

PERSATUAN GEOLOGI MALAYSIA

WARTA GEOLOGI

NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA

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GEOLOGICAL
SOCIETY OF
MALAYSIA

PERSATUAN GEOLOGI MALAYSIA

Geological Society of Malaysia

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Naib Presiden (Vice-President)	:	Abdul Ghani Rafek
Setiausaha (Secretary)	:	Ahmad Tajuddin Ibrahim
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1999-2001

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1999-2000

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Denis N.K. Tan	Leong Lap Sau	P.H. Stauffer	Yeap Cheng Hock

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

Environmental issues in quarrying

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Abstract: This paper discusses the impact of quarrying activities on the environment. The common issues are discussed. Based on the author's knowledge, experience in vetting of EIA reports and handling environmental problems, a few recommendations for improvement are suggested.

BACKGROUND

The quarry industry plays a very important role in the development of the country. It supplies the raw material (aggregates) for the building and construction industry, limestone for the cement and lime industry and stone blocks to make dimension stones.

Currently there are about 400 odd operating quarries in Malaysia. Their production varies from as little as 2,000 tonnes to 400,000 tonnes per month. Most of the quarries engage individual subcontractors to do development works, drilling and blasting, haulage and crushing. Naturally these subcontractors tend to minimise their operating cost. For example the drilling and blasting subcontractor will try to produce the maximum rock size to feed the crusher as stipulated in the agreement. However, big size rock will incur higher crushing cost with more downtime, maintenance, breakdown and low productivity.

In the past most of the quarries were located away from residential areas. As the country progressed, development has been approaching closer to the quarries. Today, the majority of quarries are situated menacingly close to the housing estates and industrial areas. The public see the quarries everyday and many have had bad experience with the quarries and

in response they made complaints to the authorities.

The public is much aware of their rights on environmental quality, health and safety of public and workers and the quality of life. Correspondingly laws have been passed to protect the environment, the health and safety of public and workers; and bylaws on work activities.

A quarry, if properly planned and carefully operated would have minimal impact on the environment. The management must be sufficiently skilful to plan ahead, operate the quarry safely, efficiently and profitably at the same time conforming to the safety, health and environmental protection requirements.

COMPLAINTS

Public complaints are part and parcel of the quarrying activities. A major complaint may lead to the issuance of stop work order. Some of the common complaints are described below:-

Mudflow

Most quarries have overburden which must be removed to expose the rock. The cheapest way to do this is to excavate the overburden

and dump it as the side of the hill or at any vacant place without any due considerations to its impact. Little or no drainage channel, turfing, stabilization and silt traps are made to contain the surface runoff. During heavy rainfall, the exposed earth is eroded and washed away as mudflow. It may cause localised flooding and damage properties.

Water Quality

Every time it rains, the exposed earth is eroded away into the drainage system. The suspended solid particles can cause siltation of river beds and reduce water quality which is harmful to aquatic life. Many quarries do not have ample silt traps. They simply discharge the water into the nearby stream.

There have been two cases in Selangor where the spillage of diesel in the quarries contaminate the water supply to the water treatment plant. A few hundred thousand households and industries were effected with no water supply for a few days. The Department of Environment is now very stringent with waste water discharge. All oil storage must have bunkers. Any oils and any material contaminated with oil must be contained and disposed accordingly.

With proper drainage channels, silt traps or retention ponds and oil traps most of the problem could be put under control.

Air Quality

Air quality is associated with the emission of dust, gases and fumes into the air. The dust come from the drilling operations, crushing of rock, screening and stockpiling of broken rock as well as movement of vehicles. Long term exposure to dust can cause lung disease called silicosis. Dust level can be controlled at source such as; using dust collector bags for the drilling machines; enclosing the crushing plants; using water sprays at screening and stockpiling stages; tarring the access roads and wetting the haulage roads.

Gases are emitted from vehicles and internal combustion machines. Smoke emissions can be reduced by having good and regular maintenance. Poor blasting and water problems in blast holes also produce noxious gases. Quarry

operators in deep pits with poor air circulation must be aware of this danger.

Flyrocks

Flyrock is associated with blasting. It is one of the most serious problem. There has been a number of deaths caused by flyrock as reported in the newspapers. Several more cases of properties damaged from flyrock were not reported. A few rock blashing operations in quarries and development sites have been stopped for a few months due to complaints about flyrock.

The nature of rock is difficult to predict and so is flyrock. In advanced countries such as UK, laser profiling equipment and borehole logging instruments are being used to design the blast in order to minimise flyrock. Various steps such as proper blast design, accurate drilling, proper direction of blast and use of blasting mat should be taken to reduce flyrock incidents.

Vibration

Vibration is also associated with blasting operations where it is measured as peak particle velocity in mm per second. Very high vibration can cause structural damage to buildings. Low level vibration e.g. 10 mm/s will not cause any structural damage but the occupants will have the psychological feeling of "my house will fall or be damaged". This psychological feeling is quite significant as the public still complains at vibration as low as 3 mm/s.

The vibration limit set by the Department of Mines is normally 10 mm/s at the nearest residential place and it varies from case to case. There many ways to reduce vibration, of which the most effective is to reduce the weight of explosive used per delay.

Airblast

Airblast is overpressure (pressure above normal ambient pressure) produced by blasting. It can cause window panes to rattle. It seldom causes damage but receives the most complaints from public. Measurement for airblast is in dB (Linear) which covers the full range of frequencies. This is different from dB (A) which measures the frequencies within the range of

human hearing. The limit set by the Department of Mines is 120 dB(L).

Landscape And Rehabilitation

Most quarries pay little attention on landscaping and rehabilitation. The exposed rock and earth is an eye sore when compared with surroundings. Green is beautiful, so it is important for quarry operators to plant trees. The trees will lessen the visual impact of the quarry operations, reduce the noise level as well as trap the dust. It also blends nicely with the surroundings and gives positive perspective to the public. It is the responsibility of the operator to rehabilitate progressively the quarry site for future use. In Malaysia, the small size of land and close proximity to developed areas will naturally turn the quarry site into residential or industrial areas.

SUGGESTIONS FOR IMPROVEMENT

EIA Process

Environmental Impact Assessment can be described as a process to identify and predict the impact on the environment and on man's health and well being (Glasson *et al.*, 1994). The present practice is to engage an environmental consultant to study a quarry proposal, write an Environmental Impact Assessment report and get it approved by the Department of Environment. From the author's experience many of the consultants do not engage qualified specialist to write on quarrying operations and its mitigating measures. They just wrote based on text books or from other reports. What is more important is to highlight the "critical, significant and insignificant" issues on the impacts of the quarrying activities. For example quarries within the water catchment areas must be able to comply the class A discharge i.e. 5 mg per litre and the EIA must prove this. Those that are close to residential areas must be able to meet the 5 mm/s vibration.

When the EIA report is being prepared the project proponent is not involved at all. Beware, whatever the consultant writes and the conditions of approval from the DOE is binding. It is the responsibility of the operator to comply with ALL the mitigating measures suggested as well as the approval conditions.

In many cases, many of the mitigating measures and the conditions are difficult, not practical and expensive to implement. Not surprisingly, many EIA reports and approval are kept in the file cabinet in the Company's Headquarters, and the quarry manager knows nothing about it.

This shortcoming can be overcome by forming a team that work together with the consultant or vet the Consultant's report. The company will then know its liability, responsibility and whether the mitigating measures are practical and economical to implement.

In some of the EIA approval, there are stringent conditions such as submission of quarry scheme to be approved by the Department of Mines, engaging consultant on permanent basis, appointment of safety, health and environment officer and periodical inspection of the quarrying activities by the management and the consultant.

Quarry Scheme

Under the Quarry Rules (Perak, Kelantan and Sabah) and also in many EIA approvals, the quarry operator must submit a Quarry Scheme. With the quarry scheme the Department of Mines hopes that the quarry is operated safely, efficiently and environmental friendly from the initial development state right through the rehabilitation stage when the quarry closes (Look Keman, 1996). A guideline for preparation of quarry scheme is available from by the Department of Mines. It is a planning tool for the benefit of the operators in planning ahead.

This concept quarry scheme is being adopted by Department of Environment. It will be used to monitor the compliance of the conditions as well as new mitigating measures to be taken for environmental protection.

Safety, Health and Environmental Unit

The Department of Environment imposes stringent conditions when approving EIA reports. One of the main item is post EIA monitoring during project implementation. Likewise the Department of Safety and Health is going to enforce the safety rules. It is the responsibility of the management to formulate safety rules on all aspect of quarrying operations,

conduct training for the workers and establish safety committees.

In the author's opinion there is a need for quarries to set up their own safety, health and environmental unit. The unit will be responsible for the safety, health and all environmental matters including inspection, checking, safety, training monitoring and reporting.

Consultant

Once the EIA approval is obtained, the project is normally tendered out to the main contractor who will then sub-contract various components to others. There may be many levels of sub-contractors. This practice is unhealthy as cost cutting is rampant in order to minimise cost and maximise profit. In the end the persons that actually doing the work have to cut corners to survive which eventually lead to accidents and non compliance of conditions. Not surprisingly, many development projects and quarries are ordered to stop operation. Stop work order is very costly.

One way to solve this problem is to engage a consultant who has sufficient knowledge on government procedures and some experience in the industry. Depending on the sensitivity of the project e.g. proximity to residential areas, he can advice the project proponent or the developer, on government requirements, environmental protection, anticipated problems to be faced and the ways to overcome them. A little investment at this planning stage is worthwhile for a hassle free project implementation.

Under the Quarry Rules, the Department of Mines requires the quarries to engaged consultants on permanent basis. This concept is being slowly adopted by the Department of Environment in some states.

Human Resources

In the United Kingdom, all quarry managers must first be a Corporate Member of responsible for the design of the blast and the shotfirer acts upon his instruction. The situation is reversed in Malaysia where the shotfirer determines the design or sometimes the driller that determines the blast hole layout. From

legal point of view, it is the manager that is responsible for any incident in the quarry.

The Institute of Quarrying Malaysia (IQM) have been organising shotfirer courses since 1993, either jointly with Department of Mines or on their own. More than 500 personnel has been trained since 1993. IQM is in the process of putting the necessary groundwork to upgrade the quarry personnel by conducting courses in association with Boxhill College, Australia. It is hoped that with these courses and others that are being planned, the level of professionalism in the quarry will continue to rise.

To upgrade the level of competency of shotfirers, the Department of Mines conducted shotfirer examination (theory) twice a year, simultaneously at 9 centres. Since the introduction of the shotfiring courses and the certification of the shotfirers there has been a marked improvement in the industry.

Public Relations

Know your neighbour, be good to them and it pays good dividend. This is very true for the quarrying industry. A courtesy call to the village head, regular meetings and discussions, donations and prompt action when there are complaints will foster good relationship. A small mistake can be forgiven and sometimes they can help you too.

CONCLUSION

Quarry operations affect the environment. It is the responsibility of the management to ensure that the quarrying activities are carried out safely, efficiently and environmentally friendly. Training is required to improve the personnel performance. A well planned and operated quarry will bring good dividends.

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- J. GLASSON, R. THERIVEL AND A. CHADWICK, 1994. *Introduction to Environmental Impact Assessment*. UCL Press, London.
- LOOK KEMAN BIN SAHARI, 1996. *Environmental Impact of Quarrying, Malaysian Perspective*. Instant Quarry Seminar, Mulpha Engineering Sdn. Bhd., 20.7.1996.

PERTEMUAN PERSATUAN Meetings of the Society

Ceramah Teknik (Technical Talk)

Malam Geologis Muda/Young Geologists Night on 8th April, 1999 in University of Malaya — Report

The idea behind the Young Geologists Night was to have some of the young practising engineering geologists come forward and share some of their experiences with members of the Society. It was also an occasion to gauge how some of our ex-students (UKM, UM etc.) are performing in their professional careers (By the way, the fact that all 3 speakers are ex-students of UKM is purely **coincidental!**). At this point, I am glad to say that all 3 speakers have done very well not only in their presentations, but also in their professional careers as well! SYABAS!!

