

PERSATUAN GEOLOGI MALAYSIA

WARTA GEOLOGI

NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA



GEOLOGICAL
SOCIETY OF
MALAYSIA

KANDUNGAN (Contents)

CATATAN GEOLOGI (Geological Notes)

- T.T. Khoo: The *in-situ* river boulder of Kasai 1

PERTEMUAN PERSATUAN (Meetings of the Society)

- GSM Postgraduate Seminar — Report 5
- Md. Shahid bin Ayub: Hidrologi isotop kawasan Olak Lempit: kemungkinan berlaku kebocoran akuifer (?) 6
- Ismail C. Mohamad, Abd. Ghani Rafek dan Abd. Rahim Samsudin: Teknik geofizik dalam kajian akuifer aluvium di kawasan Pekan-Rompin, Pahang 6
- Vun Boon Onn: Hydrological analysis of landslide occurrences in Penang Island for the past 20 years (1981–2000) 8
- Phakruddin b. Abdullah @ Kadir: Pedogenic influence on the stability of slope cut in Kenny Hill Formation 9
- Mohammed Ismael Ibrahim Abu-Shariah: Evaluation of the environmental and engineering geohazards in karst limestone using geophysical techniques 9
- Charles Makoundi: Sedimentologic study of the Jerai Formation with emphasis on facies analysis, Kuala Lipis, central basin of Peninsular Malaysia 10
- Azmi Ab. Rashid: Ciri-ciri geokimia batuan plutonik di Pulau Tioman Pahang 10
- Heru Sigit Purwanto: Structural control of gold mineralization in Lubok Mandi area, Peninsular Malaysia 11

BERITA-BERITA PERSATUAN (News of the Society)

- Pertukaran Alamat (Change of Address) 13
- Current Addresses Wanted 13
- Pertambahan Baru Perpustakaan (New Library Additions) 14
- Results of Election for GSM Council 2002/2003 14

BERITA-BERITA LAIN (Other News)

- Kalendar (Calendar) 25
- Buku-Buku Baru (New Books) 30
- CD-Roms 32

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About the Society

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

The *in-situ* river boulder of Kasai

T.T. KHOO

17 Orange St.

Eastwood 2122, Australia

Abstract: A syenite river boulder in Sungai Kasai resting on a syenite basement is interpreted to be *in-situ* as a pegmatite sheet in the basement continues into the boulder. It is suggested that this situation may indicate that the Kasai drainage system could be rather young.

Other than corestones embedded in their weathering materials in weathering profiles, boulders in all their forms and occurrences are generally considered to be not *in-situ*. I relate in this communication an unusual river boulder which appears to be *in-situ* from Sungai Kasai, near Kampong Ulu Gali, Raub. The boulder is shown in Figure 1 and 2.

The outcrop located on the western foothills of Gunung Benom and shown in Figure 1, admirably summarizes the magmatic history of the area which is in the Benom Complex of Yong (1997) and Remesh (1998). The basement outcrop on which the boulder is (or was) resting is syenite which has been cut by a later quartzofeldspathic pegmatite which penetrated jointing in the syenite as evidenced by the angular turns of the pegmatite in the foreground of the picture. The boulder is also syenite similar to the basement outcrop. It has a mafic enclave traversed by the pegmatite (Fig. 2). The pegmatite in the boulder is petrographically similar to the pegmatite in the basement and is of the same thickness. The strike of the pegmatite in the boulder is also the same as the strike of the pegmatite in the basement. Also at the outcrop the pegmatite sheet in the basement appears to continue into the pegmatite in the boulder. It would appear that the boulder is *in-situ* as it would be too coincidental for a fugitive boulder having all the necessary features to come to rest on the basement outcrop with

the pegmatite in both parts aligned with continuity.

The occurrence of the *in-situ* boulder has some geomorphological significance. It would appear that the boulder is a corestone developed over the syenite basement with only a thin veneer of grus and other weathered material in between. The boulder was once pinned down to the basement by the pegmatite which is more resistant to chemical weathering compared to the ferromagnesian-rich syenite. The pinning by the pegmatite sheet ensured the stability of the boulder until the pegmatite attachment to the basement weathered away and became easily removable.

Under the scenario interpreted above, the implication is that the river has only recently incised into the weathered section of the syenite down to the basement. I estimate that the weathered section above the syenite basement in the area is less than 10 metres thick. Failure of streams to incise into their basements may be for reasons such as slow rate incision arising from a drier climate or that the streams are depositing and building up alluvium rather than incising such as at lower courses of the streams. Streams in upland areas of the Malay peninsula such as the Kasai area, have all generally incised into the basement and thereby exposing the basement as outcrops. However, one of the factors which may cause the failure

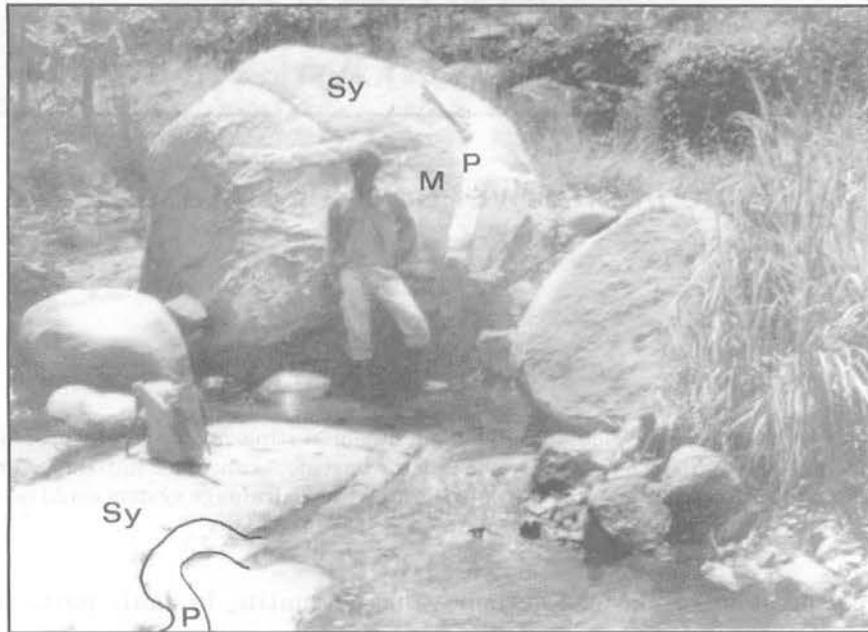


Figure 1. *In-situ* syenite boulder resting on syenite basement. Location: Sungai Kasai, near Kampong Ulu Gali, Raub. Picture looking upstream. Sy = syenite, P = pegmatite, M = mafic enclave (see Figure 2 for details). Person in picture taken in 1967 is local resident, Wook Zaki, a gentleman.

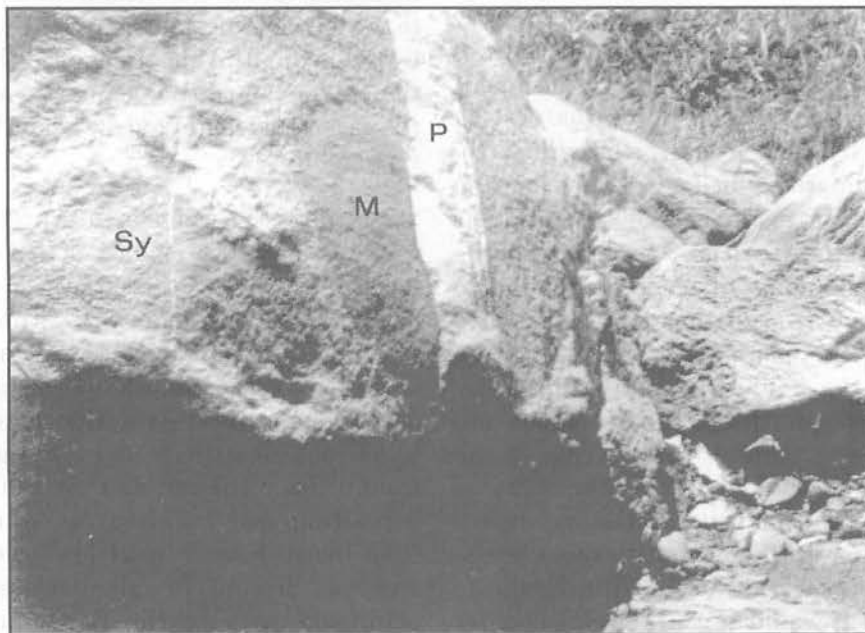


Figure 2. Kasai river boulder of syenite (Sy) with mafic (M) enclave cut by pegmatite (P). Refer to Figure 1 for scale.

of the Sungai Kasai to incise deeper than only up to the top of the basement is time. The Kasai drainage system could be of no great antiquity. If I may be allowed to hazard a guess, maybe the system is no older than the last glacial period.

