for the reactivation of the NNW dextral faults that were developed during phase-4 and as a result these faults had moved sinistrally.

Mohd Shafeea Leman

BERITA-BERITA PERSATUAN
NEWS OF THE SOCIETY

KEAHLIAN (Membership)

The following applications for membership were approved:

Full Members

1. Poonsawat Prachukbunchong
PTTEP, 555 Vibhavadi-Rangsit Road, Chatuchak, Bangkok 10900, Thailand.

2. Janice M. Christ
3, Biscay Court, The Woodlands, Tx. 77381, USA.

3. Moira Fallas
Reservoir Management Ltd., Suite 208, The Ascott, 9 Jalan Pinang, 50450 Kuala Lumpur.

4. Mat Arifin b. Ismail
Petronas Carigali, Petronas Twin Tower II, Level 15–17, KLCC, 50088 Kuala Lumpur.

5. Hesham Hendy
C.S. Mutiara Petroleum, Petronas Twin Tower 2, Level 52, KLCC, 50088 Kuala Lumpur.

6. Stephen William Noon
PT Corelab Indonesia, 303 Kawasan Komersial Cilandak, Jalan Cilandak KKO, Jakarta 12560, Indonesia.

7. Peter William Baillie
TGS-NOPEC Geophysical Co, Level 15, 1100 Hay Street, West Perth, W. Australia 6005.

8. Mohamed Mohamed Abo El Saadany
Petronas Carigali, Petronas Twin Tower II, Level 15–17, KLCC, 50088 Kuala Lumpur.

9. Jon Noad
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10. Bouisset Patrick
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11. Debnath Basu
Schlumberger, 18 Fl., East Wing, Rohas Perkasa, 8 Jalan Perak, 50450 Kuala Lumpur.

12. Bundit Chaisilboon
PTTEP, 555 Vibhavadi-Rangsit Road, Chatuchak, Bangkok 10900, Thailand.

13. Andrew Thomas
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14. David George Richert
Talisman Malaysia, Menara Citibank, Level 31, 165 Jalan Ampang, 50450 Kuala Lumpur.

15. Richard Nathan Hyde
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16. Barry Boyce
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17. James Y.K. Blevins
Murphy Sarawak Oil, Petronas Twin Tower 2, Level 27, KLCC, 50088 Kuala Lumpur.

18. Heinrich Robert Siregar
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19. Robert David Herries
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21. Koesoemahardy Widjaya
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2. Tan Hean Siew
Program Geophysics, Universiti Sains Malaysia, 11800 USM, Penang.

3. Sugeng Sapto Surono
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4. Ling Swee San
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8. Ooi Haur Hye
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10. Zuliyana Ibrahim
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13. Justin Tan
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14. Phan Kee Hock
Program Geophysics, Universiti Sains Malaysia, 11800 USM, Penang.

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2. Teguh Prasetyo
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3. Jumain Marzuki
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4. Mohd Nawawi Mohd Nordin
Program Geophysics, Universiti Sains Malaysia, 11800 USM, Penang.

Life Member

1. Leong Khee Meng
Universiti Teknologi Petronas, Bandar Sri Iskandar, 31750 Tronoh, Perak.

PETUKARAN ALAMAT (Change of Address)

The following members have informed the Society of their new addresses:

1. Guang R. Shi
School of Ecology and Environment, Deakin University, Melbourne Campus, 221 Burwood Highway, Burwood, Victoria 3125 Australia.

2. Tong Pow Mun
151-5-6, Menara Duta, Jalan 1/38B, Segambut, 51200 Kuuala Lumpur.

CURRENT ADDRESS WANTED

The GSM is seeking the address of the following members. Anyone knowing the new addresses please inform the Society.