Sdr. Mogana gave several case studies of engineering geological mapping as applied to highway, tunnelling, resort development and landfilling. Sdr. Kong gave examples comparing borehole results and seismic surveys, in particular with respects to bedrock determinations. The agreements in both methods were generally good. Sdr. Koay presented case studies of slope remedial and stabilization works, with colour slides on examples from Penang Island.

Abstracts of the 3 presentations were not given by the speakers.

There was a lively discussion involving all 3 speakers and the audience, reflecting the great interest shown in all the 3 presentations for the evening. About 30 members attended the talk, the majority of whom were "Young Geologists" as well, and interest was indicated to perhaps have a follow-up "Malam Geologis Muda II"!

Tan Boon Kong
Chairman, W/G Eng. Geol. & Hydrogeol.
23rd April 1999

Annual General Meeting & Annual Dinner 1999 — Report

The AGM for 1999 was held on Friday, 30th April 1999 at 6.15 pm in Boardroom 2, Eastin Hotel, Petaling Jaya. A total of 22 members attended the meeting.

The Annual Dinner that followed was held at the Swez Brasserie Coffee House of the Eastin Hotel and attended by about 30 members.

G.H. Teh

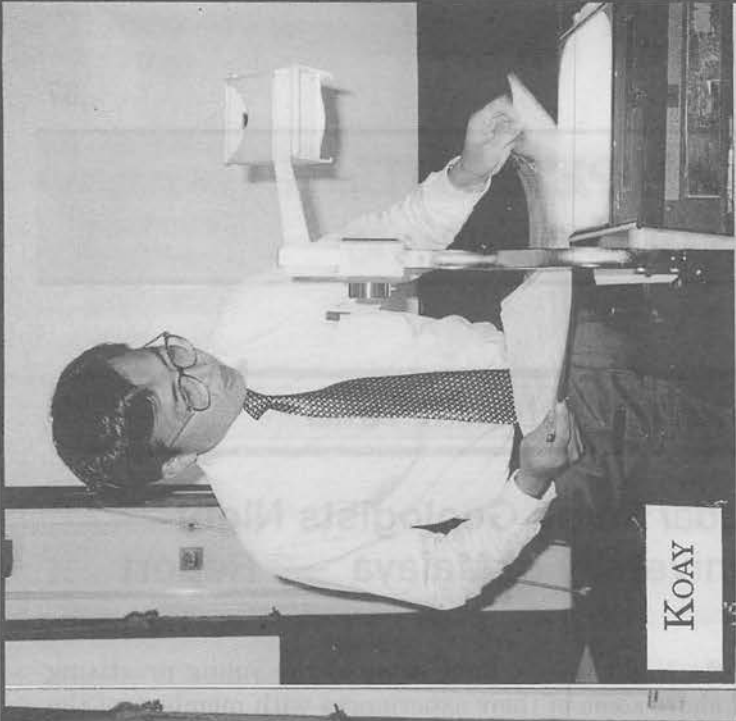
Malam Geologis Muda/Young Geologists Night



MOGANANA



KONG



KOAY



Annual General Meeting & Annual Dinner 1999



Minutes of the 32nd Annual General Meeting (1997/98)

Minutes of the 32nd Annual General Meeting held at the Mohar Room 1, Hotel Singgahsana, Petaling Jaya, at 6.15 p.m. on the 25th April 1998 (Saturday).

Present:

Jimmy K.K. Khoo (Chairman)
 Ahmad Tajuddin Ibrahim (Secretary)
 Ibrahim Komoo
 Lee Chai Peng
 Leong Lap Sau
 Abd. Ghani Rafek
 Gan Lay Chin
 Ng Tham Fatt
 J.J. Pereira
 Seet Chin Peng
 Mogana Sundaram
 Selvarajah
 Mazlan Madon
 K.N. Moorthy
 Rusli Abdullah
 Abd Rasid Jaapar
 Chu Yun Shing
 Ng Chak Ngoon

Nicholas Jacob
 Mior Sallehuddin
 C.S. Hutchison
 Fateh Chand
 Ab. Rahim Samsudin
 Teh Guan Hoe
 Choo Mun Keong
 S. Paramanathan
 Tan Boon Kong
 Azhar Hussin
 R.B. Tate
 H.D. Tjia
 Nik Ramli
 Yip Foo Weng
 Mohd. Zaini
 Chin Lik Suan
 Gary Leong

1. Confirmation of the minutes of the previous AGM (1997)

The minutes of the 31st AGM were passed on the proposal of Dr. Leong Lap Sau and seconded by Mr. Yip Foo Weng.

2. Matters Arising

1. **Geologist's Act** — IGM President informed the meeting that there has been no further progress made so far, further meetings with the Ministry officials will be held to finalise the proposed Act.

Society representative to IGM — the Secretary is the representative to IGM.

2. **Certificates for all Life Members** — the certificates were already distributed to those present at the Annual Geological Conference 1997 in Terengganu.

3. President's Report

Mr. Jimmy Khoo presented the report as Dr. Khalid Ngah resigned in January 1998. He thanked the chairmen of the Annual Geological Conference '97 and the Petroleum Geology Conference '97 for their success in organising these two Conferences and also the chairmen of the various working committees for the various activities held during

the past year. Finally he expressed gratitude to all the companies, agencies and individuals for their generous sponsorships, donations and support given.

Mr. M.K. Choo seeks clarification on the post of the President when he/she resigned early, whether the Vice-President takes over as President or as Acting- President. The meeting agreed to let the incoming council decide on the interpretation of Article V Section 4 and 5 of the constitution accordingly.

The President's Report was passed on the proposal of Dr. S. Paramanathan and seconded by Dr. Leong Lap Sau.

4. Secretary's Report

Dr. Ahmad Tajuddin presented his report for the 1997/98 session. One amendment was recorded for the list of Society Activities 1997/98 (appendix 3):

10 November 1997 — Field Trip to Batu Arang organised by the Working Group on Sedimentology and Stratigraphy.

He reported that the Council met every month (12 times) during the session. Total memberships of the Society shows an increase from 594 to 615.

Besides the two major Conferences held as already mentioned in the President's Report, there were 18 technical talks, one seminar jointly organised by the Sedimentology & Stratigraphy Working Group, one site visit and two field trips organised by the various working groups.

He also reported that we are now also represented in the executive committee of the Confederation of Scientific and Technological Associations in Malaysia (COSTAM) by Mr. Jimmy Khoo.

Dr. C.S. Hutchison suggested that attempts be made to get more institutional members. They could be encouraged to join if they know of our list of publications and perhaps this could be done easily through the e-mail.

The Secretary's Report was passed on the proposal of Dr. J.J. Pereira and seconded by Dr. Abdul Ghani Rafek.

5. Editor's Report

Dr. G.H. Teh in his report stated that the *Warta Geologi* continue to come regularly. He assured the meeting that Bulletins 37, 38, 39 and 40 should be available before the GEOSEA '98.

The Editor's Report was passed on the proposal of Dr. S. Paramanathan and seconded by Dr. Abdul Rahim Samsudin.

6. Treasurer's and Honorary Auditor's Reports

Dr. C.P. Lee reported there is a small drop in the net current assets from RM612,511.09 to RM608,324.07 for the past year.

He also cautioned the meeting on the big jump in income for the 1997 of RM129,706.39 compared to that for 1996 of RM99,511.09 because there is still the substantial printing bills of RM34,000.00 yet to be paid.

Dr. Nik Ramli suggested that the Society take advantage of the presently high interest rate offered by some banks. He also suggested that we list out the list of donors in the treasurer's report. The treasurer replied that list of donors are normally already published in the program book for the event.

Dr. Abdul Ghani Rafek enquired on the availability of the Langkawi Field Guide. The treasurer will check on this and if necessary will make extra copies.

Dr. C.S. Hutchison commented on the poor sale of the souvenirs. The treasurer explained that some of these souvenirs are given away to speakers at our technical talks, to host of site visits, etc.

The Treasurer's Report and the Honorary Auditor's Report were passed on the proposal of Dr. C.S Hutchison and seconded by Dr. Leong Lap Sau.

7. Election of Honorary Auditor 1998/99

The meeting reelected Mr. Lee Siew Fatt of S.F. Lee & Co., on the proposal of Dr. Lee Chai Peng and seconded by Dr. S. Paramanathan as Honorary Auditor for the 1998/99 session.

8. Announcement of New Council (1998/99)

The Council for 1998/99 shall be as listed below:

President:	Prof. Ibrahim Komoo (UKM)
Vice-President:	Mr. Jimmy Khoo Kay Khean (JPK)
Secretary:	Dr. Ahmad Tajuddin Ibrahim (UM)
Assistant Secretary:	Dr. Mazlan Madon (PRSS)
Treasurer:	Dr. Lee Chai Peng (UM)
Editor:	Dr. Teh Guan Hoe (UM)
Councillors (2-years):	Dr. Abdul Ghani Rafek (UKM) Dr. Tajul Anuar Jamaluddin(UM) Mr. M. Selvarajah (JPK) Mr. Muhinder Singh (PLRT)
Councillors (1-year):	Dr. Azhar Haji Hussin (UM) Mr. Liew Kit Kong (PETRONAS) Dr. Kadderi Md. Desa (UKM) Mr. Tan Boon Kong (UKM)
Immediate Past President:	Dato' Dr. Khalid Ngah (Kedah Cement)

Laporan Presiden 1998/1999

Ucapan terima kasih atas kepercayaan tuan dan puan mengizinkan saya dan ahli Majlis lain menguruskan Persatuan Geologi Malaysia untuk sidang 1998/1999. Kami berbangga memaklumkan bahawa Persatuan telah bergerak dengan cergas dan menjalankan aktiviti tahunan selancarnya, sejajar dengan tradisi keilmuan serta membawa ke tahap penghormatan tinggi di peringkat kebangsaan dan antarabangsa.

Aktiviti terpenting pada sidang ini ialah penganjuran Kongres GEOSEA 1998 yang telah berlangsung pada 17–19 Ogos. Saya bersyukur kerana kongres telah berjalan dengan jayanya. Peserta dari lapanbelas negara telah mengambil bahagian dan lebih 160 kertas kerja telah dibentangkan dalam kongres kali ini. Mesyuarat GEOSEA Union dimana Presiden dari hampir semua negara bergabung turut berlangsung sempena kongres kali ini. Persatuan Geologi Malaysia telah dipilih sebagai Sekretariat GEOSEA Union untuk tempuh 3 tahun. Saya mengambil kesempatan ini untuk mengucapkan terima kasih kepada Pengerusi Kongres, Profesor Hamzah Mohamad dan seluruh ahli jawatankuasanya atas kejayaan cemerlang penganjuran kongres rantauan ini.

Persatuan telah semakin mantap apabila pelbagai aktiviti pengembangan ilmu dianjurkan oleh kumpulan-kumpulan Kerja. Beberapa Kumpulan Kerja sangat aktif sementara beberapa yang lain masih perlu sokongan ahli untuk menjalankan kegiatan masing-masing. Atas permintaan ahli, dua kumpulan kerja baru diwujudkan iaitu Kumpulan Kerja Penilaian Formasi dan Kumpulan Kerja Geofizik. Ini menggambarkan suasana keilmuan yang sihat dimana ahli telah bersedia mewujudkan kelompok kecil di dalam Persatuan untuk mengembangkan sub-bidang ilmu yang lebih mengkhusus. Kepada semua Pengerusi Kumpulan Kerja dan ahli dalam kelompoknya, saya mengucapkan syabas di atas sumbangan tuan dan puan kepada kejayaan Persatuan.