Slightly more than 30 years later I visited the location on 3 different occasions to check whether the boulder has moved. But on all occasions the boulder was not sighted and probably it has moved away or has been removed to facilitate agricultural activities. The situation described above is a very rare occurrence and field mapping and measurements should persevere with the traditional wisdom of *in outcrops we trust*.

ACKNOWLEDGEMENTS

This work is completed with the assistance of staff and facilities of the Department of Geology, University of Malaya for which I am thankful. I am grateful to Mr. Y.H. Ching who assisted with the illustrations.

REFERENCES

- REMESH, V., 1998. *Petrogenetic model of monzonite in relation to syenite-gabbro complex, Sg. Kelau, Raub, Pahang*. Unpublished B.Sc. Project Report, Dept. of Geology, University of Malaya. 89p.
- YONG, B.T., 1997. *Benom Complex: Evidence for an igneous origin*. Unpublished B.Sc. Project Report, Dept. of Geology, University of Malaya. 49p.

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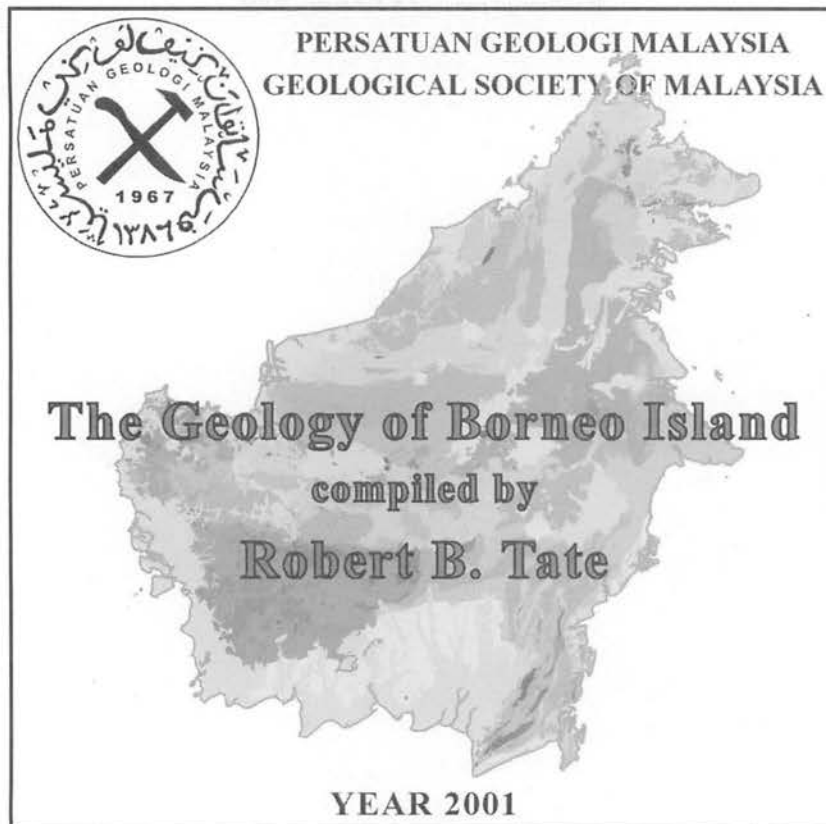
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PERTEMUAN PERSATUAN Meetings of the Society

Ceramah Teknik (Technical Talk)

GSM Postgraduate Seminar — Report

The seminar was held on 26th January 2002 (Saturday morning) at Program Geologi, Universiti Kebangsaan Malaysia Bangi. It was well attended by about 40 people, made up of students and teaching staff from Universiti Malaya, Universiti Kebangsaan Malaysia and the neighbouring institutions of MINT and PRI.

The seminar began sharp at 8.45 am with opening remarks by the Society's President, Assoc. Prof. Dr. Abdul Ghani Rafek, followed by the presentations. A total of 8 papers were presented with 3 papers on subsurface geophysical investigations, 2 on slope stability and landslides and one each on sedimentologic study of Jelai Formation, petrogenesis of Tioman granite, and structural control of gold mineralization at Lubuk Mandi. Each presentation was followed by a question-answer session. The 9th speaker, scheduled to talk on the limestone erosion in the Kinta and Lenggong valleys did not turn up due to some medical problem. The seminar ended at about 12.15 pm.

Programme

- 8:45 : Presenters, audience took their seats
- 8:50 : Welcome speech by GSM President
- 9:00 : Shahid Ayob (UKM)
Hidrologi isotop kawasan Olak Lempit: kemungkinan berlaku kebocoran akuifer
- 9:20 : Ismail C. Mohammad *et al.* (UKM)
Teknik geofizik dalam kajian akuifer di kawasan Pekan-Rompin, Pahang
- 9:40 : Vun Boon Onn (UM)
Hydrological analysis of landslide occurrences in Penang Island for the past 20 years (1981–2000)
- 10:00 : Phakhuruddin bin Abdullah @ Kadir (UM)
Pedogenic influence on the stability of slope cuts in the Kenny Hill Formations
- 10:20 : Mohammed Ismael Ibrahim Abu-Shariah (UKM)
Evaluation of the environmental and engineering geohazards in karst limestone using geophysical techniques
- 10:40 : Tea break

- 11:00 : Charles Makoundi (UM)
Sedimentologic study of the Jelai Formation with emphasis on facies analysis, Kuala Lipis, Central basin of Peninsular Malaysia
- 11:20 : Azmi Ab Rashid (UM)
Ciri-ciri geokimia batuan plutonik di Pulau Tioman, Pahang.
- 11:40 : Heru Sigit Purwanto (UKM)
Structural control of gold mineralization in Lubuk Mandi area, Peninsular Malaysia

Wan Fuad Wan Hassan
UKM Bangi

GSM

Hidrologi isotop kawasan Olak Lempit: kemungkinan berlaku kebocoran akuifer (?)

MD. SHAHID BIN AYUB

Kawasan kajian terdiri daripada alluvium Kuaterner setebal 60 m. Lapisan atas agak nipis, dengan ketebalan kira-kira 5–6 m. Ia diikuti dengan selang sili lempung, lodak dan pasir setebal 35–40 m, di mana keujudan lempung lebih kerap pada bahagian atas. Lapisan terakhir terdiri daripada pasir, kerikil dan sedikit lensa-lensa lempung.

Persampelan air hujan bulanan telah dijalankan dari May 1999 sehingga Jun 2001. Hasilnya menunjukkan bahawa Garis Air Meteor kawasan kajian adalah mengikut rumus $\delta D = 8.8 \delta^{18}O + 10.33$. Sementara itu nilai 'weighted mean' δD dan $\delta^{18}O$ untuk air hujan kawasan ini masing-masing adalah -7.94 dan -53.20 . Nilai ini dianggap merupakan input air hujan di kawasan ini walau pun nilai bulanannya berbeza-beza dari bulan kebulan.

Kajian air tanah pula mendapati bahawa tidak terdapat segregasi jelas nilai isotop stabil air tanah dari akuifer atas dan bawah. Mereka kelihatan terkumpul bersama. Ini boleh dianggap bahawa mungkin berlaku percampuran di antara kedua-dua air. Tetapi percampuran hanya boleh berlaku jika kedua-dua air ini bertemu. Pelbagai punca dan penyebab boleh diandaikan pada peringkat ini, salah satunya ialah aktiviti perlombongan. Adakah aktiviti perlombongan di kawasan tersebut telah menembusi lapisan lempung yang memisahkan di antara kedua-dua air? Jika ya, bagaimana? Persoalan ini belum terjawab sepenuhnya. Tetapi rata-rata, aktiviti perlombongan telah menyebabkan sekurang-kurangnya lapisan 20 m teratas telah terusik.