1. Abdul Halim Abdul
2. Mohd. Tajuddin Abdul Ghani
3. Badrul Hashim Ibrahim
4. Kasmawati Abdul Rahman
5. Mohd. Faizal Tajul Baharuddin
6. Raguram B.
7. Ismail Tawnie
8. Azman Yahya
9. Nordin Mat
10. Mohamad Faizul Saat
11. Mahat Hj. Sibon
12. Wan Mohd. Zaizuri W. Embong
13. Saidi Ideris
14. Haro Krishna
15. Kesaran
16. Yusri Yusof
17. Mohd. Nazri Ishak
18. Zulhisham Mohd. Said
19. Supian Suntuk
20. Balamurali
21. Norddin Mohamad Nasir
22. Abdul Majia Abdullah
23. V. Ramesh Viswambharan
24. Ahmad Jamani Samat
25. R.A.S. Cayzer (Australia)

PERTAMBAHAN BAHARU PERPUSTAKAAN (New Library Additions)

The Society has received the following publications:

1. SOPAC News, No. 2003 (1&2), 2003.
2. Geoscience Journal, vol. 7, no. 2, 2003
3. AAPG Bulletin 87, no. 4, 9 & 10 2003.
4. Monthly statistics on Mining Industry in Malaysia, May 2003.
5. AAPG Explorer, June & September, 2003.
6. Journal of Science of the Hiroshima University, vol. 11, no. 2, 2003.
7. Development in Sarawak: an aerial perspective.
8. Episodes, vol. 26, no. 3, 2003.
9. Overview of trends in Canadian mineral exploration, 2002.
10. Oklahoma Geology notes, vol. 62, nos. 3 & 4, 2002.
11. Geological Survey of Japan, Bulletin no. 53, no. 11/12, 2002 & no. 54, nos. 1/2 & 3/4, 2003.
12. USGS Professional Paper, no. 1630 (2001).
13. Geological Survey of New South Wales, Quarterly Notes no. 115, 2003.
14. Scripta Geologica, no. 124 (2002); no. 125 & 126 (2003)
15. AAPG Bulletin: 20003: vol. 87, nos. 8; 2004: v. 88, nos. 1, 2.
16. Sopac News, no. 3, 2003.
17. Episodes, vol. 26, no. 4, 2003.
18. AAPG Explorer, 2003: Jan, Feb.
19. Geoscience Journal, vol. 7, no. 1, 2003.
20. Geologica Belgica, vol. 6, nos. 3–4, 2003.
21. Museum of Nature & Human Activities, Hyogo: Humas & Naturu, no. 13, 2002.
22. Museum of Nature & Human Activities, Hyogo: Nature & Human Activities, no. 7, 2002.
23. Geological Survey of Japan, Bulletin vol. 54, nos. 5/6, 2003.
24. Monthly statistics on mining industry in Malaysia, June 2003.
25. U.S.G.S. Professional Paper, no. 1659 & 1419 (2002); no. 1411-B (2003).
26. U.S.G.S. Circular, no. 1248 (2003).

Geological Society of Malaysia
PHOTOGRAPHIC COMPETITION 2003

RESULTS

An encouraging total of 27 entries were received. There was an overall improvement in the quality of the entries. The 3 judges on 28 February 2004 agreed on the following prize winners:

1st Prize (RM1,000):

*** ISNEY ZAIREEN ROSE ZAIN ***

2nd Prize (RM500):

*** S. AHMAD YASIK b. S. AB HAMID ***

3rd Prize (RM300):

*** LEE CHAI PENG ***

Consolation Prize (RM100 each):

1. **Patrick Gou**
2. **S. Ahmad Yasik b. S. Ab Hamid**
3. **Patrick Gou**
4. **Lee Chai Peng**
5. **Tommy Tam**

G.H. Teh
Organiser

BERITA-BERITA LAIN
OTHER NEWS

BUKU-BUKU BARU (NEW BOOKS)