Ceramah Teknik yang disampaikan oleh ahli geologi terkemuka dari dalam dan luar negara diteruskan seperti tradisi Persatuan dalam sidang-sidang sebelum ini. Sebanyak 15 ceramah teknik telah berjaya dianjurkan. Selain ceramah teknik, Persatuan juga menganjurkan Kursus Latihan (1), Kerjalapangan (3), Syarahan Awam (2), dan Forum, Seminar dan Dialog (4). Untuk memastikan kelicinan perjalanan aktiviti ilmiah ini, Profesor Madya Dr. Azhar Hussin telah dilantik sebagai Kordinator Ceramah Teknik. Kepada beliau, dan semua penceramah yang menjayakan aktiviti di atas, Persatuan ingin mengucapkan terima kasih di atas sumbangan tuan dan puan.

Tulang belakang kejayaan dan kecemerlangan Persatuan terletak pada kemampuannya menerbitkan Warta dan Buletin yang bermutu tinggi. Ini satu usaha yang sukar dan memerlukan komitmen yang tinggi. Walaupun sedikit ketinggalan, Persatuan terus berusaha menyediakan dua bentuk penerbitan ini sekemas dan bermutu seperti yang diharapkan. Keahlian dapat dikekalkan/dipertingkatkan dan pada sidang ini jumlah ahli Persatuan ialah 439 orang. Kewangan Persatuan terus kukuh hasil sumbangan luar yang berterusan dan pengurusan kewangan yang berhati-hati.

Selama ini Persatuan telah amat berjaya menjalankan aktiviti untuk ahlinya. Sebagai sebuah Persatuan ilmunan yang sudah matang, kita perlu memandang ke hadapan dan memikirkan pula peranan Persatuan untuk meningkatkan kesedaran awam mengenai

sumbangan ilmu geosains dalam pembangunan negara. Untuk mencapai hasrat ini, Kumpulan Promosi Geosains telah diaktifkan semula. Kejayaan awal dalam gagasan ini ialah apabila cadangan Persatuan untuk mewujudkan 'Muzium Geologi Tanjung Balau' telah diterima dan diluluskan oleh Lembaga Pengarah KEJORA. Saya ingin mengucapkan terima kasih kepada Dr Tajul Anuar Jamaluddin, Pengerusi Jawatankuasa Teknikal Penubuhan Muzium dan ahli-ahlinya yang telah memulakan inisiatif ini.

Dalam sidang 1998/1999 ini, Persatuan berjaya menganjurkan pelbagai aktiviti dengan sokongan padu tuan dan puan. Saya dan ahli Majlis yang lain ingin mengucapkan ribuan terima kasih kepada semua ahli Persatuan yang telah terlibat secara langsung dan tidak langsung untuk kejayaan kita bersama ini. Kepada rakan-rakan jaringan, khususnya individu, syarikat dan agensi, saya bagi pihak Persatuan ingin mengucapkan berbilang terima kasih atas sokongan dan sumbangan anda.

Ibrahim Komoo
Presiden
Persatuan Geologi Malaysia
1 April 1999

Secretary's Report

1. THE COUNCIL

Members of the Council of the Geological Society of Malaysia for the period 26th April, 1998 to the 30th April 1999 are as follows:

President	:	Ibrahim Komoo (Universiti Kebangsaan Malaysia)
Vice-President	:	Jimmy Khoo Kay Khean (Geological Survey Department Malaysia) (resigned 29.4.98) S. Paramanathan (Consultant) (appointed 18.6.98)
Secretary	:	Ahmad Tajuddin Ibrahim (University of Malaya)
Assistant Secretary	:	Mazlan Madon (PRSS)
Treasurer	:	Lee Chai Peng (University of Malaya)
Editor	:	Teh Guan Hoe (University of Malaya)
Councillors (2-years)	:	Abdul Ghani Rafek (Universiti Kebangsaan Malaysia) Tajul Anwar Jamaluddin (University of Malaya) M. Selvarajah (Geological Survey Department Malaysia) Muhinder Singh (PLRT)
Councillors (1-year)	:	Tan Boon Kong (Universiti Kebangsaan Malaysia) Azhar Hussin (University of Malaya) Liew Kit Kong (PETRONAS Carigali) Khadderi Md. Desa (Universiti Kebangsaan Malaysia) (resigned 21.7.98)
Immediate Past President	:	Khalid Ngah (Kedah Cement)

2. COUNCIL MEETINGS

Council Meetings were held almost monthly throughout the 1998/99 session. A total of 10 Council Meetings have been held. Attendance of Council Members at these meetings is as shown in Appendix 1.

3. MEMBERSHIP

The total membership of the Society as at 31st December, 1998 is at 551 showing a slight decrease from the previous year's total of 615. There are 112 members from outside Malaysia. Life memberships have however increased by 9 to 125. Details of the various classes of memberships and their geographical distributions are shown in Appendix 2.

4. SOCIETY ACTIVITIES

This year the Annual Geological Conference and the Annual Petroleum Geology Conference were not held to enable us to concentrate on the organisation of the Ninth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia (GEOSEA '98) under the chairmanship of Prof. Hamzah Mohamad. This was successfully held at the Shangri-La Hotel, Kuala Lumpur on the 17-19th August 1998. A total 159 oral papers were presented with another 19 presented as posters. An exhibition was

also held participated by 14 companies. The Congress was officially opened by the Honourable Minister of Primary Industries, Y.B. Dato' Seri Dr. Lim Keng Yaik and was well attended by 430 participants and 77 students. IGCP 383 and 350 also convened their symposia during the Congress. The Congress was well supported by the various companies and organisations (listed in the Congress program book) for which the Society would like to record our sincere appreciation.

The Congress was preceded by a two-day Training Course (Sense indicators on fault planes and in fault zones, with field applications) on the 15-16th August 1998. A Regional Dialog on Geoinicators for Sustainable Development was also held in conjunction with this Congress on the 20th August 1998. One fieldtrip were held around Kuala Lumpur before the Congress and two fieldtrips to Langkawi and West Sarawak were held after the Congress.

The Working Groups have not been very active during this session due to pressure of work. However a seminar on "Problems and issues relating to the stratigraphy and tectonics of Peninsular Malaysia" was organised by the Sedimentology & Stratigraphy Working Group, at the Department of Geology University of Malaya on the 10th April 1999. The Engineering Geology/Hydrogeology Working Group held two forums.

A total of 2 forums, 15 technical talks, 1 dialogue, 1 seminar, 2 public lectures and 3 fieldtrips/site visit were organised during the 1998/99 session. Details of the Society's activities are shown in Appendix 3.

5. PUBLICATIONS

Sales of publications remain sluggish slow as in previous years. Bulletins 2 to 19 registered an increase in sales. Only the "Rocks and Minerals Poster" is selling very well but some of them are actually given away free. The remaining stock and sales made during 1998 is as shown in Appendix 4. Work is still in progress to get the Stratigraphic Lexicon, which was originally scheduled to be completed before the GEOSEA '98. We hope to get this published before the Petroleum Geology Conference 1999. The Society has also decided to publish Robert Tate's Ph.D. thesis in the form of a monograph. The Society continued to maintain a publication exchange with various professional bodies and libraries from various parts of the world.

6. ACKNOWLEDGEMENTS

The Society would like to acknowledge with thanks the generous cooperation and sponsorships received from companies, professional societies, government departments, universities and institutions; the Head of the Department of Geology, University of Malaya where the Society is housed and where most of the activities were held and the numerous individuals and Councilors who have contributed in one way or another to the Society's activities.

Ahmad Tajuddin Ibrahim
Secretary

Appendix 1

Attendance of Council Members at Council Meetings

No.	Name	19/5	24/6	21/7	27/8	6/10	10/11	22/12	26/1	23/2	1/4
1	Khalid Ngah	0	0	0	0	0	0	0	0	0	0
2	Ibrahim Komoo	X	X	X	X	X	X	X	X	X	X
3	S. Paramanathan	N	X	0	0	X	X	0	0	0	0
4	Ahmad Tajuddin Ibrahim	X	X	X	X	X	X	X	X	0	X
5	Lee Chai Peng	X	X	X	X	X	X	X	X	X	X
6	Teh Guan Hoe	X	X	X	X	X	X	X	X	X	X
7	Mazlan Madon	X	X	0	X	X	0	0	0	0	X
8	Azhar Hussin	X	X	X	X	X	X	X	X	X	X
9	Liew Kit Kong	0	X	0	0	X	0	0	X	X	X
10	Khadderi Md Desa	0	0	0	-	-	-	-	-	-	-
11	Abdul Ghani Rafek	0	X	0	0	X	X	0	X	X	X
12	M. Selvarajah	X	X	X	0	X	X	X	X	X	X
13	Muhinder Singh	0	0	0	0	0	0	0	0	0	0
14	Tan Boon Kong	X	X	0	0	X	X	0	X	0	X
15	Tajul Anuar	X	X	0	X	X	X	X	X	X	X

X : present

0 : absent with apologies

- : resigned

N : not yet appointed

Appendix 2

Memberships for 1998

Country	Full	Life	Institutional	Student	Associate	Honorary	Total
Australia	11	8	2				21
Brunei	3	1	2				6
Canada	3			1			4
Europe	9	7	2		1	1	20
India	1						1
Indonesia	5	2					7
Japan	5	1					6
Libya		2					2
New Zealand	2						2
Philippines		2					2
Singapore	9	5	3		1		18
South America	1						1
Thailand	1	1					2
USA	13	5		1			19
Vietnam			1				1
Malaysia	202	91	8	122	13	3	439
TOTAL	265	125	18	124	15	4	551

Appendix 3 Society Activities 1998/99

No.	Date	Event/Speaker/Venue
1.	4 May 1998	Technical Talk 1: <i>Formation evaluation application of sonic measurements</i> by Alain Brie, Schlumberger K.K., Japan at the Kuala Lumpur Hilton jointly organised with the Malaysian Society of Exploration Geophysics.
2.	22 June 1998	Technical Talk 2: <i>Formation evaluation in cased holes</i> by Alan Sibbit, Schlumberger Center for Advanced Formation Evaluation, Texas at the Shangri-La Hotel, Kuala Lumpur jointly organised with the Malaysian Chapter of the Society of Professional Well-Log Analysts.
3.	23 June 1998	Technical Talk 3: <i>Leachate migration through clay liners</i> by Tan Boon Kong, Universiti Kebangsaan Malaysia at the University of Malaya, Kuala Lumpur.
4.	17 July 1998	Technical Talk 4: <i>Modern approaches to fractured reservoirs</i> by Ron Nelson, Schlumberger at the Shangri-La Hotel, Kuala Lumpur.
5.	7 August 1998	Technical Talk 5: <i>Geotechnical Investigation of Malaysian ethylene/polyethylene project</i> by Ng Chak Ngon, Subsurface Engineering Sdn. Bhd. at the University of Malaya, Kuala Lumpur.
6.	15–16 August 1998	Training Course: <i>Sense indicators on fault planes and in fault zones, with field applications</i> held in conjunction with GEOSEA '98 at the University of Malaya.
7.	16 August 1998	Fieldtrip 1: <i>Geology of Kuala Lumpur and the surrounding area</i> held in conjunction with GEOSEA '98.
8.	17–19 August 1998	Ninth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia (GEOSEA '98) at Shangri-La Hotel, Kuala Lumpur.
9.	20 August 1998	Dialogue: <i>Regional dialogue on geoindicators for sustainable development</i> jointly organised with LESTARI, Universiti Kebangsaan Malaysia at LESTARI in conjunction with GEOSEA '98.
10.	19–21 August 1998	Fieldtrip 2: <i>Mesozoic-Cenozoic of West Sarawak</i> in conjunction with GEOSEA '98.
11.	19–21 August 1998	Fieldtrip 3: <i>Geology of the Langkawi Islands</i> in conjunction with GEOSEA '98.
12.	30 September 1998	Technical Talk 6: <i>Pressure meter and penetration vane shear tests</i> by Rusli Abdullah, Central Soil Laboratory at the University of Malaya, Kuala Lumpur.
13.	30 September 1998	Technical Talk 7: <i>Piezocene and dilatometer tests</i> by Abdul Rasid Jaafar, Central Soil Laboratory at the University of Malaya, Kuala Lumpur.