Secara umum jika berlaku segregasi sepenuhnya di antara akuifer, kita akan mendapati akuifer di sebelah bawah adalah lebih tua dari akuifer di atas. Perbezaan umur mungkin beribu-ribu tahun. Tetapi di kawasan kajian umur ketara imbuhan air untuk kedua-dua akuifer adalah serupa. Kajian CFC menunjukkan imbuhan ketara di antara akhir 1960an dan awal 1970an.

Teknik geofizik dalam kajian akuifer aluvium di kawasan Pekan-Rompin, Pahang

ISMAIL C. MOHAMAD, ABD. GHANI RAFEK DAN ABD. RAHIM SAMSUDIN

Masalah kejatuhan paras air tanah dan peningkatan kemasinan di dalam air tawar akuifer aluvium di kawasan Pekan-Rompin, Pahang telah dikesan daripada kerja-kerja pengawasan air tanah yang dilakukan di kawasan tersebut. Kajian geofizik telah dicadangkan sebagai sebahagian daripada kajian bagi mendapatkan data asas hidrogeologi kawasan

POSTGRADUATE SEMINAR

Seminar Pascasiswazah



MD. SHAHID BIN AYUB



ISMAIL C. MOHAMAD



YUN BOON ONN



HERU SIGIT PURWANTO



CHARLES MAKOUNDI



PHAKHRUDDIN



MOHAMMED ISMAEL IBRAHIM



AZMI AB. RASHID

Sedimentologic study of the Jelai Formation with emphasis on facies analysis, Kuala Lipis, central basin of Peninsular Malaysia

CHARLES MAKOUNDI

A sedimentologic study of the Jelai Formation in the central basin of Peninsular Malaysia indicated that deposition took place in a shallow water environment.

This is supported by the occurrence of *Costatoria* sp (myophoria facies) which is a bivalve of shallow water marine zone. Field study showed that it was difficult to provide a complete type section of the Jelai Formation on a wider scale due to advanced weathering and urban construction. Scanning electron microscopy of clay samples indicated that quartz (SiO_2), orthoclase (KAlSi_3O_8) and zircon (ZrSiO_4) are major components associated with the clay minerals. Fluorine, titanium, carbon are accessory chemical elements. Iron oxide is also present.

X-ray diffraction revealed the following main clay minerals: illite, montmorillonite and kaolinite whereas gypsum and pyrite are also present. Petrographic study of arenite (sandstone) showed two distinct facies:

1. Medium to coarse-grained sandstone, ferruginous, poorly sorted with abundant rock fragments, containing quartz, trace of mica, plagioclase grains which are mostly altered, and trace of orthoclase. Grain size varying from 0.25 to 1 mm.
2. Fine to medium-grained sandstone, argillaceous, moderately to well sorted, containing quartz, muscovite, trace of orthoclase, little amount of plagioclase and biotite, iron oxides, and rock fragments. Grain size varying from 0.12 to 0.5 mm.

Petrographic study of rudite (conglomerate and breccia) indicated two distinct facies:

1. Sheared sedimentary breccia, containing fragments cemented by iron oxides. Mineralogy showed the presence of quartz, feldspar, altered mica, and abundant rock fragments.
2. Conglomerate, containing quartz, altered muscovite, rock fragments cemented by iron oxides. Facies distribution shows that sandstone facies occurs in the central and northeastern part of the study area. Conglomerate appears in the northeastern part whereas breccia is seen in the southwestern part of the study area. Oxidizing conditions prevailed during deposition of the Jelai Formation with variable energy conditions seaward.

Paleocurrent study showed sense of paleoflow as trending WNW-ESE within the study area.

Ciri-ciri geokimia batuan plutonik di Pulau Tioman, Pahang

AZMI AB. RASHID

Batuan igneus plutonik di Pulau Tioman terdiri sebahagian besarnya dari jenis granit, diorit dan gabro. Batuan ini membentuk lebih kurang 70% dari keluasan Pulau Tioman dan sebahagian besarnya terdapat di bahagian timur pulau ini. Kaitan lapangan oleh pengkaji terdahulu membahagikan batuan plutonik di Pulau Tioman kepada 2 badan iaitu badan batuan granitik dan dioritik/gabroik. Julat SiO_2 menunjukkan bahawa batuan ini mempunyai julat SiO_2 yang luas iaitu dari 55.8% ke 75.43%. Julat yang luas ini pada amnya menyamai assosiasi batuan igneus yang terdapat di Jalur Timur. Mineralogi dan geokimia mencadangkan batuan di sini ialah dari jenis I iaitu asalan igneus. Ini disokong oleh nilai ACNK batuan di mana semua sampel yang dianalisa mempunyai nilai kurang dari 1.1 dan juga nilai Na_2O yang tinggi (purata: 3.5%). Hasil awal pemplotan nilai-nilai oksida-oksida unsur major dan surih mencadangkan terdapatnya tiga kelompok magma. Kajian dimasa hadapan akan menitik beratkan samada ketiga-tiga kelompok magma ini dari asalan punca yang sama atau sebaliknya.

Structural control of gold mineralization in Lubok Mandi area, Peninsular Malaysia

HERU SIGIT PURWANTO

Lubok Mandi Gold Mine is an active gold mine located in the Eastern Belt of Peninsular Malaysia. The area is dominantly covered by volcano-clastic and metasedimentary rocks (slate, phyllite). In some places the rocks are carbonaceous. This rock formation is Middle Carboniferous to Permian in age and is cut by dacitic dyke as well as quartz veins. The major structural trends in the Lubok Mandi area are controlled by WNW-ESE (thrusting fault zones), NNW-SSE (shear or lateral fault zones) and NE-SW (right lateral fault zones). The earlier ductile deformations formed folds, microfolds and cleavages, followed by quartz veins. Brittle deformations formed shear and fault zones which controlled the formation of the mineralization. The mineralization in the quartz veins and the wall rocks is related to intensive alteration such as silicification, argillitization and propylitization (chloritization) especially around the sheared and lateral fault zones. The common minerals observed are native gold, chalcopyrite and arsenopyrite with pyrite being the most dominant. The result of the fluid inclusion analysis from quartz vein gave a temperature of 196.2°C–198.7°C and salinity 3.7%–4.2%WT. The structures which control gold mineralization in the area was studied using all the available slip data of the meso-structures observed on the fault planes. The stress history or paleostresses of the area, which was operating at the time or after the formation of the fault planes, determined the movement or slip, that took place on the fault planes. At the same time it also governed the orientation of the gold-quartz veins which are related to the gold mineralization of the area.

Generally, the mineralized quartz veins are related to and followed the NNW-SSE dextral fault zones but at times they followed the WNW-ESE thrust fault zones. Based on the fault slip data of the meso-structures, three directions of the paleostress were obtained. The first paleostress was related to the brittle-ductile deformation, acting in the NE-SW ($\sigma_1 = 08^\circ - 09^\circ$, N197°–211°E) controlled the folds, cleavages, thrust fault zones and quartz veins. The second direction, NNE-SSW ($\sigma_1 = 04^\circ - 25^\circ$, N194°–220°E) was related to purely brittle deformation that controlled the dextral fault zones and mineralised quartz vein zones. Finally, the compression with $\sigma_1 = 18^\circ - 19^\circ$, N232°–255°E was responsible in the right lateral slip fault zones with NE-SW direction.

The NNW-SSE quartz veins that followed the dextral fault zones are the centre of high-grade gold mineralization, especially those in the quartz breccia.