- *38TH ANNUAL SYMPOSIUM ON ENGINEERING GEOLOGY AND GEOTECHNICAL ENGINEERING, PROCEEDINGS 2003* (March 19–21, 2003, Reno, Nevada), by S. Elfass. Engineering Geology & Geotechnical Symposium, 2003. 483pp, paper back, USD35.00.
- *AN INTRODUCTION TO GEOLOGICAL STRUCTURES AND MAPS* (7th ed.), by Bennison *et al.* Arnold, 2003. 160pp, paper back, GBP14.99, ISBN 0340809566.
- *EARTH SCIENCE* (10th ed.), by E. Tarbuk *et al.* Pearson Education, 2003. 686pp, paperback, HKD657.00, ISBN 0130353906.
- *EARTH: GEOLOGIC PRINCIPLES AND HISTORY*, by S. Chernicoff & H.A. Fox. Houghton Mifflin Co., 2002. 570pp, paperback, USD79.96, ISBN 0618022759.
- *ESSENTIALS OF GEOLOGY* (3rd ed.), by S. Chernicoff & H.A. Fox. Houghton Mifflin Co., USA, 2003. 468pp, paperback, USD76.00, ISBN 0618221514.
- *EXTENSIONAL TECTONICS: FAULTING AND RELATED PROCESS* (Part 2) (Key Issues in Earth Sciences, Vol. 2), by R.E. Holdsworth & J.P. Turner. Geological Society, UK, 2002. 328pp, paperback, GBP27.50, ISBN 1862391157.
- *EXTENSIONAL TECTONICS: REGIONAL-SCALE PROCESSES* (Part 1) (Key Issues in Earth Sciences, Vol. 2), by R.E. Holdsworth & J.P. Turner. Geological Society, UK, 2002. 352pp, paperback, GBP27.50, ISBN 1862391149.
- *FRONTIERS IN GEOCHEMISTRY: GLOBAL INORGANIC GEOCHEMISTRY* (Konrad Krauskopf Volume 1; International Book Series, Volume 5), by W.G. Ernst, GSA, 2002. 324pp, paperback, USD95.00, ISBN 0966586948.
- *FRONTIERS IN GEOCHEMISTRY: ORGANIC, SOLUTION, AND ORE DEPOSIT GEOCHEMISTRY* (Konrad Krauskopf Volume 2; International Book Series, Volume 6), by W.G. Ernst, GSA, 2002. 205pp, paperback, USD85.00, ISBN 0966586956.
- *GEOCHEMISTRY: AN INTRODUCTION*, by Francis Albarede. Cambridge University Press, 2003. 245pp, hardback, GBP48.00. ISBN 0521814685.
- *GEOLOGICAL HAZARDS: THEIR ASSESSMENT, AVOIDANCE AND MITIGATION*, by Fred Bell. Spon Press, 2003. 656pp, paperback, GBP29.99, ISBN 0415318513.
- *HISTORICAL GEOLOGY: EVOLUTION OF EARTH AND LIFE THROUGH TIME* (4th ed.), by Reed Wicander, Thomson Learning, 2003. 608pp, USD100.95, ISBN 0534392873.
- *INDUSTRIAL MINERALS 2002 — 14TH ANNUAL CANADIAN CONFERENCE / TORONTO, OCT 22–23, 2002*, Blendon Information Services, 2002. USD183.00
- *INTRODUCTION TO HYDROGEOLOGY*, by David Deming, McGraw Hill, 2002. 480pp, hardback, USD118.44, ISBN 0072326220.
- *INTRODUCTION TO ORE FORMING PROCESSES*, by Laurence Robb. Blackwell Science, 2003. 416pp, paperback, GBP32.50, ISBN 0632063785.
- *IRON ORE 2002 CONFERENCE PROCEEDINGS* (Held 9–11 September 2002 Perth WA — Hardcopy), Australasian

Institute of Mining and Metallurgy (AUSIMM), 2002. 318pp, hardback, AUD132.00, ISBN 187577694X.