Appendix 3 (cont'd) Society Activities 1998/99

No.	Date	Event/Speaker/Venue
14.	8 October 1998	Technical Talk 8: <i>Geological input for mechanised tunneling — case study of Kelinci transfer tunnel, Negeri Sembilan</i> by Mogana Sundram, University Kebangsaan Malaysia at the University of Malaya, Kuala Lumpur.
15.	15 October 1998	Technical Talk 9: <i>Reservoir evaluation and data integration in horizontal wellbores</i> by Robert A. Skopec, Petrophysical Applications International Inc., Houston at the Concorde Hotel, Kuala Lumpur jointly organised with Core Laboratories (M) Sdn Bhd.
16.	31 October 1998	Public Lecture 1: <i>“Aspek terpilih geologi dalam kehidupan harian”</i> by Abdul Ghani Rafek, Universiti Kebangsaan Malaysia at the Universiti Sains, Pulau Pinang in conjunction with “Minggu Fizik”.
17.	18 November 1998	Technical Talk 10: <i>Outcrop analogues of subsurface reservoirs in NW Borneo</i> by J.J. Lambiase, Universiti Brunei Darussalam, Brunei at the University of Malaya.
18.	23 November 1998	Technical Talk 11: <i>Origin of bornhardts</i> by C.R. Twidale, University of Adelaide, South Australia at the University of Malaya.
19.	28 November 1998	Public Lecture 2: <i>The wandering poles: earth history in new perspective.</i> Technical Talk 12: <i>Research methods in Global Wrench Tectonics.</i> Both were given Universiti Sains Malaysia, Pulau Pinang.
20.	30 November 1998	Technical Talk 13: <i>An alternative evolutionary model for the earth — part 1</i> by Karsten M. Storetvedt, University of Bergen, Norway at the University of Malaya, Kuala Lumpur.
21.	1 December 1998	Technical Talk 14: <i>An alternative evolutionary model for the earth — part 2</i> by Karsten M. Storetvedt, University of Bergen, Norway at the Petronas Twin Towers, Kuala Lumpur organised jointly by the Geophysics Working Group and Petronas Carigali Sdn Bhd.
22.	4 December 1998	Technical Talk 15: <i>The deep gas potential of the Batu Raja Formation in South Sumatra. A case history: the Singa gas discovery</i> by Jonathan Redfern, Oxford Brookes University, United Kingdom at the University of Malaya, Kuala Lumpur.
23.	18 December 1998	Forum 1: <i>Malam “WWW: Weather, Weathering & Water”</i> organised by the Engineering Geology/Hydrogeology Working Group at the University of Malaya, Kuala Lumpur
24.	8 April 1999	Forum 2: <i>“Malam Geologis Muda”</i> organised by the Engineering Geology/Hydrogeology Working Group at the University of Malaya, Kuala Lumpur
25.	10 April 1999	Seminar 1: <i>Problems & issues relating to the stratigraphy and tectonics of Peninsular Malaysia</i> organised by the Sedimentology & Stratigraphy Working Group at the Universiti of Malaya, Kuala Lumpur.

Appendix 4 Stock of Publications

BULLETIN NO./PUBLICATION	SALES 1998	STOCK REMAINING
2	5	293
2	36	252
3	39	254
4	39	119
5	36	26
6	44	476
7	42	293
8	4	13
11	43	52
13	39	92
15	44	6
16	40	33
17	47	93
18	48	74
19	4	630
20	2	478
21	2	244
22	4	304
23	2	306
24	1	480
25	1	257
26	1	301
27	3	179
28	1	178
29	1	174
30	1	243
31	2	188
32	3	222
33	4	341
34	4	144
35	1	150
36	2	186
41	53	103
Abstracts (Bulletin 6)	1	4
Stratigraphic Correlation	38	245
Rocks and Minerals Poster	163	489
Geological Evolution of SEA (CSH)	67	443
Malaysian Stratigraphic Guide	9	789

Editor's Report 1998/99

The Society's newsletter, the *Warta Geologi*, after a late start, has been brought up-to-date. The latest *Warta*, Vol. 25, No. 1 (Jan-Feb 1999), is with the printers.

We are again in need of geological notes for the *Warta* and it is hoped that the contributions will continue to come in.

Due to complications with our computer resulting from the recent hard disc upgrade and new Operating System we have not been able to get any Bulletin out in time for this AGM. The problem is being sorted out and we should be getting out the Bulletins for the Annual Geological Conference 1999.

The Society is grateful to the many authors for their valuable contributions, and the donors and advertisers for their valuable financial contributions to the Society's Funds.

Special thanks are due to Ng Tham Fatt and A.K. Fan for assistance in the various editorial processes. The contributions of members of the Editorial Subcommittee and reviewers and advice of members of the Editorial Advisory Board are greatly appreciated.

G.H. Teh
Editor

Treasurer's Report 1998

There is an increase in the Society's nett current assets and from RM608,324.07 in 1997 to RM630,425.97 for 1998.

There is a drop in the Society's income from RM129,706.39 in 1997 to RM98,918.95 for 1998 mainly due to the drop in interest on fixed deposits due to timing of maturity dates. This drop in income from fixed deposits is offset somewhat by the increase in donations to the last Petroleum Geology Conference from RM17,434.70 in 1997 to RM33,500.31 in 1998.

There is a big increase in expenditure for 1998 of RM178,499.12 compared to RM89,642.84 for 1997 because of the RM117,083.00 printing bill for GSM bulletins and RM19,631.59 for *Warta Geologi*. This has led to a deficit of RM79,580.17 for 1998.

The Society would like to thank our generous donors for their continuous support and also our Honorary Auditor, Mr. Lee Sia Fatt for his service to us.

Lee Chai Peng
Treasurer
1st April 1999

Auditors' Report to the Members of Persatuan Geologi Malaysia (Geological Society of Malaysia)

We have audited the accounts in accordance with approved auditing standards.

In our opinion, the accounts give a true and fair view of the state of affairs of the Society as at 31st December, 1998 and of its income and expenditure and receipts and payments for the year ended on that date.

Signed

S.F. LEE & CO.

(AF: 0670)

Public Accountants

5-3, Udarama Complex

Jalan 1/64A, Off Jalan Ipoh

50350 Kuala Lumpur

Signed

LEE SIEW FATT

(1179/9/00J)

Public Accountant

Kuala Lumpur

Date: 21 April 1999

PERSATUAN GEOLOGI MALAYSIA
(Geological Society of Malaysia)

Income and Expenditure Account for the Year
Ended 31 December 1998

INCOME	1997	1998
	RM	RM
Entrance fees	980.00	540.00
Interest on fixed deposits	72,636.30	38,999.34
Subscriptions	24,758.05	17,809.18
Sales of publications	7,459.73	4,533.91
PGC '97: Donation	17,434.70	33,500.31
Xerox	2,025.21	3,467.21
Souvenirs	45.00	69.00
Advertisement	4,000.00	-
Study groups	367.40	-
	129,706.39	98,918.95
 EXPENDITURE		
Audit fee	500.00	500.00
Annual dinner	2,820.00	1,237.44
Annual Conference	6,032.44	-
E-mail	500.00	500.00
Bank charges	123.79	258.34
Honorarium	13,192.00	10,656.00
Postage	5,896.95	188.59
Geoscience Promotion	-	480.30
Printing and Stationery:		
— Miscellaneous	18,540.18	11,680.92
— Bulletin	19,360.00	117,083.00
— Warta Geologi	7,180.00	19,631.59
Refreshments	1,590.91	1,364.60
Study groups	-	734.88
Sundry expenses	893.92	4,022.96
Speakers' account	3,431.29	3,211.65
Subscription: Professional bodies	200.00	209.70
Telephone	797.83	175.27
Telefax	487.67	1,636.75
Depreciation on fixed assets	3,924.56	3,862.11
Seminar Geologi Sekitaran	2,000.00	-
Stratigraphic committee	1,523.90	215.02
Langkawi fieldguide	147.40	-
Photo competition	500.00	850.00
	89,642.84	178,499.12
 EXCESS OF INCOME OVER EXPENDITURE:		
Transfer to capital fund	40,063.55	-79,580.17

PERSATUAN GEOLOGI MALAYSIA
(Geological Society of Malaysia)

Balance Sheet as at 31 December 1998

	<u>1997</u>	<u>1998</u>
	RM	RM
FIXED ASSET	35,321.06	34,758.95
CURRENT ASSETS		
Fixed Deposits with licensed banks	488,553.56	488,167.49
Deposit and prepayment	30,815.27	9,283.95
Cash and bank balances	53,634.18	98,215.58
	<u>572,503.01</u>	<u>595,667.02</u>
NET CURRENT ASSETS	<u>608,324.07</u>	<u>630,425.97</u>
 FINANCED BY:		
ACCUMULATED FUND		
Balance brought forward	565,117.69	605,181.24
Surplus/Deficit for the year	40,063.55	-79,580.17
	<u>605,181.24</u>	<u>525,601.07</u>
Young Geoscientist Award	3,142.83	3,142.83
GEOSEA 98	-	101,682.07
	<u>608,324.07</u>	<u>630,425.97</u>

Council For 1999/2000

President	:	Ibrahim Komoo (Universiti Kebangsaan Malaysia)
Vice-President	:	Abdul Ghani Rafek (Universiti Kebangsaan Malaysia)
Secretary	:	Ahmad Tajuddin Ibrahim (University of Malaya)
Assistant Secretary	:	Mazlan Madon (PRSS)
Treasurer	:	Lee Chai Peng (University of Malaya)
Editor	:	Teh Guan Hoe (University of Malaya)
Councillors (2-years)	:	Liew Kit Kong (PETRONAS Carigali)
		Tan Boon Kong (Universiti Kebangsaan Malaysia)
		Mogana Sundaram (Consultant)
		Hamdan Hassan (Consultant)
Councillors (1-year)	:	M. Selvarajah (Geological Survey Department Malaysia)
		Tajul Anuar Jamaluddin (University of Malaya)
		Muhinder Singh (PLRT)
		(one vacant)

In this first seminar of the series, entitled "Problems & Issues relating to the Stratigraphy and Tectonics of Peninsular Malaysia", five papers were presented.

Abdul Hadi Abd. Ismail
Chairman
GSM Sedimentology &
Stratigraphy Working Group

DYNAMIC STRATIGRAPHY & TECTONICS OF PENINSULAR MALAYSIA

First Seminar

**Problems & issues relating to the Stratigraphy
and Tectonics of Peninsular Malaysia**

Saturday, 10 April 1999

**Geology Department
University of Malaya
Kuala Lumpur**

The publication of *The Geology of Malay Peninsula* (Gobbett & Hutchison, 1973) was a milestone to the understanding of the geology and geological research of Peninsular Malaysia. The published volume summarised more than forty years of geological investigations that have been carried out since *The Geology of Malaya* (Scrivenor, 1928) publication. The breadth and depth of our understanding of the geology of Peninsular Malaysia and the neighbouring region has expanded immeasurably since the 1970's, especially after the 'explosion' of oil exploration activities and the associated expansion of academic research in the region. In short, owing to the availability of new data onshore and offshore, surface and subsurface and the accessibility of new technology, much work has been carried out and many new findings have been published. As we approach the new millennium, there seem to be a need to summarise the findings of the past twenty-five years and more.

The series of seminars on the *Dynamic Stratigraphy & Tectonics of Peninsular Malaysia* was planned with the objective of reviewing and compiling the current understanding of the stratigraphy and tectonics of the peninsula. In the effort to understand the origin of rocks and unravel the evolution of a terrain, it is necessary to utilise data and findings from diverse geological disciplines such as geochemistry, geophysics, igneous and metamorphic petrology, palaeobiology, sedimentology and structural geology.

Since the development of the theory of plate tectonics, there have been diverse hypotheses, proposals and speculations concerning the evolution of Peninsular Malaysia. Today, after more than two decades of "plate tectonism", new hypotheses are emerging challenging the relevance of the plate tectonic theory in describing the crustal evolution of the earth. With this background in mind, we would like to adopt a more 'open' approach to the description of the crustal evolution of the peninsula. The outflow and availability of new data makes it more difficult to confirm or to refute geological hypotheses. The best precaution to take is to explore these ideas by comparing the interpretations with the data!