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CHARLES S. HUTCHISON



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BERITA-BERITA PERSATUAN

News of the Society

PETUKARAN ALAMAT (Change of Address)

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

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Kong Ing Chung
S/L9, Greenwood Park Phase 5, 9$\frac{1}{2}$th Mile
Penrissen Road, 93250 Kuching, Sarawak.</p> | <p>4. Johnny Ating Kading
Petroleum Development Oman, P.O. Box
81, Postal Code 113, Muscat, Sultanate of
Oman.</p> |
| <p>2. Ting Ching Soon
132-2-5 Villa U-Thant, Jalan U-Thant,
55000 Kuala Lumpur.</p> | <p>5. Denis N.K. Tan
Asia-Pacific Evaluation Services (EPT-
AGP), SIEP Inc., 200 North Dairy Ashford,
Houston, Texas 77079.</p> |
| <p>3. Prinya Nutalaya
No. 473, Utane 12, Sri Nakorn Pattana,
Navamintr Road, Bung Khum, Bangkok,
10240 Thailand.</p> | |

CURRENT ADDRESSES WANTED

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

- | | |
|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <p>1. Malek Musa
43, Jalan Impian Jaya, Saujana Impian,
43000 Kajang, Selangor D.E.</p> | <p>2. Scott A. McManus
Level 1, Lot 9 & 10, Block H, Taman Sri
Jalan Borneo, 93100 Kuching, Sarawak.</p> |
|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|

GSM

PERTAMBAHAN BAHARU PERPUSTAKAAN (New Library Additions)

The Society has received the following publications:

1. Modeling of volcanic processes edited by Chi-Yu Keng *et al.*
2. Research in terrestrial impact structures, edited by J. Pohl.
3. The Rhenish Massif, edited by Andreas Vogel *et al.*
4. Geophysical data inversion: methods & applications, edited by A. Vogel *et al.*
5. American Museum Novitates, nos. 3348 & 3350, 2001.
6. Model optimization in exploration geophysics 1 & 2, edited by A. Vogel, 1987 & 1988.
7. SOPAC: proceedings of the 30th session, 2001.
8. AAPG Explorer, Dec 2001.
9. Geological Survey of Japan, vol. 52, nos. 4/5, 2001.
10. Episodes, vol. 24, no. 4, 2001.
11. Geologica Belgica, vol. 3, nos. 3-4, 2000.
12. USGS Bulletin no. 2183, 2001.

GSM

Results of Election for GSM Council 2002/2003

As nominations were received, election by ballot was carried out for the GSM Council 2002/2003 for the following posts, namely President, Secretary, and Editor.

The Election Officer, Dr. Ismail Yusoff, reported that the ballot count was held on Wednesday, 2 January 2002 at Klompe Reading Room, Geology Department, University of Malaya at 2.30 pm. A total of 88 votes were counted.

The successful candidates are as follows:

President	:	Abdul Ghani Rafek
Secretary	:	Ahmad Tajuddin Ibrahim
Editor	:	Teh Guan Hoe

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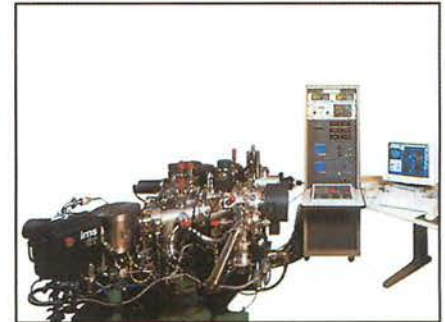
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Cameca EPMA



Cameca Magnetic Sector SIMS

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- High Frequency Scanning Acoustic Microscopy (SAM)
- Infrared Thermography
- Contactless Shaft Measurement System
- Confocal Laser Scanning Microscopy (CLSM)
- Scanning Electron Microscopy (SEM, VP SEM, FE SEM)
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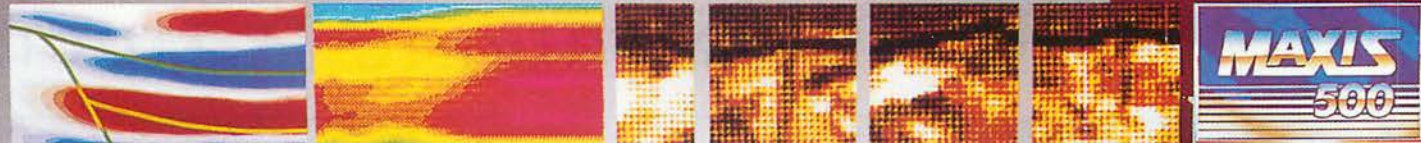