- *MIND OVER MAGMA: THE STORY OF IGNEOUS PETROLOGY*, by Davis A. Young. Princeton University Press, 2003. 704pp, hardback, USD69.95, ISBN 0691102791.
- *MINE WASTES: CHARACTERIZATION, TREATMENT AND ENVIRONMENTAL IMPACTS*, by B. Lottermoser. Springer, 2003. 277pp, hardback, EUR99.95, ISBN 3540005269.
- *MINE WATER HYDROGEOLOGY AND GEOCHEMISTRY (Special Publication, 198)*, by P.L. Younger & N.S. Robins. Geological Society, UK, 2002. 408pp., hardback, GBP85.00, ISBN 18623921130.
- *MINERAL RESOURCES MANAGEMENT AND THE ENVIRONMENT*, by U. Aswathanarayana. A.A. Balkema, 2003. 316pp, EUR99.00, ISBN 9058095452.
- *PALYNOLOGY: PRINCIPLES AND APPLICATIONS* (3 Volume Set-boxed), by Jan Jansonius. AASP Foundation, 2002. 1330pp, paperback, USD100.00, ISBN 0931871077.
- *PERILOUS PLANET EARTH: CATASTROPHES AND CATASTROPHISM THROUGH THE AGES*, by Trevor Palmer. Cambridge University Press, 2003. 522pp, hardback, GBP40.00, ISBN 0521819288.
- *PHYSICAL GEOLOGY: EARTH REVEALED*, by D. McGeary. McGraw-Hill, 2003. 592pp, paperback, USD83.13, ISBN 0072463279.
- *PREHISTORIC PAST REVEALED: THE FOUR BILLION YEAR HISTORY OF LIFE ON EARTH*, by Douglas Palmer. University of California Press, 2003. 176pp, hardback, USD29.95, ISBN 0520241053.
- *PRINCIPLES OF ENVIRONMENTAL GEOCHEMISTRY*, by G. Nelsen Eby. Academic Press, 2003. Hardback USD94.95, ISBN 0122290615.
- *PRINCIPLES OF STRATIGRAPHY*, by M.E. Brookfield. Blackwell, 2003. 256pp, paperback, USD64.95, ISBN 140511164X.
- *SANDSTONE PETROLOGY (AAPG/ Datapages Discovery Series 6)*, by Kitty Milliken and Suk-Joo Choh *et al.* American Association of Petroleum Geologists, 2003. CD-ROM, USD22.00, ISBN 1588610055.
- *SEDIMENT HOSTED LEAD-ZINC SULPHIDE DEPOSITS*, by M. Deb. Alpha Science International Ltd., 2003. 264pp, hardback, GBP65.00, ISBN 817319520X.
- *SEDIMENTARY ROCKS IN THE FIELD* (3rd ed.), by Maurice E. Tucker, John Wiley & Sons, 2003. 234pp, paperback, USD25.95, ISBN 0470851236.
- *THE TIMING AND LOCATION OF MAJOR ORE DEPOSITS IN AN EVOLVING OROGEN (Special Publication, 204)*, by D.J. Blundell et al. Geological Society, UK, 2002. 368pp, hardback, GBP85.00, ISBN 186239122X.
- *VOLCANOES* (2nd ed.), by Peter Francis. Oxford University Press, 2003. 480pp, GBP28.99, ISBN 0199254699.
- *WATER POLLUTION VII: MODELLING, MEASURING AND PREDICTION (Progress in Water Resources Series, Vol. 9)*, by C.A. Brebbia, WIT Press, 2003. 528pp, hardback, USD249.00, ISBN 1853129763.
- *WATER RESOURCES MANAGEMENT II (Progress in Water Resources, Vol. 8)*, by C.A. Brebbia. WIT Press, 2003. 506pp, hardback, GBP190.00, ISBN 1853129674.
- *WATER-ROCK INTERACTION, ORE DEPOSITS, AND ENVIRONMENTAL GEOCHEMISTRY (Special Publication Vol. 7)*, by R. Hellmann & S.A. Wood. The Geochemical Society, Washington University USA, 2002. USD72.00, ISBN 0941809064.