In this first seminar of the series, entitled "Problems & issues relating to the Stratigraphy and Tectonics of Peninsular Malaysia", five papers were presented.

Abdul Hadi Abd. Rahman
Chairman
GSM Sedimentology &
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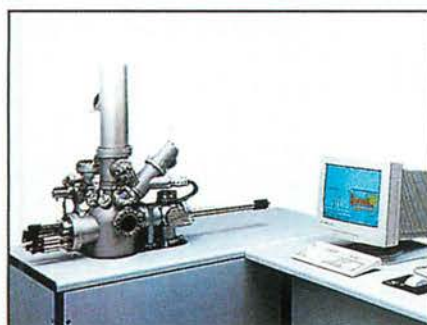
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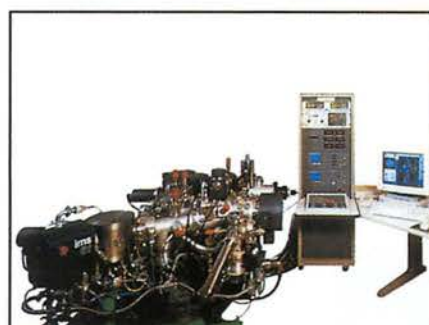
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-  Energy Filtered Transmission Electron Microscopy (EF TEM)
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-  Focused Ion Beam System (FIB)
-  Optical Defect Inspection and Review Stations (DRT)
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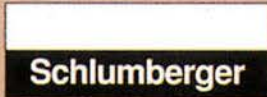
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Value is the difference.

* Mark of Schlumberger—the UBI tool is a MAXIS 500* tool



General Information

Papers should be as concise as possible. However, there is no fixed limit as to the length and number of illustrations. Normally, the whole paper should not exceed 30 printed pages. The page size will be 204 x 280 mm (8 x 11 inches).

The final decision regarding the size of the illustrations, sections of the text to be in small type and other matters relating to printing rests with the Editor.

The final decision of any paper submitted for publication rests with the Editor who is aided by a Special Editorial Advisory Board. The Editor may send any paper submitted for review by one or more reviewers. Authors can also include other reviewers' comments of their papers. Scripts of papers found to be unsuitable for publication may not be returned to the authors but reasons for the rejection will be given. The authors of papers found to be unsuitable for publication may appeal only to the Editor for reconsideration if they do not agree with the reasons for rejection. The Editor will consider the appeal together with the Special Editorial Advisory Board.

Unless with the consent of the Editor, papers which have been published before should not be submitted for consideration.

Authors must agree not to publish elsewhere a paper submitted and accepted.

Authors alone are responsible for the facts and opinions given in their papers and for the correctness of references etc.

One set of proofs will be sent to the author (if time permits), to be checked for printer's errors. In the case of two or more authors, please indicate to whom the proofs should be sent.

Twenty-five reprints of each article published are supplied free-of-charge. Additional reprints can be ordered on a reprint order form, which is included with the proofs.

Correspondence: All papers should be submitted to

The Editor (Dr. Teh Guan Hoe)
Geological Society of Malaysia
c/o Geology Department
University of Malaya
50603 Kuala Lumpur
MALAYSIA

Tel: (603) 7957 7036 Fax: (603) 7956 3900

Script Requirements

Scripts must be written in Bahasa Malaysia (Malay) or English.

Two copies of the text and illustrations must be submitted. The scripts must be typewritten double-spaced on paper not exceeding 210 x 297 mm (or 8.27 x 11.69 inches, A4 size). One side of the page must only be typed on.

Figure captions must be typed on a separate sheet of paper. The captions must not be drafted on the figures. The figure number should be marked in pencil on the margin or reverse side.

Original maps and illustrations or as glossy prints should ideally be submitted with sufficiently bold and large lettering to permit reduction to 18 x 25 cm: fold-outs and large maps will be considered only under special circumstances.

Photographs should be of good quality, sharp and with contrast. For each photograph, submit two glossy prints, at least 8 x 12.5 cm and preferably larger. Use of metric system of measurements (SI) is strongly urged wherever possible.

An abstract in English which is concise and informative is required for each paper.

References cited in the text should be listed at the end of the paper and arranged in alphabetical order and typed double-spaced. The name of the book or journal must be in *italics*. The references should be quoted in the following manner:

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.

Submission of electronic text. In order to publish the paper as quickly as possible after acceptance, authors are requested to submit the final text also on a 3.5" diskette. Both Macintosh and PC (DOS/Windows) platforms are supported. Main text, tables and illustrations should be stored in separate files with clearly identifiable names. Text made with most word processors can be readily processed but authors are advised to provide an additional copy of the text file in ASCII format. Preferred format for illustration is Encapsulated PostScript (EPS) but authors may submit graphic files in their native form. It is essential that the name and version of softwares used is clearly indicated. The final manuscript may contain parts (e.g. formulae, complex tables) or last-minute corrections which are not included in the electronic text on the diskette; however, this should be clearly marked in an additional hardcopy of the manuscript. Authors are encouraged to ensure that apart from any such small last-minute corrections, **the disk version and the hardcopy must be identical**. Discrepancies can lead to proofs of the wrong version being made.

DYNAMIC STRATIGRAPHY & TECTONICS OF PENINSULAR MALAYSIA

**Problems & issues relating to the Stratigraphy
and Tectonics of Peninsular Malaysia**

Saturday, 10 April 1999

**Geology Department
University of Malaya
Kuala Lumpur**

PROGRAMME

- 8.45–9.30 am : Registration
- 9.30–9.40 am : A short Welcoming Speech
- 9.40–10.05 am : **Paper 1:** Slide-rule tectonics, Sundaland
Tjia, H.D. (Petronas PRSS)
- 10.05–10.15 am : Discussion
- 10.15–10.40 am : **Paper 2:** The Quaternary period in Peninsular Malaysia — uncertainties
and doubts
J.K. Raj (University of Malaya)
- 10.40–11.50 am : Discussion
- 10.50–11.00 am : *Tea Break*
- 11.00–11.25 am : **Paper 3:** A five-fold stratigraphic and tectonic subdivision of the
Malay Peninsula and the implications on its tectonic evolutionary
history
Mustaffa K.S. & Abdul Hadi A.R. (University of Malaya)
- 11.25–11.35 am : Discussion
- 11.35–12.00 noon : **Paper 4:** Malaysian Permian brachiopod palaeobiogeography and
problems related with the tectonic setting of Peninsular Malaysia and
the adjacent SEA region
Shafeea Leman (Universiti Kebangsaan Malaysia)
- 12.00–12.10 pm : Discussion
- 12.10–12.35 pm : **Paper 5:** Interregional unconformities in Peninsular Malaysia —
their characteristics, origin and significance
Abdul Hadi A.R., Mustaffa K.S. & Tajul Anuar J. (University of Malaya)
- 12.35–12.45 pm : Discussion
- 12.45–12.50 pm : Closing Remarks
- 12.50 pm : *Lunch*

DYNAMIC STRATIGRAPHY & TECTONICS OF PENINSULAR MALAYSIA

Problems & issues relating to the Stratigraphy and Tectonics of Peninsular Malaysia



DYNAMIC STRATIGRAPHY & TECTONICS OF PENINSULAR MALAYSIA

**Problems & issues relating to the Stratigraphy
and Tectonics of Peninsular Malaysia**

Saturday, 10 April 1999

**Geology Department
University of Malaya
Kuala Lumpur**

ABSTRACTS OF PAPERS

Slide-rule tectonics, Sundaland

H.D. TJIA

PETRONAS Research & Scientific Services Sdn. Bhd.
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43000 Kajang

Continental SE Asia, that is, Sundaland and Indochina, achieved relative tectonic stability by the beginning of the Cenozoic. Since then tectonic activity has been restricted to existing regional fault zones and to slow vertical crustal movements that produced small and large sedimentary basins. Since the Middle Eocene, Sundaland and Indochina have been extruded differentially SE-ward along the Red River, Wang Chao-Mae Ping-Tonle Sap and Three Pagodas-Axial Malay fault zones. During the Palaeocene the stress regime of Sundaland was transtensional while the regional faults slipped in sinistral sense. The large continental segments contain smaller crustal slabs that are also bounded by NW faults, and less frequently by N-S faults. At times these smaller crustal slabs also participated in differential extrusion. The sliding of smaller and larger crustal slabs past each other resembles slide-rule operations.

From the end of the Early Miocene, the stress regime in Sundaland has become transpressional. This situation was achieved because N-S spreading of the Philippine and Caroline subplates stopped and thus ceased to act as barriers for the westward convergence of the Pacific plate, while the larger Indonesian region — including Sundaland — had also become severely constricted by the sustained convergence of the Indian Ocean-Australian plate. Slip reversals took place on some of the regional and other major faults contemporaneously with structural inversion in the Malay basin. Slide-rule tectonics was again evident.

The Quaternary period in Peninsular Malaysia — uncertainties and doubts

J.K. RAJ

Geology Department
University of Malaya
50603 Kuala Lumpur

A large amount of more recently published data that has led to changes in ideas and concepts on the Quaternary that were relevant in earlier years. It is in comparing this data with the published and (available) unpublished data on the Quaternary of Peninsular Malaysia, that many uncertainties and doubts have arisen.

It can be said that there is still scope for more detailed work on the Quaternary of the Peninsula. Several aspects of the Quaternary need to be defined and clarified, in particular, the influence and impact of climatic changes, as well as sea-level changes, not only on erosional processes and landform development, but also on depositional processes. The role of tectonic events also needs to be examined with reference to geological processes and landform development. Finally correlation of the Quaternary stratigraphic units of the Peninsula with other established stratigraphic units also needs to be carried out in order to provide a better understanding of the development of our present-day physical environment.

Malaysian Permian brachiopod paleobiogeography and some problems related with the tectonic setting of Peninsular Malaysia and adjacent Southeast Asian region

MOHD SHAFEEA LEMAN

Jabatan Geologi
Universiti Kebangsaan Malaysia
43600 Bangi, Selangor D.E.

Brachiopod is one of the most abundant and diverse marine invertebrate during the Permian time and many Permian brachiopod genera are known to be quite endemic to certain climatic and geographic conditions. Malaysian Permian brachiopod comprises several assemblages from the cold Gondwanan assemblages to warm tropical Tethyan assemblages. These assemblages can be correlated throughout east Asian region. Local distribution of different assemblages are compared with those reported from the neighbouring Southeast Asian region. This comparison shows that there are very strong provincialism among Malaysian Permian brachiopod in the Early and Middle Permian time. The fauna of the western belt or Sibumasu block has a very strong affinity towards the Gondwanan cold water fauna while the fauna of central belt or East Malaya block exhibits a very close association with the Tethyan warm water fauna. The Sibumasu fauna received the influx of warm water brachiopod genera gradually, beginning from late Early Permian time. Faunal differences within supposedly single belt is the main problem which requires further interdisciplinary research.

A five-fold stratigraphic and tectonic subdivision of the Malay Peninsula and the implications on its tectonic evolutionary history

MUSTAFA K.S. AND ABDUL HADI A.R.

Department of Geology
University of Malaya
50603 Kuala Lumpur

The generally accepted and widely used threefold division of the Malay Peninsula is a geographic and spatial one. Despite its usefulness in giving a general picture of the geology of the Malay Peninsula, it does not reveal the real geology, which involves stratigraphic development, tectonic history and magmatism through time.

A new five-fold stratigraphic and tectonic subdivision of the peninsula through geologic time, which involved the recognition of five major unconformities, is proposed. The identified unconformities are the Middle Devonian Unconformity, the Variscan (Middle Permian) Unconformity, the Indosinian (Upper Triassic) Unconformity, the Middle Cretaceous Unconformity and the Pliocene-Pleistocene Unconformity and erosional surface.