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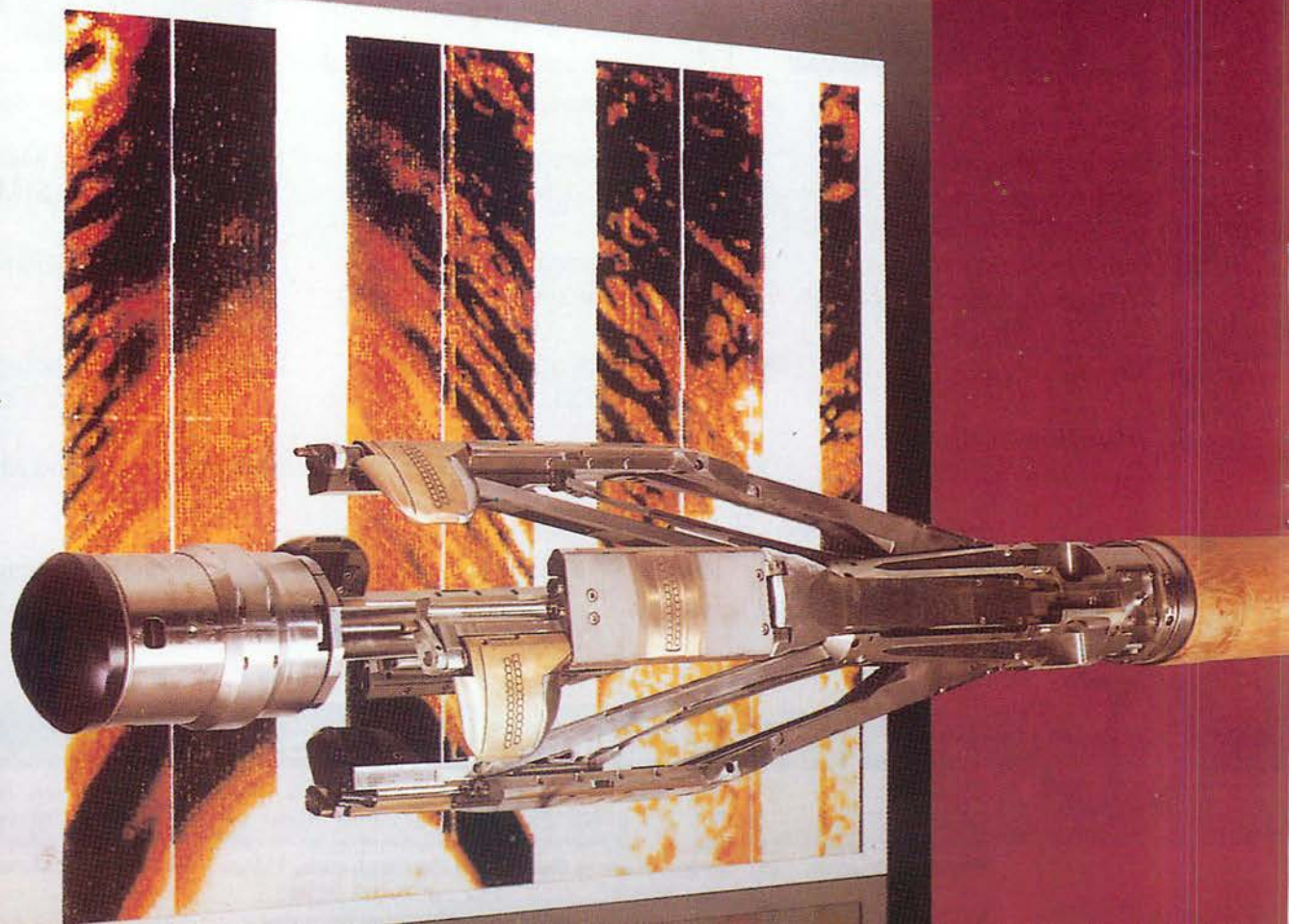
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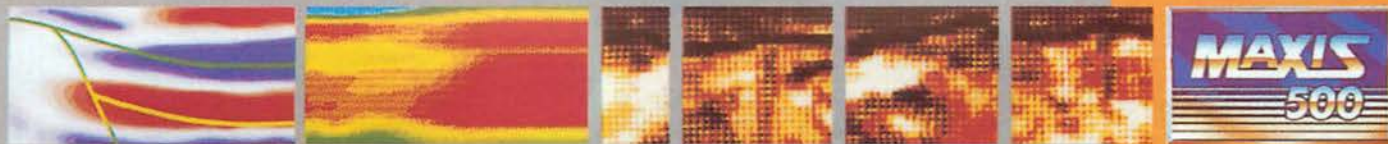
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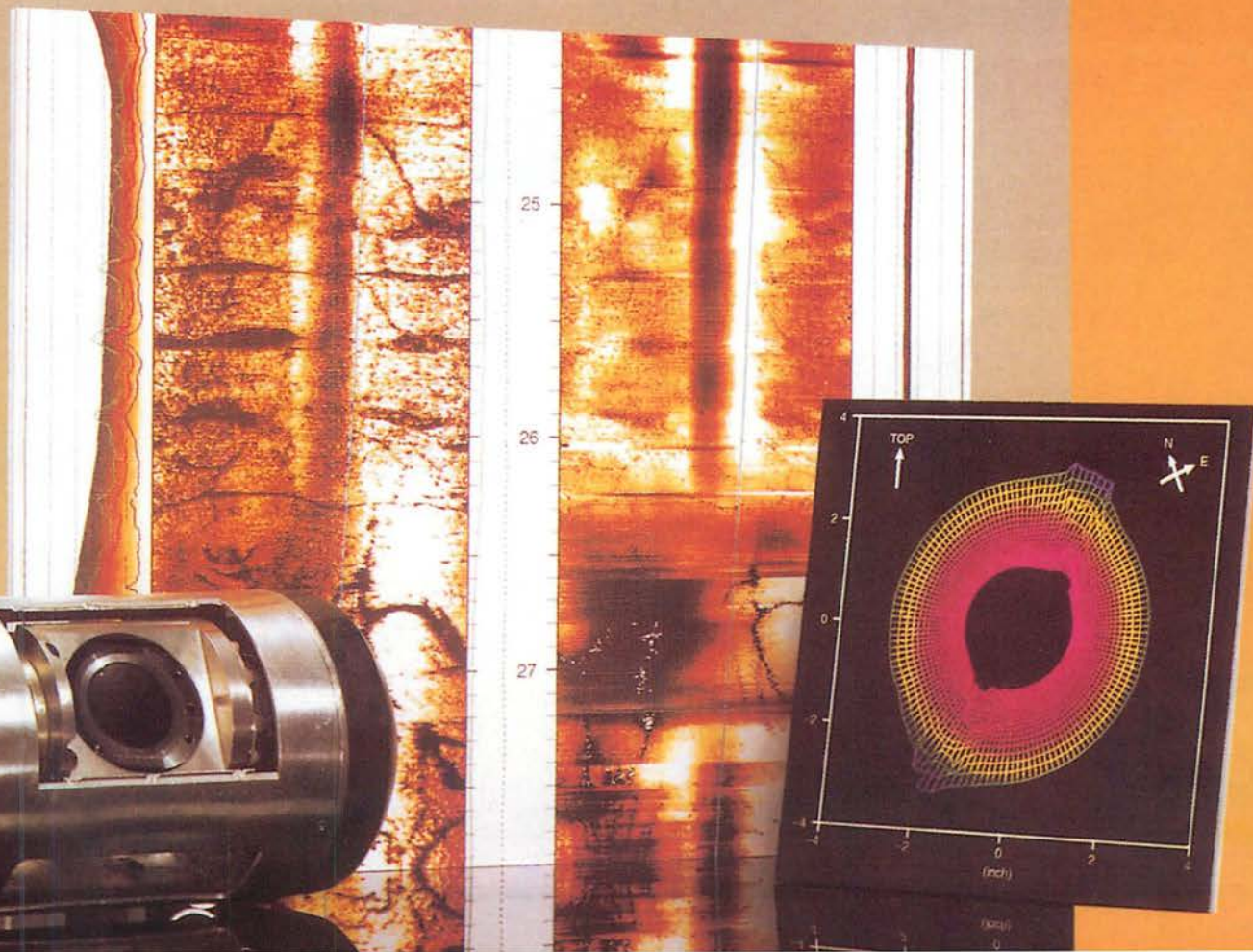
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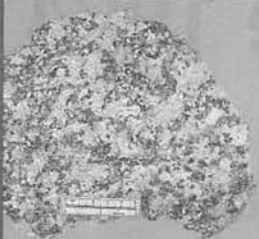
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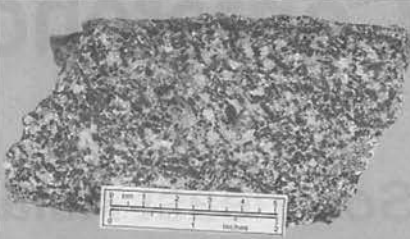
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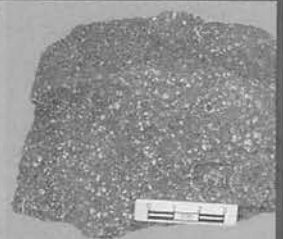
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EUROPEAN ASSOCIATION OF GEOSCIENTISTS AND ENGINEERS (63rd Conference & Technical Exhibition), Florence, Italy. (Contact: Website: <http://www.eage.nl/>)

May 29-31

GREEN PROCESSING 2002, "International Conference on the Sustainable Processing of Minerals", Cairns, Australia. (Contact: Miriam Way, AusIMM, P.O. Box 660, Carlton South, Victoria, Australia 3053. Tel: +61 3 96623166; Fax: +61 3 96623662; E-mail: conference@ausimm.com.au; Website: www.ausimm.com)

June 2-5

43RD WELL LOGGING SYMPOSIUM, Oiso, Japan. (Contact: Ms. Shizu Kobayashi, Schlumberger K.K. Tel: 81 42 759-2115; Fax: 81 42 759-4270; E-mail: kobayssi@fuchinobe.skk.slb.com)

June 3-7

ZEOLITE 2002, Aristotle University, Thessaloniki, Greece. (Contact: Website: <http://www.chem.auth.gr/activities/zeo2002/>)

June 17-20

CALIBRATION AND RELIABILITY IN GROUND WATER MODELLING, Prague, Czech. (Contact: ModelCARE'2002, Opletalova, 22, AZ-110 00 Prague 1, Czech Republic. Tel: 420 2 8400 1444; Fax: 420 2 8400 1448; E-mail: modelcare2002@guarant.cz; Website: <http://www.guarant.cz/ModelCARE2002>)

June 18-20

RECYCLING AND WASTE TREATMENT IN MINERAL AND METAL PROCESSING, Lulea, Sweden. (Contact: E-mail: caisa.samuelsson@km.luth.se)

June 19-21

RISK ANALYSIS 2002 (Third International Conference on Computer Simulation in Risk Analysis and Hazard Mitigation), Sintra, Portugal. (Contact: Conference Secretariat, RISK02, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK. Tel: 44 (0) 238 029 3223; Fax: 44 (0)

238 029 2853; E-mail: rgreen@wessex.ac.uk;
Website: <http://www.wessex.ac.uk/conferences/2002/risk02/>)

June 30 – July 5

16TH AUSTRALIAN GEOLOGICAL CONVENTION, *Geoscience 2002: Expanding Horizons*, Adelaide Convention Centre, Adelaide South Australia. (Contact: the Organising Committee, 16th Australian Geological Convention, c/o The Secretary GSA (SA Division), P.O. Box 295, Kent Town, SA 5071. E-mail: info@16thagc.gsa.org.au; Website: www.16thagc.gsa.org.au)

July 6–10

FIRST INTERNATIONAL PALAEOONTOLOGICAL CONGRESS, Sydney, Australia. (Contact: Jophn A. Talent, MUCEP, Earth and Palaeontological Sciences, Macquarie University, NSW 2109, Australia. Fax: 61 2 9850 6053; E-mail: IPC2002@m.q.edu.au; Website: www.es.mq.edu.au/mucep)

July 7–12

16TH INTERNATIONAL SEDIMENTOLOGICAL CONGRESS, Auckland Park, Gauteng, South Africa. (Contact: Bruce Cairncross, Department of Geology, Rand Africans University, P.O. Box 524, Auckland Park, 2006, South Africa. Tel: +27 11 489 23 13; Fax: +27 11 489 23 09; E-mail: bc@na.rau.ac.za; Website: <http://general.rau.ac.za/geology/announcement.htm>)

July 9–12

GEOLOGY OF THE DEVONIAN SYSTEM, Syktyvkar, Russia. (Contact: Website: <http://sds.uta.edu/ras-update/russian-academy-of-sciences.htm>)

July 21–25

9TH INTERNATIONAL PLATINUM SYMPOSIUM, Billings, Montana, USA. Sponsored by IGCP 427/SEG/SGA. (Contact: Website: <http://www.platinumsymposium.org/>)