KALENDAR (CALENDAR)

2004

March 27 – April 4

NATIONAL EARTH SCIENCE TEACHERS ASSOCIATION (Annual Meeting), Atlanta, Georgia, USA. (Contact: NESTA, 2000 Florida Ave., N.W., Washington, D.C. 20009, USA. Tel: +1-202 462 69 10; Fax: +1-202 328 0566; E-mail: fireton@kosmos.agu.org)

March 29–31

EURADWASTE'04 — Radioactive Waste Management Community Policy and Research Initiatives, Luxembourg. (Contact: Christophe Davies, European Commission Office: MO75 - 5/42, B-1049 Brussels, E-mail: christophe.davies@cec.eu.int; Fax: (32 2) 2954991 or Simon Webster, European Commission Office: DM24-07/091, B-1049 Brussels; E-mail: simon.webster@cec.eu.int; Fax: (32 2) 2950061).

April 18–21

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS AND SOCIETY FOR SEDIMENTARY GEOLOGY (SEPM) (Joint Annual Meeting and Exhibition), Dallas, Texas, USA. (Contact: AAPG Conventions Dept., P.O. Box 979, Tulsa, OK 74119, USA. Tel: +1-918 560 2679; Fax: 1-918 560 2684; E-mail: convene@aapg.org; Website: www.aapg.org)

May 17–21

AMERICAN GEOPHYSICAL UNION AND CANADIAN GEOPHYSICAL UNION (Joint Meeting), Montreal, Canada. (Contact: AGU Meetings Department, 2000 Florida Avenue, NW, Washington, DC 20009 USA. Tel: +1 202 462 6900; Fax: +1 202 328 0566; E-mail: meetinginfo@agu.org; Website: http://www.agu.org/meetings)

June 7–11

10TH COAL GEOLOGY CONFERENCE, Prague, Czech Republic. (Contact: Prof. Jiri Pesek, DSc., Faculty of Science, Charles University, Albertov 6, 128 43 Prague 2, Czech Republic. Fax: +420-2-21951450 or +420-2-24921736; E-mail: ir@natur.cuni.cz).

June 27 – July 2

WATER-ROCK INTERACTION (11th International Symposium), Saratoga Springs, New York, USA. (Contact: Dr. Susan Brantley, Secretary General, Dept. of Geosciences, The Pennsylvania State University, 239 Deike Building, University Park PA 16802, USA. Tel: +1-814 863 1739; Fax: +1-814 863 8724; Website: www.outreach.psu.edu/C&I/WRI/)

July 4–9

INTERNATIONAL PALYNOLOGICAL CONGRESS (11th), Granada, Spain. (Contact: Technical Secretary. E-mail: eurocongres@eurocongres.es; Website: www.ugr.es/~bioveg/)

August 20–28

INTERNATIONAL GEOLOGICAL CONGRESS (32nd), "The Renaissance of Geology", Florence, Italy. (Contact: Ms. Chiara Manetti, Universitàdegli Studi di Firenze, Dipartimento di Scienze della Terra, Via La Pira, 4, 50121 Firenze, Italy. Tel/Fax: +39-055 238 2146; E-mail: cmanetti@geo.unifi.it; To request the First Circular, send e-mail to: 32igc@32igc.org or visit the Congress Website: www.32igc.org)

August 27 – September 4

VLADIVOSTOK-2004 INTERIM IAGOD CONFERENCE (Metallogeny of the Pacific Northwest: Tectonics, Magmatism & Metallogeny of Active Continental Margins), Vladivostok, Khabararovsk, Magadan, Russian Far East, Russia. (Contact: Russian National IAGOD Group, Federal Far East Geological Institute, Far Eastern Branch of Russian Academy of Sciences, 159, Prospekt 100-letiya, Vladivostok, 690022, Russia. Tel: 7(4232)31-87-50; Fax: 7(4232)31-78-47; E-mail: iagodconf@fegi.ru or fegi@online.marine.su; Website: http://www.fegi.ru/IAGOD/index.htm)

September 11–19

TECTONICS, MAGMATISM AND METALLOGENY OF ACTIVE CONTINENTAL MARGINS (Interim International Conference on Metallogeny of the Pacific Northwest), Vladivostok, Russia.