These unconformities and their time-equivalent conformities are the bounding discontinuities to mega-sequences of sedimentary rocks, igneous rocks and other minor unconformities. The mega-sequences are informally named as:

1. The Setul Mega-sequence of Cambrian to Lower Devonian age;
2. The Singa Mega-sequence of Late Devonian to Early Permian age;
3. The Semanggol-Semantan Mega-sequence of Permian to Late Triassic age;
4. The Tembeling Mega-sequence of Jurassic to Mid-Cretaceous age and
5. The Tertiary Batu Arang Mega-sequence.

The basin architecture for each mega-sequence is as follows:

1. The Setul mega-sequence
— the presence of shallow deltaic sediments in the west grading into platform sediments and eventually deep basinal sediments to the east suggest a continental margin setting.
2. The Singa mega-sequence
— the presence of shallow marine near-shore sediments to the west and eastern sides of the basin together with the presence of deep water sediments along the central part of the basin suggest deposition within a rift basin setting.
3. The Semanggol-Semantan mega-sequence
— a five province facies distribution is recognised that represents sedimentation along strike-up controlled basins.
4. The Tembeling mega-sequence
— they are composed of continental alluvial fan and red beds sequence deposited in many small intermontane basins probably associated with dextral strike-slip fault movements.
5. The Batu Arang mega-sequence
— they are continental sediments deposited in isolated strike-slip pull-apart basins.

The structural inversion of the Setul megasequence is attributed to an Early to Mid-Devonian deformation and metamorphic event. This event was subsequently followed by an

extensional event that caused rifting and the deposition of the Singa megasequence strata. The corresponding patterns of sedimentation of the Singa megasequence in all the three belts imply that the whole peninsular has acted as a single block by Mid-Palaeozoic. The structural inversion of the rift basin is attributed to the dextral transpressive deformation and the low grade metamorphic Mid-Permian (Variscan) event that eventually give rise to a five-fold facies distribution of the Permo-Triassic Semanggol-Semantan megasequence. The structural inversion of the Permo-Triassic basins is attributed to the continued dextral transpressive movements that is accompanied by granite emplacements, which eventually caused uplift and the deposition of continental Jurassic-Cretaceous Tembeling megasequence sediments within small strike-slip fault-controlled basins. The structural inversion of the Tembeling intermontane basins is attributed to Mid-Late Cretaceous event that caused sinistral movements. Pull-aparts along *en-echelon* strands of the developing NW trending sinistral strike-slip faults gave rise to the small isolated occurrences of the Batu Arang megasequence.

Interregional unconformities in Peninsular Malaysia — their characteristics, origin and significance

ABDUL HADI A.R., MUSTAFFA K.S. & TAJUL ANUAR J.

Department of Geology
University of Malaya
50603 Kuala Lumpur

The sedimentary record of Peninsular Malaysia from Mid-Cambrian to Quaternary is characterised by five major regional unconformities.

The five major unconformities of Peninsular Malaysia are:

1. The Middle Devonian Unconformity (Pre-Singa)
2. The Lower Permian Unconformity (Pre-Semanggol)
3. The Upper Triassic Unconformity (Pre-Tembeling)
4. The Upper Cretaceous Unconformity (Pre-Batu Arang)
5. The Pliocene-Pleistocene Unconformity (Pre-Quaternary) and Erosional surface

The Middle Devonian Unconformity separates the three-phase folded Setul Mega-sequence rocks from two-phase folded Singa Mega-sequence.

The Lower Permian Unconformity separates the more deformed Singa Mega-sequence from the younger, one-phase folded Semanggol-Semantan Mega-sequence beds.

The Upper Triassic Unconformity separates the Semanggol-Semantan Mega-sequence from the gently folded/tilted Jura-Cretaceous Tembeling Mega-sequence.

The Upper Cretaceous Unconformity is an imaginary surface which separates the Tembeling Mega-sequence from the Tertiary Batu Arang Mega-sequence.

The Pliocene-Pleistocene Unconformity (Pre-Quaternary) and Erosional surface part underlies the Quaternary deposits, and also forms the present erosional surface of Peninsular Malaysia.

Further research needs to be carried out to estimate the time gaps and the thickness of eroded sediments represented by the different unconformities.

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. Yew Hwa Hin
B9-13A-9, Venice Hill Condominium & Golf Resort, Persiaran Puteri Satu, Taman Puteri, Batu 9, 43200 Cheras, Selangor.</p> <p>2. David G.R. Goold
W.L. Gore & Associates, Inc., 100 Chesapeake Boulevard, P.O. Box 10, Elkton, Maryland, MD 21922-0010, USA.</p> | <p>3. Liza Jimmy
MEX Environmental Sdn. Bhd., Lot 1958, First Floor, Cinmuk Commercial Centre, Kota Sentosa, 93250 Kuching.</p> <p>4. Tan Kim Yoke
Level 7 & 8, Menara Sungei Way, Jalan Lagoon Timur, Bandar Sunway, 46150 Petaling Jaya.</p> |
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GSM

CURRENT ADDRESSES WANTED

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

- | | |
|--|---|
| <p>1. Mr. Huw Evans
Premier Oil Pacific Ltd., 1 Scotts Road, #21-01/03 Shaw Centre, Singapore 228208.</p> <p>2. Mr. Hairul Azhar Ahmad Anval
11 Jalan Bukit Setiawangsa, 54200 Ulu Kelang, Selangor D.E.</p> | <p>3. Dr. Mirza Arshad Beg
Sarawak Shell Bhd., PEG/37, 98100 Lutong, Sarawak</p> <p>4. Mirza Arshad Beg
Sarawak Shell Bhd., PEG/37, 98100 Lutong, Sarawak</p> |
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GSM

PERTAMBAHAN BAHARU PERPUSTAKAAN (New Library Additions)

The Society has received the following publications:

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Monthly statistics on Mining Industry in Malaysia, december 1998. 2. Tin International, vol. 72, no. 1, 2 & 3, 1999. 3. Berliner Geowissenschaftlichen Abhandlungen, Band 195 (1997), 196 & 197 (1998). 4. Monthly statistics on mining industry in Malaysia, Nov. 1998. 5. AAPG Explorer, March & April, 1999. 6. National Science Museum, Bulletin vol. 24, nos. 3 & 4, 1998. | <ol style="list-style-type: none"> 7. Bulletin Centre Rech Elf Exploration & Production, vol. 21, no. 2, 1997. 8. AAPG Bulletin vol. 83/3, 1999. 9. Journal of Shijiazhuang University of Economics, vol. 21, nos. 4 & 5, 1998. 10. Acta Geoscientia Sinica, vol. 19, no. 4 & vol. 19 supplementary, 1998. 11. American Museum Novitates, no. 3260, 1999. 12. US Geological Survey, Professional Paper: 1998: Nos. 1416-A, 1605, 1416-I. 13. US Geological Survey, Professional Paper: 1997: Nos. 1550-D. |
|---|--|

GSM

CURRENT ADDRESSES WANTED

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

- | | |
|--|--|
| <ol style="list-style-type: none"> 3. Dr. Mirza Asad Beg
Sarawak Shell Bhd., P.O. Box 48100
Intan Sarawak 4. Mirza Asad Beg
Sarawak Shell Bhd., P.O. Box 48100
Intan Sarawak | <ol style="list-style-type: none"> 1. Mr. Hui Fuan
Romer Oil Pacific Ltd., 1 Scotts Road,
#21-01/02 Shaw Centre, Singapore 228208 2. Mr. Hui Hui Aun (Aun Aun)
11 Jalan Besar, Singapore, 229000 (11)
Kelang, Kelantan, D.K. |
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BERITA-BERITA LAIN

Other News

Local News

East Coast Highway work starts after study on firm

The construction of the East Coast Highway project is to begin within three months after the Works Ministry has received and studied the financial reports of the company involved in the project.

Works Minister Datuk Seri S. Samy Vellu said the permit to commence work on the RM4 billion project would only be issued after the concession company, Projek Lebuhraya Timur Sdn. Bhd. (Pelita), had submitted a report on its financial capability to the ministry.

Pelita, the concessionaire for a 33-year period, is a wholly-owned subsidiary of the Malaysia Mining Corporation.

"Such a move is being made by the Ministry because we do not want the project to suffer the same fate as some projects which have had to be abandoned due to financial difficulties."

"There may be a small delay in starting the project as the concession company has to secure loans from banks before the construction can start simultaneously in Terengganu and Pahang."

"The cost to start the project for the initial stage in both States is about RM700 million," he said.

Samy Vellu said this after the launching of the RM32 million Tengku Ampuan Bariah Bridge by the Sultan of Terengganu at Kuala Ibai today.

On the toll rates for the highway, Samy Vellu said, the matter would only be announced once the East Coast Highway project was

completed.

"Road users will only have to pay toll if they want to use the new highway and if they prefer safety, comfort and shorter travelling time. Otherwise, they can opt to use the old route to the East Coast States," he said.

The *New Straits Times* reported that the 338 km East Coast Highway project was expected to be completed in mid-2005.

Motorists using the highway would only take two hours to travel from Kuala Lumpur to Kuantan and 3½ hours to Chendering, Terengganu.

The two-lane highway will have 16 grade separated interchanges for uninterrupted traffic flow and will use a closed toll system. There will be 16 toll plazas — two mainline and 14 ramp toll plazas.

The highway, with 10 rest and service areas and 22 lay-bys, will act as a land bridge for industrial areas on the west coast especially the Klang Valley and the East Coast Corridor.

Samy Vellu also reiterated that all road construction projects which had been signed would proceed and those that were not would have to be shelved in view of the present economic climate.

In addition, he announced that an allocation of RM26 million had been approved yesterday to improve the Kuala Berang road involving an 11-km stretch. The project would start within two months.

NST, 3.3.1999

Pahang ready to supply water to other States

Pahang is ready to supply water to neighbouring States including Malacca, once its RM30 million dam in Rompin is ready.

Pahang Deputy Menteri Besar Datuk Hassan Arifin said the dam was built to facilitate the future supply of water to neighbouring States like Negeri Sembilan, Malacca and Johor.

Construction work on the dam has started and it is expected to be completed within two years.

Hasan said negotiations on water supply to Malacca was still being discussed by both State Governments.

Commenting on statements by Chief Minister Datuk Seri Abu Zahar Isnin that Pahang was expected to face a water shortage by the year 2002, Abu Zahar had said the construction of the RM150 million Jus dam in Selandar was one of the long-term measures to ensure adequate supply.

Water demand in 1997 in Malacca stood at

275 million litres per day and this increased to 294 million litres last year.

By 2000, 314 million litres would be required for consumption, followed by 360 million litres in 2001, 406 million litres (2002), 451 million litres (2003), 497 million litres (2004), 543 million litres (2005), 592 million litres (2006) and 641 million litres by 2007.

Abu Zahar also had said negotiations were being carried out to get future supply from Negeri Sembilan, Johor and Pahang.

In a related development, Malacca Water Corporation general manager Abdul Rahim Shamsuddin said that the corporation would let the State Government decide on the construction of the Jus dam.

Clarifying his earlier statements reported in the NST on March 2, Abdul Rahim said that the corporation "will leave it to the State Government to decide".

NST, 6.3.1999

MB: State will go ahead with Sungai Selangor project

Menteri Besar Datuk Seri Abu Hassan Omar today said the State Government has no choice but to go ahead with the Sungai Selangor Third Phase Programme (SSF3) if it wanted to avert another water crisis.

He said the decision to go ahead with the RM1.96 billion project, which would entail building a regulating dam at Sungai Selangor near Batang Kali, was not taken lightly.

"We have studied all other alternatives to secure adequate water supply to keep up with the ever increasing demand, especially from the Klang Valley, and found that our best option is to go ahead with SSF3 as it can be completed within four years."

"We cannot depend on the proposed inter-State water transfer from Pahang as the 37.5 km tunnel needed for the purpose would take a long time to be completed and would cost about three times more than the cost of the SSF3 besides the royalty to be paid to the Pahang Government."

"The long construction period for the tunnel is unacceptable because, according to our projection, Selangor and the Federal Territory will again face an acute water shortage by the

year 2003 unless a new water source is found by then," he said at a special briefing for the media about the project today.