July 22–26

THIRD INTERNATIONAL CONFERENCE ON WATER RESOURCES AND ENVIRONMENT RESEARCH (ICWRER), *Water quantity & quality aspects in modeling and management of ecosystems*, Dresden, Germany. (Contact: Conference Secretariat ICWRER 2002, Institute of Hydrology and Meteorology, Dresden University of Technology,

Wuerzburger Str. 46, 01187 Dresden, Germany. Tel: + 49-351-463 3931; Fax: + 49-351-463 7162; E-mail: icwrer2002@mailbox.tu-dresden.de; Website: www.tu-dresden.de/fghihm/hydrologie.html)

July 22–26

11TH QUADRENNIAL IAGOD SYMPOSIUM AND GEOCONGRESS 2002, Windhoek, Namibia. (Contact: Website: <http://www.geoconference2002.com/>)

August 11–15

4TH INTERNATIONAL CONGRESS ON ENVIRONMENTAL GEOTECHNICS, Rio de Janeiro, Brazil. (Contact: Tel: +55 21 290-1730; Fax: +55 21 280-9545; E-mail: 4iceg@pec.coppe.ufrj.br; Website: www.4iceg.ufrj.br)

August 25–30

GONDWANA 11: CORRELATIONS AND CONNECTIONS, Gateway Antarctica, University of Canterbury, Christchurch, New Zealand. (Contact: Tel: +64-3-364 2136; Fax: +64-3-364 2197; E-mail: s.hawtin@anta.canterbury.ac.nz or gateway@anta.canterbury.ac.nz; Website: www.anta.canterbury.ac.nz)

September 1–5

17TH WORLD PETROLEUM CONGRESS, Rio de Janeiro, Brazil. (Contact: Brasoc — Brazilian Organizing Committee, Tel: +55 21 2282 2002; Fax: +55 21 2282 2005; E-mail: brasoc@wpc2002.com; Website: www.wpc2002.com)

September 1–6

MINERALOGY FOR THE NEW MILLENNIUM, Edinburgh, Scotland. (Contact: E-mail: info@minersoc.org; Website: www.minersoc.org/IMA2002)

September 12–22

6TH INTERNATIONAL SYMPOSIUM ON THE JURASSIC SYSTEM, Palermo, Sicily, Italy. (Contact: Dr. Luca Martire, Fax: 39 011 541755; E-mail: martire@dst.unito.it)

September 15–19

INTERNATIONAL CONFERENCE ON URANIUM MINING AND HYDROGEOLOGY, Freiberg, Germany. (Contact: E-mail: umh@geo.tu-freiberg.de; Website: www.geo.tu-freiberg.de/umh)

September 16–20

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY AND THE ENVIRONMENT (IAEG), "Engineering Geology for Developing Countries" (9th International Congress), Durban, South Africa. (Contact: South African Institute for Engineering and Environmental Geologists, P.O. Box 2812, Pretoria, 0001, South Africa. E-mail: saieg@hotmail.com; Website: home.geoscience.org.za/saieg/2002.htm)

September 22–27

SOCIETY OF EXPLORATION GEOPHYSICISTS (72nd Annual Meeting and International Exposition), Las Vegas, Nevada, USA. (Contact: SEG Business Office, Tel: +1-918 497 5500; Fax: +1-918 497 5557; Website: seg.org/)

September 24–28

URANIUM DEPOSITS: FROM THEIR GENESIS OF THEIR ENVIRONMENT IMPACTS, Prague, Czech. (Contact: Bohdan Kribeck, Czech Geological Survey, 152000 Prague 5. Tel: 422 51085 518; Fax: 422 5817 390; E-mail: kribeck@cgu.cz)

October 15–19

INTERNATIONAL WORKSHOP ON INTEGRATED WATER RESOURCE MANAGEMENT. Organised by the US Bureau of Reclamation, Denver, Colorado, U.S.A. (Contact: International Affairs Team, D-1520, US Bureau of Reclamation, P.O. Box 25007, Denver, CO 80225, U.S.A. Tel: +1 303 445 2127; Fax: +1 303 445 6322; E-mail: lprincipe@do.usbr.gov; Website: http://www.usbr.gov/)

October 21–25

INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS, "Groundwater and Human Development" (32nd International Congress), Mar del Plata, Argentina. (Contact: Dr. Emilia Bocanegra, Centro de Geología de Costas y del Cuaternario, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata, Casilla de Correo 722, 7600 Mar del Plata, Argentina; Tel: +54 223 475 4060; Fax: +54 223 475 3150; E-mail: ebocaneg@mdp.edu.ar)

October 27–30

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Denver, Colorado, USA. (Contact: Meeting 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: www.geosociety.org/meetings/index.htm)

November 20–23

ROLE OF NATURAL RESOURCES AND ENVIRONMENT FOR SUSTAINABLE DEVELOPMENT IN SOUTH AND SOUTHEAST ASIA, Dhaka, Bangladesh. (Contact: Ms. Afia Akhtar, Convenor, NESDA & Vice President, AGID, Director, Geological Survey of Bangladesh, 153 Pioneer Road, Segunbagicha, Dhaka 1000, Bangladesh. Tel: 880-2-418545 (O), 9337559, 9350412 (H); E-mail: afia@agni.com or mnhasan@agni.com; or Mr. Nehal Uddin, Member Secretary, NESDA, Deputy Director, Geological Survey of Bangladesh, 153 Pioneer Road, Segunbagicha, Dhaka 1000, Bangladesh. Tel: 880-2-9348318; E-mail: nehalu@bttb.net.bd)

2003

SIXTH INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL GEOCHEMISTRY, Edinburgh, Scotland. (Contact: John Farmer, Dept. of Chemistry, The University of Edinburgh, Joseph Black Building, Kings Buildings, West Mains Road, Edinburgh EH9 3JJ Scotland. Tel: 0131-650-1000; Fax: 0131-650-4757; E-mail: J.G.farmer@ed.ac.uk)

March 27–30

NATIONAL EARTH SCIENCE TEACHERS ASSOCIATION (Annual Meeting), Philadelphia, Pennsylvania, USA. (Contact: NESTA, 2000 Florida Ave., N.W., Washington, D.C. 20009, USA. Tel: +1-202 462 6910; Fax: +1-202 328 0566; E-mail: fireton@kosmos.agu.org)

May

INTERNATIONAL SYMPOSIUM ON KARST AND HARD ROCK FORMATIONS, Esfahan, Iran. (Contact: Dr. A. Afrasiabian, National Karst Study and Research Center, P.O. Box 15875-3584, Tehran, Iran. Tel: +98 21 7520474; Fax: +98 21 7533186)

June 15–17

7TH ICOBTE — INTERNATIONAL CONFERENCE ON BIOGEOCHEMISTRY OF TRACE ELEMENTS, Uppsala, Sweden. (Contact: George R. Gobran. Fax: 46 (18) 67 34 30; E-mail: George.Gobran@eom.slu.se or ICOBTE7@slu.se; Website: <http://www.eom.slu.se>)

June 16–18

5TH INTERNATIONAL CONFERENCE ON THE ANALYSIS OF GEOLOGICAL AND ENVIRONMENTAL MATERIALS, Rovaniemi, Finland. (Contact: Website: <http://www.gsf.fi/geoanalysis2003>)

August 18–21

9TH INTERNATIONAL SYMPOSIUM ON THE ORDOVICIAN SYSTEM, 7TH INTERNATIONAL GRAPTOLITE, AND FIELD MEETING OF THE SUBCOMMISSION ON SILURIAN STRATIGRAPHY, San Juan City, Argentina. (Contact: ISOS: Guillermo L. Albanesi. E-mail: galbanesi@arnet.com.ar or Matilde S. Beresi. E-mail: mberesi@labocricyt.edu.ar; IGC-SSS field meeting: Gladys Ortega. E-mail: gcortega@arnet.com.ar or Guillermo F. Aceñolaza. E-mail: acecha@unt.edu.ar)

September 15–18

INDUSTRIAL MINERALS AND BUILDING STONES — IMBS 2003, Istanbul, Turkey. (Contact: Erdogan Yüzer, Maden fakültesi, Ayazaga Kampüsü, 80626 Maslak/Istanbul, Turkey. Tel/Fax: 90 212 285 61 46; E-mail: yuzer@itu.edu.tr)