Sponsored by the Russian Academy of Sciences and The Society of Economic Geologists. (Contact: Far East Geological Institute, Far Eastern Branch of Russian Academy of Sciences, 159, Prospekt 100-letiya, Vladivostok, 690022 Russia. Tel: +7(4232)31-87-50; Fax: +7(4232)31-78-47; E-mail: iagodconf@fegi.ru or fegi@online.marine.su; Website: http://www.fegi./ru/IAGOD/)

September 15–17

SEDIMENTOLOGY (23rd Annual Meeting of the International Association of Sedimentology), Coimbra, Portugal. (Contact: Rui Pena dos Reis, uiversidade de Coimbra, Dpto. Ciências da Terra, Largo Marquês de Pombal, 3014 Coimbra, Portugal; E-mail: penareis@ci.uc.pt)

October 10–15

SOCIETY OF EXPLORATION GEOPHYSICISTS (74th Annual Meeting and International Exposition), Denver, Colorado, USA. (Contact: Debbi Hyer, 8801 S. Yale, Tulsa, OK 74137, USA. Tel: (+1-918) 497 5500; E-mail: dhyer@seg.org; Website: meeting.seg.org)

November 7–10

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Denver, Colorado, USA. (Contact: GSA Meetings Dept., P.O. Box 9140, Boulder, CO 80301-9140, USA. Tel: +1 303 447 2020; Fax: +1 303 447 1133; E-mail: meetings@geosociety.org; Website: http://www.geosociety.org/meetings/index.htm)

December 13–17

AMERICAN GEOPHYSICAL UNION (Fall Meeting), San Francisco, California, USA. (Contact: AGU Meetings Department, 2000 Florida Avenue, NW, Washington, DC 20009 USA; Tel: +1 202 462 6900; Fax: +1 202 328 0566; E-mail: meetinginfo@agu.org; Website: http://www/agu.org/meetings).