Abu Hassan said the commissioning of the SSF3 did not mean the inter-State water transfer would be scrapped as it was still needed to meet the increasing demand after the year 2006.

Based on a very conservative increase of six per cent per year, the State Government had projected that the demand for clean water would increase from 2,973 million litre per day to 3.151 MLD by the year 2003 while the State's maximum production capacity, including the second phase of Sungai Selangor project which was expected to be fully completed by the end of the year will remain at 3,028 MLD.

Abu Hassan said there were several factors which prompted the State Government to go ahead with the project, including the fact that the area which would be inundated by the project would only be about 600 ha of mainly secondary jungle and two Orang Asli settlements with a total population of 339.

He said Sungai Selangor was by far the best option because if similar project were to be

carried at other sites suitable for such project, the area of inundation would be much bigger and it would involve several growth areas.

Prior to choosing Sungai Selangor, feasibility studies were carried out at Sungai Rening, Beletak, Rawang and Batang Kali but all were rejected as their impact on human settlement, existing infrastructure and the environment would be too big compared with the amount of water source provided by them.

"In this case, the State Government is only carrying out its responsibility to ensure adequate water supply for the more than five million consumers in Selangor and Kuala Lumpur even if it means dislocating 339 Orang Asli."

"We have already weighed the advantages and disadvantages of this project before deciding to go ahead with it," he said, adding that the project proponent, a consortium called TSWA-Gamuda-KDEB, has already given its undertaking to follow to the letter all mitigating measures suggested by the Department of Environment to minimise its impact on the environment.

Abu Hassan said the Orang Asli from Kampung Gerachi and Kampung Pertak would be relocated to nearby areas and provided with houses, land for agriculture and infrastructure.

NST, 11.3.1999

Tenaga to complete Bakun tunnel

Tenaga Nasional Bhd.'s first task in taking over the proposed Bakun hydro-electric dam project is to complete the diversion tunnel, Sarawak Deputy Chief Minister Datuk Amar Dr. George Chan Hong Nam said yesterday.

He said Tenaga's task now was to complete the tunnel for which both the State and Federal Government had already spent about RM1 billion.

"They want to complete that (tunnel) first and have already taken a look at it," he said after presenting his paper *Sarawak's Economy — Outlook, Prospects and Challenges* at the Sarawak Business Conference '99 in Kuching.

Dr. Chan, who is also Finance and Public Utilities Minister, said Tenaga was assuming the "lead" role in reviving Bakun and had spoken

to both Sarawak and Sabah on the matter.

He added that power from Bakun would most likely be sold to Sabah.

Earlier in delivering his paper, Dr. Chan said power supply from Bakun might be scaled down from the initial 2,400 MW to only 500 MW and its energy would not be transmitted to the peninsula.

"The height of the dam may eventually be only 75 m instead of 210 m, and ideas are being bandied about to use the diversion tunnel as the source of power instead of the dam."

Dr. Chan said that at present, the State did not need the power from Bakun as existing capacity in the State totalled between 700 and 750 MW while current needs was only 400 MW.

NST, 18.3.1999

Don: Nickel-producing plant found in Sabah

If gold can be extracted from plants in New Zealand through a process called phytomining, a particular plant found in Sabah can produce nickel.

The unique plant species, known as *Rinorea bengalensis* (of the violaceae family), can be found in the sub-district of Telupid in Sandakan, about 200 km west of the State capital.

Universiti Malaysia Sabah deputy dean (Research and Development) Associate Prof. Dr. Marcus Jopony said today only a small number

of such plant species can be found in the world.

"This species is a hyper-accumulator of nickel. Studies have shown it can absorb and retain nickel in its tissues, like leaves, when growing in nickel rich soil."

The news about the existence of this species in Sabah came about a following report in several local newspapers on Sunday that researchers at New Zealand's Massey University headed by Prof. Robert Brooks had found that gold can be extracted from plants.

The average gold yield of the Indian mustard plants used by the researchers produced about one per cent of about 10 grammes of gold per 1,000 grams of dried plants.

Jopony said Sabah has a relatively large area, particularly in and around Telupid, having ultrabasic soils. These soils are naturally rich in nickel and often considered to be relatively infertile.

"But with land development, logging and human settlements, the species had become a rarity," he said.

He said the general features of this jungle plant, among others, included large leaves, straight stems, small flowers and pea-like fruits.

"With the availability of nickel hyperaccumulator plant species locally, it is possible to mass produce the seedlings through tissue culture," he said.

He said these seedlings could then be systematically planted (plantation scale) in the ultrabasic areas. Later the leaves can be harvested, like harvesting tea leaves.

"The nickel present in the leaves can be extracted," he said.

Metallic white coloured nickel are mostly used to produce alloy for industrial use and also for making coins.

Jopony said there was no doubt that the plant species planted in ultrabasic soils would be able to absorb significant levels of nickel but the challenging question is whether this can be commercially viable.

Studies show that to date *Rinorea bengalensis* is the only nickel hyperaccumulator that can be found in Malaysia, and one of the three from South East Asia.

The other two are *Planchonella oxyedra* (Sapotaceae family) and *Trichospermum kjellbergii* (Tiliaceae family) found in Obi Island, Indonesia.

Jopony said owing to the uniqueness and increasing rarity of the plant, it was high time the nickel plant be categorised as one of the protected or endangered species.

NST, 30.3.1999

Enough water with building of Sungai Selangor Dam

The Sungai Selangor will provide enough water to the Klang Valley for a long time, said dam project co-ordinator Ooi Boon Keng.

Ooi, a general manager with Gamuda Bhd., part of the consortium which did a technical feasibility study on the dam recently, said if the dam was not built by 2003 there would be another round of water rationing.

He said the inter-state water transfer pipeline from Pahang to Selangor could only be built at the earliest by 2007.

"Even if we start work on the pipeline now, it will not be completed before 2007. The pipeline will provide 1,000 millilitres daily (mld) as opposed to the Sungai Selangor Dam which will provide 1,050 mld by 2003," he said.

Ooi said fears that the dam would be a white elephant were unfounded.

The five major dams in Selangor are Klang Gates, Semenyih, Sungai Langat, Sungai Batu and Sungai Tinggi.

The dams provide a total of 258 mil cubic metres of water from a total area of 1,840 ha. The Sungai Selangor Dam, which is a fraction of

the size of all these dams at 600 ha, has a capacity of 235 mil cubic metres.

Ooi said the consortium had also taken into account the siltation which was a problem with other dams.

"Based on calculations, we will only lose 5 mil cubic metres of our capacity after 100 years of siltation."

"This is not taking into account siltation control methods such as using the diversion tunnel under the dam to channel out debris and silt and dredging the dam," he said.

However, Ooi admitted that the area surrounding the dam needed to be gazetted as a water catchment site.

He said erosion could be caused by the felling of trees, the clearing of jungle and the cutting of hillsides.

"We need to protect the area so that erosion and siltation can be kept to a minimum."

"The dam will meet the needs of an additional two million residents as well as future industries," Ooi said.

Star, 2.4.1999

Science centre opens at the Petronas Twin Towers

Petronas Sdn. Bhd., a non-profit organisation owned by Petroliam Nasional Bhd. (Petronas), said its new world-class interactive Science Discovery Centre *Petrosains* is poised to be a major hit among Malaysians interested in gaining a better knowledge of the science and technology in the petroleum industry.

Petrosains project director Tengku Nasariah Tengku Syed Ibrahim said the 100,000 sq ft Petrosains, strategically located at the Petronas Twin Towers, is expected to attract some 500 visitors per day by the year 2000.

Petrosains features over 150 exhibits which define the most advanced science centres such as the *Dark Ride*, taking visitors through

Malaysia's ancient rain-forest and then into modern Malaysian cities, *Petrojaya* a cartoon village, an ancient *Geotime Diorama* filled with replicas of prehistoric life like a singing dinosaur and a volcano, a *Molecule Nano World* and a true life oil platform.

As a contemporary museum, Petrosains allows visitors especially young children to touch, feel and manipulate the items on display.

The science discovery centre, which opens daily except on Mondays, starts at 9.30 am. The entrance fee is RM12 for adults (18 years above), RM7 (13 to 17 years old), RM4 for child (5 to 12 years old) and a 50% discount applies to senior citizens.

Star, 2.4.1999

60 landslides close roads near Fraser's Hill

More than 60 landslides, three of which were described as "critical", occurred early yesterday between Kuala Kubu Baru and Fraser's Hill and Kuala Kubu Baru and Simpang Tranum on the Raub road to Pahang.

No one was injured in the landslips but the stretches were cut off to traffic.

The landslides, said to be the worst in 10 years, were believed to have been caused by continuous rain in the past week, culminating in torrents throughout Wednesday and yesterday.

"Usually only two or three areas are affected when it rains continuously. This time the number was exceptionally high," a PWD officer at one of the sites said.

Most of the affected roads which were closed from 8 am, were reopened by seven last night, except for a 32 km stretch between the Gap and Simpang Tranum.

The road is expected to be reopened this morning.

Most of the reopened roads, however, are

only passable to cars and small vehicles.

According to the PWD officer, the three landslides between the 96 km and 99 km of the Gap-Simpang Tranum stretch were regarded as critical because of the ongoing construction of a new road to Fraser's Hill.

"About 30 PWD workers and a private contractor worked throughout the day to clear the roads, using five excavators and five lorries."

"We will resume work tomorrow morning to remove the debris," the officer said, adding that the operations stopped at 7 pm because of poor light and dangerous conditions.

The JKR officer said landslides had also occurred beyond Fraser's Hill town, between Simpang Tranum and Raub, and between Simpang Tranum and Bentong, but could not state how many there were at press time.

Traffic flow to and from Fraser's Hill was disrupted the whole of yesterday, causing inconvenience to a few hundred people.

Star, 2.4.1999

Four more major landslides

Four more major landslides occurred yesterday between the 96th km and 99th km of the Kuala Kubu Baru-Raub trunk road to Pahang.

No injuries were reported during the pre-dawn incidents.

PWD officials blamed the landslides on week-long rain in the area.

They said an estimated 60 landslides were reported in the area on Thursday.

Thirty PWD workers using seven excavators and two trucks cleared the trunk road by noon, allowing vehicles to pass again.

The road between Gap-Simpang Tr anum was closed on Thursday because of 15 other

landslides.

"Although we have opened the entire stretch, it will take at least three days to completely clear the debris and repair damage portions," a PWD official said.

He said heavy rain forecast over the next few days could cause more landslides.

The new 8 km alternative road to Fraser's Hill was also completely cut off by several landslides.

The RM27 mil road which links Gap to the hill resort had earlier been declared unsafe.

This was because of the lack of safety features.

Star, 3.4.1999

Dept: Mining not cause of sinkholes

The Geological Survey Department has refuted Bukit Merah residents' claim that the appearance of sinkholes in their area is due to mining activities nearby.

Department director Yunus Abd Razak, however, said that mining activities could have hastened the formation of sinkholes due to the rapid lowering of underground water.

He said this was found during a recent study by the department.

"We found in the study that the formation of sinkholes in Bukit Merah and Lahat does not appear to have been influenced by mining activities."

"It could have contributed to the process in terms of hastening its appearance," he said in an interview yesterday.

Residents in Bukit Merah, Menglembu, where nine sinkholes had appeared last week, claimed that mining activities were the cause.

All nine sinkholes were covered with sand by the Public Works Department on Monday.

In October alone, there were six reported sinkhole appearances in Bukit Merah.

Yunus said the appearance of sinkholes in Bukit Merah and Lahat was a natural phenomenon as the area was underlain with a limestone bedrock.

"As such it is not strange there are so many sinkholes appearing in the areas," he said, adding that these were triggered by vibrations caused by heavy traffic along the Ipoh-Lumut trunk road and also fluctuations in water tables due to rain fall.

He said sinkholes in Bukit Merah and Lahat were first reported in 1972 and since then there had been a continuous occurrence until now.