September 22–26

1ST INTERNATIONAL CONFERENCE — GROUNDWATER IN GEOLOGICAL ENGINEERING, Ljubljana, Slovenia. (Contact: Slovene Committee of IAH, Andrej Juren, Kebetova 24, SI-1000 Ljubljana, Slovenia. E-mail: andrej.juren@siol.net or Nadja Zalar, E-mail: nadja.zalar@siol.net; Website: <http://www.iah.org>)

September 28 – October 3

SOCIETY OF EXPLORATION GEOPHYSICISTS (73rd Annual Meeting and International Exposition), Dallas, Texas, USA. (Contact: SEG Business Office, Tel: +1-918 497 5500; Fax: +1-918 497 5500; Fax: +1-918 497 5557; Website: seg.org/)

November 2–5

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Seattle, Washington, 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/meeting/index.htm>)

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)

August

32ND INTERNATIONAL GEOLOGICAL CONGRESS, Florence, Italy. Congress theme: "The Renaissance of Geology: From the Mediterranean area toward a global Geological Renaissance-Geology, Natural Hazards, and Cultural Heritage". (Contact: E-mail: 32igc@32igc.org; Website: <http://www.32igc.org/>)

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: dhayer@seg.org; Website: meeting.seg.org)

BUKU-BUKU BARU (NEW BOOKS)

- *A SHORT COURSE IN GEOTECHNICAL SITE INVESTIGATION*, by Noel Simons *et al.* Thomas Telford, 2001. 250pp., hardback, GBP45.00, ISBN 0727729489.
- *ANALYSIS OF SEDIMENTARY SUCCESSIONS — A field manual*, by Ajit Bhattacharyya and Chandan Chakraborty. A.A. Balkema, 2000. 24 cm, 420pp., EUR70.00/\$70.00, ISBN 90 5809 209 7 (HC), ISBN 90 5809 227 5 (PB).
- *ANNUAL REVIEW OF EARTH AND PLANETARY SCIENCES*, Volume 29. Annual Reviews, 2001. Hardback. 616pp., ISBN 0-8243-2029-8, ISBN 0084-6597.
- *APPLIED WETLANDS SCIENCE AND TECHNOLOGY* (2nd ed.), by Donald M. Kent. Lewis Publisher, 2001. 472pp., USD79.95, ISBN 156670359X.
- *BACKFILL AND CONTACT GROUTING OF TUNNELS AND SHAFTS*, by Raymond W. Henn. Thomas Telford, 2001. 200pp., GBP35.00, ISBN 0727729837.
- *BRACHIOPODS: PAST AND PRESENT* (Systematics Association Special Volume No. 63), by Howard Brunton and Robin Cocks. Taylor & Francis, 2001. 496pp., GBP80.00, ISBN 0748409211.
- *CARBONATE RESERVOIRS: POROSITY EVOLUTION AND DIAGENESIS IN A SEQUENCE STRATIGRAPHIC FRAMEWORK* (Developments in Sedimentology Vol. 55), by C.H. Moore. Elsevier, 2001. 460pp., NGL350.00, ISBN 0444508384.
- *CHEMICAL CONTAMINANTS IN ESTUARIES AND COASTAL PLUMES*, by G.E. Millward, G.A. Glegg & A.J. Turner. John Wiley & Sons, 2001. 350pp., hardback, USD84.95, ISBN 0471967394.
- *CONTINENTAL REACTIVATION AND REWORKING* (Geological Society Special Publication No. 184), edited by J. Miller *et al.*, Geological Society, 2001. 450pp., GBP95.00, ISBN 1862390800.
- *CRUSTAL HEATFLOW: A GUIDE TO MEASUREMENT AND MODELLING*, by Graeme R. Beardsmore & James P. Cull. Cambridge University Press, 2001. 324pp., hardback, GBP70.00, ISBN 0521792894.
- *DECISION ANALYSIS FOR PETROLEUM EXPLORATION* (2nd ed.), by Paul Newendorp & John Schayler. Planning, 2000. 606pp., hardback, USD64.95.
- *DINOSAURS OF THE AIR: THE EVOLUTION AND LOSS OF FLIGHT IN DINOSAURS AND BIRDS*, by G. Paul. Johns Hopkins University Press, 2001. Hardback, GBP33.50, ISBN 0801867630.
- *DISTURBED SOIL PROPERTIES AND GEOTECHNICAL DESIGN*, by Andrew Schofield. Thomas Telford, 2001. 200pp., hardback, GBP45.00, ISBN 0727729829.
- *DRINKING WATER CHEMISTRY: A LABORATORY MANUAL*, by Barbara A. Hauser. CRC Press, 2001. USD54.95, ISBN 1566704863
- *DYNAMICS OF FLUIDS IN FRACTURED ROCK* (Geophysical Monograph Series, Vol. 122), edited by B. Faybishenko *et al.* American Geophysical Union, 2001. 400pp., hardback, USD65.00, ISBN 0875909809.
- *EARTH'S MATERIALS: MINERALS AND ROCKS*, by Gautarn Sen. Prentice Hall, 2001. 560pp., hardback, GBP30.99, ISBN 0130812951.
- *ENVIRONMENTAL GEOCHEMISTRY OF POTENTIALLY TOXIC METALS*, by F.R. Siegel. Springer, 2001. 200pp., DM107.00, ISBN 3540420304.
- *EXPLORATION AND MINING GEOLOGY, Ancient and modern seafloor volcanogenic massive sulfide deposits*, CIM/ICM, 2001. Guest editors: Peter A. Rona and Zengqian Hou. 395pp., paperback, ISSN 0964-1823.
- *EXPLORATION OF MINERAL DEPOSITS* (Developments in Economic Geology, Vol. 31), by D.V. Rundqvist. Elsevier, 2001. Hardback, USD211.50, ISBN 0444503021.

- **EXPLORING EARTH: An Introduction to Physical Geology** (2nd ed.), by Jon Davidson *et al.* Prentice Hall, 2001. 576pp., paperback, USD73.33, ISBN 0130183725.
- **EXPLORING FOR OIL AND GAS TRAPS** (Treatise of Petroleum Geology, Handbook of Petroleum Geology Series), by Edward A. Beaumont & Norman h. Foster. American Association of Petroleum Geologists, 2000. 1150pp., USD49.00, ISBN 089181602X.
- **FAUNAL AND FLORAL MIGRATION AND EVOLUTION IN SE ASIA-AUSTRALASIA**, by Ian Metcalfe *et al.* A.A. Balkema, 2001. 361pp., hardback, NGL262.50, ISBN 9058093492.
- **GIS AND REMOTE SENSING TECHNIQUES IN LAND AND WATER MANAGEMENT**, by A. Van Dijk & M.G. Bos. Kluwer, 2001. 104pp., hardback, USD44.00, ISBN 079236788X.
- **GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE IN PERSPECTIVE**, OECD, 2000. 68pp., FRF131.19, ISBN 9264184252.
- **GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: REVIEW OF DEVELOPMENTS IN THE LAST DECADE** (Radioactive Waste Management), by NEA. OECD, 2000. 108pp., FRF203.34, ISBN 9264171940.
- **GEOLOGICAL AND BIOLOGICAL EFFECTS OF IMPACT EVENTS** (Impact Studies), edited by E. Buffetaut & C. Koeberl. Springer, 2001. 310pp., hardback, DEM139.90, ISBN 3540422862.
- **HEAVY METALS RELEASE IN SOILS**, by H. Magdi Selim. Lewis Publishers, Inc., 2001. 300pp., hardback, USD99.95, ISBN 1566705312.
- **LAND USE PLANNING: SUSTAINABILITY AND THE ENVIRONMENT** (Routledge Research Global Environment Change Series 7), by Susan Owens. Routledge, 2001. 200pp., hardback, GBP55.00, ISBN 0415162769.
- **MANTLE CONVECTION IN THE EARTH AND PLANETS**, by Gerald Schubert *et al.* Cambridge University Press, 2001. 912pp., hardback, GBP140.00, ISBN 052135367X.
- **MANTLE PLUMES AND THEIR RECORD IN EARTH HISTORY**, by Kent C. Condie. Cambridge University Press, 2001. 336pp., hardback, GBP75.00, ISBN 0521806046.
- **METEORITES**, by Brigitte Zanda & Monica Rotaru. Cambridge University Press, 2001. 128pp., paperback, GBP11.95, ISBN 0521799406.
- **PLATE TECTONICS: UNRAVELLING THE MYSTERIES OF THE EARTH** (Rev. ed.), by J. Erickson. Facts on File, 2001. Hardback, GBP37.95, ISBN 0816043272.
- **QUATERNARY GEOLOGY AND ENVIRONMENT** (Springer-Praxis Books in Geophysical Science), by Jean Riser. Springer, 2001. Hardback, ISBN 3540626469.
- **RADIOLARIANS IN THE SEDIMENTARY RECORD**, by P. Wever. Gordon & Breach, 2001. 265pp., hardback, GBP75.00, ISBN 9056993364.
- **RESOURCES OF THE EARTH: ORIGIN, USE, AND ENVIRONMENTAL IMPACT** (3rd ed.), by James Craig *et al.* Prentice Hall, 2001. 485pp., hardback, HKD623.31, ISBN 0130834106.
- **SEA LEVEL RISE: HISTORY AND CONSEQUENCES** (*International Geophysics*), by Bruce Douglas, Michael Kearney & Stephen Leatherman. Academic Press, 2000. 256pp., USD59.95, ISBN 0122213459.
- **SEDIMENTARY PETROLOGY** (3rd ed.), by M.E. Tucker. Blackwell 2001. 272pp., paperback, GBP24.95, ISBN 063057351.
- **SUBSURFACE MICROBIOLOGY AND BIOGEOCHEMISTRY**, by James K. Frederickson *et al.* John Wiley & Sons, Inc., 2001. 352pp., hardback, USD109.95, ISBN 047131577X.
- **THE HISTORY AND DYNAMICS OF GLOBAL PLATE MOTIONS** (Geophysical Monograph Series, Vol. 121), by M.A. Richards *et al.* American Geophysical Union, 2000. 398pp., hardback, USD70.00, ISBN 0875909795.