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PERSATUAN GEOLOGI MALAYSIA
GEOLOGICAL SOCIETY OF MALAYSIA

ANNUAL GEOLOGICAL CONFERENCE 2003

Hilton Hotel
Kuching, Sarawak
24 – 26 May 2003

Editors: G.H. Teh, Alex Unya Ambun, Askury Abd. Kadir & T.F. Ng

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Minerals and Geoscience Department Malaysia
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University of Malaya
Universiti Sains Malaysia
Universiti Malaysia Sarawak
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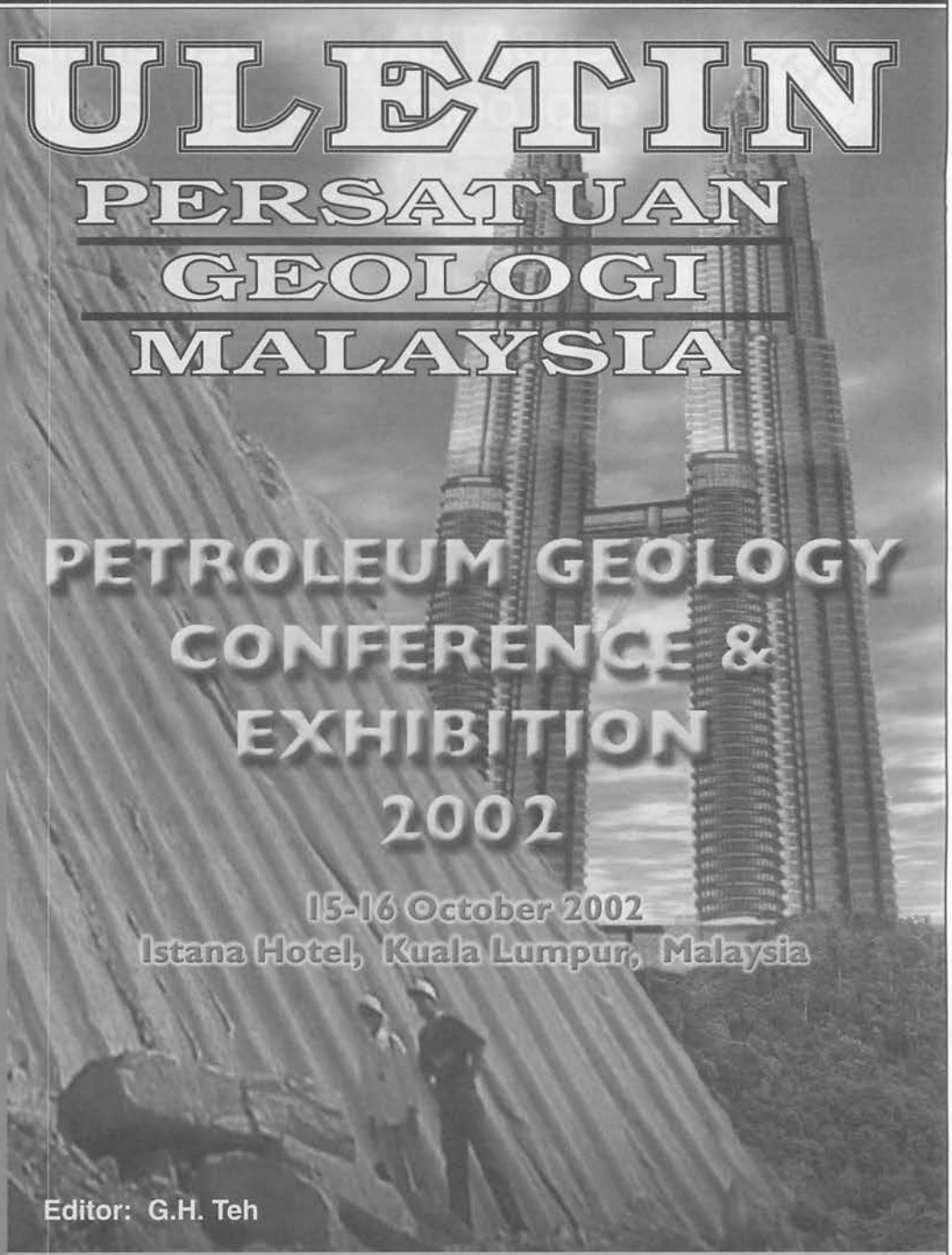

PETROLEUM GEOLOGY CONFERENCE & EXHIBITION 2002

15-16 October 2002
Istana Hotel, Kuala Lumpur, Malaysia

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GEOLOGICAL SOCIETY OF MALAYSIA PUBLICATIONS

Bulletin 1 (Feb 1968). 79 p. Studies in Malaysian Geology. Edited by P.H. Stauffer. A collection of papers presented at a meeting of the Geological Society on 31st January 1967. **Out of Stock.**

Bulletin 2 (Dec 1968). 152 p. Bibliography and Index of the Geology of West Malaysia and Singapore by D.J. Gobbett. Price: RM5.00.

Bulletin 3 (Mar 1970). 146 p. Papers in Geomorphology and Stratigraphy (with Bibliography supplement). Edited by P.H. Stauffer. Price: RM5.00.

Bulletin 4 (Jun 1971). 100 p. Papers in Petrology, Structure and Economic Geology. Edited by P.H. Stauffer. Price: RM5.00.

Bulletin 5 (Feb 1973). 70 p. The Search for Tungsten Deposits by K.F.G. Hosking. Price: RM5.00.

Bulletin 6 (Jul 1973). 334 p. Proceedings, Regional Conference on the Geology of Southeast Asia. A collection of papers, Kuala Lumpur, March, 1972. Edited by B.K. Tan. Price: RM5.00.

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