- **THE HISTORY AND SEDIMENTOLOGY OF ANCIENT REEF SYSTEMS** (Topics in Geobiology, Vol. 17), by George D. Stanley. Plenum Pub. Corp., 2001. 468pp., hardback, USD95.00, ISBN 03064464675.

- **UNDERSTANDING EARTH** (3rd ed. with text and CD-ROM), by Frank Pross & Raymond Silver. W.H. Freeman Company, 2000. Paperback, USD69.95, ISBN 0716741172.

CD-ROMS

- **MICROFOSSILS ON CD-ROM**, by N. Macleod. Blackwell Science UK, 2000. A\$223.30, ISBN 0632054425.

- **PALEOBASE: MACROFOSSILS (PART 2 CD-ROM)**, by N. Macleod. Blackwell Science UK, 2001. A\$80.30, ISBN 06320958919.

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HAMILTON, W., 1979. Tectonics of the Indonesian region. *U.S. Geological Survey Professional Paper 1078*, 345p.

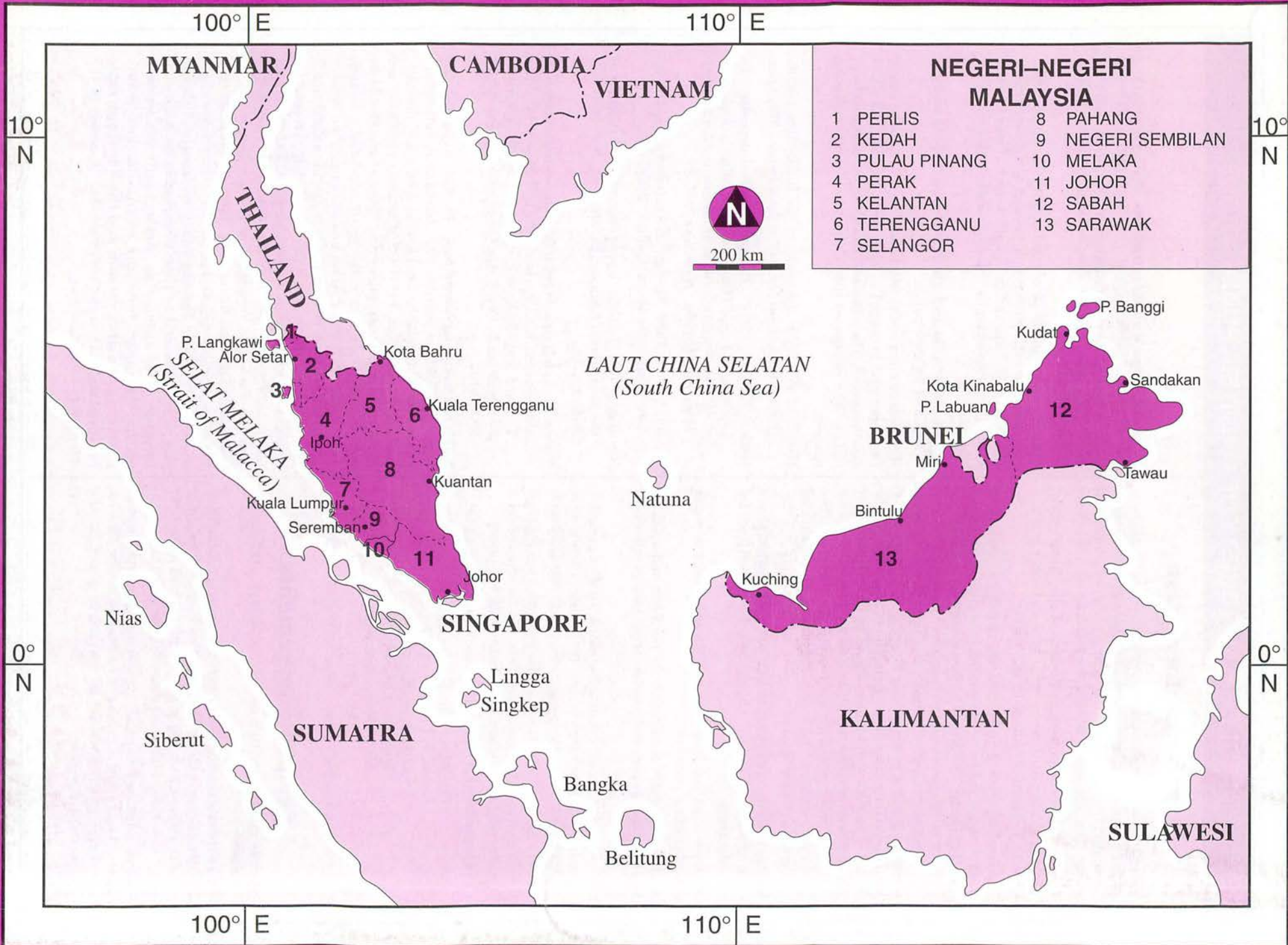
HOSKING, K.F.G., 1973. Primary mineral deposits. In Gobbett, D.J. and Hutchison, C.S. (Eds.), *Geology of the Malay Peninsula (West Malaysia and Singapore)*. Wiley-Interscience. New York, 335-390.

HUTCHISON, C.S., 1989. *Geological Evolution of South-east Asia*. Clarendon Press, Oxford. 368p.

SUNTHARALINGAM, T., 1968. Upper Paleozoic stratigraphy of the area west of Kampar, Perak. *Geol. Soc. Malaysia Bull. 1*, 1-15.

TAYLOR, B., AND HAYES, D.E., 1980. The tectonic evolution of the South China Sea basin. In: D.E. Hayes (Ed.), *The Tectonic and Geologic Evolution of Southeast Asian Sea and Islands, Part 2. Am. Geophy. Union Monograph 23*, 89-104.

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| 3 PULAU PINANG | 10 MELAKA |
| 4 PERAK | 11 JOHOR |
| 5 KELANTAN | 12 SABAH |
| 6 TERENGGANU | 13 SARAWAK |
| 7 SELANGOR | |

LAUT CHINA SELATAN
(South China Sea)

SELAT MELAKA
(Strait of Malacca)

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KALIMANTAN

SULAWESI

SINGAPORE

SUMATRA

Bangka

Belitung

Nias

Siberut

Lingga
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Miri

Kota Kinabalu
P. Labuan

Kudat

P. Banggi

Sandakan

Tawau

Kota Bharu

Kuala Terengganu

Ipoh

Kuantan

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