"From the reported cases since 1972, sinkholes in the areas seem to have occurred within a 3 km-long and 200 m-wide belt that stretches from the west side of Bukit Merah where the new village is located to Pusing in a north-south direction."

"The highest incidence of appearances was in 1989 with 11 sinkholes in Bukit Merah and 24 in Lahat," he said.

Yunus said the department had submitted a report to the relevant authorities.

He said the report contained some scientific recommendations on how to redress the problems.

Meanwhile, Perak DAP chairman Ngeh Koo Ham urged the government to make public its reports on the soil condition in Bukit Merah so that the residents were well-informed and could take precautionary measures.

Star, 29.4.1999

KALENDAR (CALENDAR)

1999

May 3-4

ASSESSMENT AND REMEDIATION OF CONTAMINATED SITES IN ARCTIC AND COLD CLIMATES (International Conference), Edmonton, Alberta, Canada. (Contact: ARCSACC Conference — Edmonton '99, Room 303 CEB, Dept. of Civil and Environmental Engineering, University of Alberta, Edmonton, Alberta T6G 2G7, Canada. Tel: +1 403 497 3862; Fax: +1 403 497 3842; E-mail: kwbiggar@civil.ualberta.ca; ornahirm@pwgsc.gc.ca)

May 3-5

SEISMOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Seattle, Washington, USA. (Contact: S. Malone, Geophysics Program, Box 351650, University of Washington, Seattle, Washington 98195-1650, USA. Tel: +1 206 685 3811; Fax: +1 206 543 0489; E-mail: ssa99@geophys.washington.edu; Website: <http://www.geophys.washington.edu/SEIS/SS A99>; abstract deadline: February 5, 1999)

May 3-6

31ST OFFSHORE TECHNOLOGY CONFERENCE, Houston, USA. (Contact: OTC Meetings and Exhibits Unit, P.O. Box 833868, Richardson, TX 75083-3868, USA. Tel: 1 972 952-9494; Fax: 1 972 952-9435; E-mail: dweaver@spelink.spe.org)

May 6-7

GEOVISION '99: IMAGING APPLICATION IN GEOLOGY, Liège, Belgium. (Contact: Geovision '99, Université de Liège, Campus du Sart Tilman, Géologie de l'Ingénieur-Bât B19, 4000 Liège, Belgium. Tel: 32 4 366-2216; Fax: 32 4 366-2817; E-mail: fcheslet@ac.be)

May 24-26

WATER POLLUTION 99, Modelling, Measuring and Prediction (Fifth International Conference), Lemnos, Greece. Organized by: Wessex Institute of Technology, UK and Aristotle University of Thessaloniki, Greece. (Contact: Clare Duggan, Conference Secretariat Water Pollution 99, Wessex Institute of Technology, Ashurst Lodge, Ashurst,

Southampton, SO40 7AA, UK. Tel: 44 (0) 1703 293223; Fax: 44 (0) 1703 292853; E-mail: cduggan@wessex.ac.uk)

May 26-28

GEOLOGICAL ASSOCIATION OF CANADA-MINERALOGICAL ASSOCIATION OF CANADA, JOINT ANNUAL MEETING, Sudbury, Ontario. (Contact: Dr. P. Copper, Dept. of Earth Sciences, Laurentian University, Sudbury, Ontario P3E 2C6, Canada. Tel: (705) 657-1151 ext. 2267; Fax: (705) 675-4898; E-mail: gacmac99@nickel.laurentian.ca)

May 31 - June 2

SECOND INTERNATIONAL CONFERENCE ON ECOSYSTEMS AND SUSTAINABLE DEVELOPMENT, Lemnos, Greece. Organised by: Wessex Institute of Technology, UK and Universitat Jaume I, Spain. (Contact: Clare Duggan, Conference Secretariat-ECOSUD 99, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK. E-mail: cduggan@wessex.ac.uk)

May 31 - June 4

AMERICAN GEOPHYSICAL UNION (Spring Meeting), Boston, Massachusetts, 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@kosmos.agu.org; Website: <http://www.agu.org>)

June 5-9

CLIMATIC, BIOTIC, AND TECTONIC CORING TRANSECT OF TRIASSIC-JURASSIC PANGEA (International Workshop), Wolfville, Nova Scotia, Canada. (Contact: Paul Olsen, Lamont Doherty Earth Observatory, Rt. 9W, Palisades, New York 10964, USA. Tel: +1 914 365 8491; Fax: +1 914 365 2312; E-mail: polsen@ldeo.columbia.edu; Website: <http://www.ldeo.columbia.edu>)

June 6-9

VAIL ROCK 99 (Symposium), Vail, Colorado, USA, by American Rock Mechanics Association. (Contact: Expomasters. Tel: +1 303 771 2000; Fax: +1 303 843 6212; E-mail: mcramer@expomasters.com)

June 15-17

ERES 99 (Second International Symposium on Earthquake Resistant Engineering Structures), Catania, Italy. Organized by: University of Catania, Italy and Wessex Institute of Technology, UK. (Contact: Liz Kerr, Symposium Secretariat, ERES 99, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton SO40 7AA UK. Tel: +44 (0) 1703 293223; Fax: +44 (0) 1703 292853; E-mail: Liz@wessex.ac.uk)

June 17-19

SEMINAR ON COASTAL ZONE OF THE ALENTEJO, Porto, Portugal. (Contact: ASSOCIAÇÃO EUROCOAST-PORTUGAL, a/c Instituto de Hidráulica e Recursos Hídricos, Faculdade de Engenharia fo Porto, Rua dos Braga, 4099 Porto Codex-Portugal. Tel: 351-2-2050870; Fax: 351-2-2059280)

June 20-24

COASTAL SEDIMENTS 1999 (4th International Symposium on Coastal Engineering and Science of Coastal Sediment Processes), Hauppauge, New York, USA. (Contact: N. Kraus, Co-Chair, U.S. Army Engineer Waterways Experiment Station, Coastal & Hydraulics Laboratory, 3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199, USA. Tel: +1-601 634 2016; E-mail: preinfo@coastalsediments.org; Website: <http://www.coastalsediments.org>; abstract deadline: May 11, 1998)

June 21-22

THE GEOLOGY OF TODAY FOR TOMORROW (A satellite conference of the World Conference of Science), Budapest, Hungary. (Contact: János Halmai, Chairman of the Organizing Committee, Hungarian Geological Society, H-1371 Budapest, Pf. 433. Tel: 36 1 2517770; Fax: 36 1 3561215; E-mail: mail.mft@mtesz.hu; Website: <http://www.mafi.hu/mft/alap.html>)

June 21-24

FOURTH INTERNATIONAL AIRBORNE REMOTE SENSING CONFERENCE AND EXHIBITION, The Westin Hotel, Ottawa, Ontario, Canada. Organized by ERIM with sponsors that include NASA, Environment Canada, and U.S. DOE Nevada Operations

Office and Remote Sensing Laboratory. (Contact: ERIM Airborne Conferences, Box 134008, Ann Arbor, MI 48113-4008 USA. Tel: +1 734 994 1200, ext. 3234; Fax: +1 734 994 8123; E-mail: wallman@erim.int.com; Website: <http://www.erim-int.com/CONF/conf.html>)

June 21-24

INTERNATIONAL GEOMOLOGICAL SYMPOSIUM. San Diego, California, USA. (Contact: Dona Dirlam, Gemological Institute of America, 5345 Armada Dr., Carlsbad, California 92008, USA. Tel: +1 760 603 4154; Fax: +1 760 603 4256; E-mail: ddirlam@gia.edu; abstract (poster) deadline: October 1, 1998)

June 21-25

SECOND INTERNATIONAL CONFERENCE ON EARTHQUAKE GEOTECHNICAL ENGINEERING, Lisbon, Portugal. (Contact: Pedro S. Sêco e Pinto, chairman for SICEGE, Laboratório Nacional de Engenharia Civil, Av. do Brasil, 101, 1799 Lisboa cedex, Portugal. Fax: (351) 847 81 87; E-mail: SICEGE@lnec.pt)

June 21-27

TERRANE ACCRETION ALONG THE WESTERN CORDILLERAN MARGIN: CONSTRAINTS ON TIMING AND DISPLACEMENT (Geological Society of America Penrose Conference), Seattle and Winthrop, Washington, USA. (Contact: J.B. Mahoney, Department of Geology, University of Wisconsin-Eau Claire, Eau Claire, Wisconsin 54702-4004, USA. E-mail: mahonej@uwec.edu)

June 26 - July 1

CLAY MINERALS SOCIETY (36th Annual Meeting), Purdue University, West Lafayette, Indiana, USA. (Contact: Patricia Jo Eberl, Clay Minerals Society, P.O. Box 4416, Boulder, Colorado 80306, USA. Tel: +1 303 444 6405; Fax: +1 303 444 2260; E-mail: peberl@clays.org)

June 29 - July 2

THE 11TH INTERNATIONAL CONFERENCE OF THE GEOLOGICAL SOCIETY OF AFRICA: Earth resources for Africa, University of Cape Town, South Africa. The closing date for abstracts is the 1st of March 1999. (Contact: Congress Secretariat. Tel/Fax: +27 (21) 61 9547; E-mail: geoconf@gsal.l.co.za; Website: www.gsal.l.co.za)

July 11-14

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (International Regional Conference), Istanbul, Turkey. (Contact: AAPG Conventions Dept., P.O. Box 979, Tulsa, OK 74101-0979, USA. Tel: 1 918 560 2679; Fax: 1 918 560 2684)

July 12-14

ICHNOFABRICS IN PETROLEUM GEOLOGY (International Meeting), Aberdeen, Scotland. (Contact: Stuart G. Buck, Mark J.F. Lawrence, Z&S Geology Ltd., Campus 2, Aberdeen Science and Technology Park, Balgowan Drive, Bridge of Don, Aberdeen, AB22 8GU, UK. Tel: +44 122 48 22 555; Fax: +44 122 48 23 777; E-mail: stuart.buck@zands.com or mark.lawrence@zands.com or Nigel H. Trewin, Department of Geology & Petroleum Geology, Meston Building, King's College, University of Aberdeen, Aberdeen, AB24 3UE, UK. Tel: +44 122 42 73 448; Fax: +44 122 42 72 785; E-mail: n.trewin@geol.abdn.co.uk)

July 12-15

THE BATHURST MEETING, Cambridge, UK. (Contact: Dr. J.A.D. Dickson, Dept. of Earth Sciences, University of Cambridge, Downing St, Cambridge, CB2 3EQ, UK. Tel: +44 1223 333400; Fax: +44 1223 333450; E-mail: jaddl@esc.cam.ac.uk)

July 12-16

NATIONAL SPELEOLOGICAL SOCIETY (Convention), Filer, Idaho, USA. (Contact: David W. Kesner, P.O. Box 1334, Boise, Idaho, USA 83701. Tel: +1 208 939 0979; E-mail: drdave@micron.net)

July 15-20

ICHNOFABRICS (5th International Workshop and Field Seminar), Manchester, U.K. (Contact: John Pollard, Department of Earth Sciences, University of Manchester, Manchester, M13 9PL, UK. Tel: +44 161 27 53 817; Fax: +44 161 27 53 947; E-mail: john.pollard@man.ac.uk)

July 19-30

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS, Birmingham, UK. (Contact: IUGG99, School of Earth Sciences, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK. Fax: 44 121 414 4942; E-mail: IUGG99@bham.ac.uk)

July 19-30

INTERNATIONAL ASSOCIATION OF HYDROLOGICAL SCIENCES (International Meeting), Birmingham, UK. (Contact: IUGG99, School of Earth Sciences, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK. Fax: 44 121 414 4942; E-mail: IUGG99@bham.ac.uk)

July 22-25

EUROPEAN PALEONTOLOGICAL ASSOCIATION WORKSHOP, Lisboa, Portugal. (Contact: CEPUNL, Quinta da Torre, P-2825 Monte de Caparica, Portugal. Tel: 351 1 2948573; Fax: 351 1 2948556; E-mail: cepunl@mail.fct.unl.pt; Website: <http://www.si.fct.unl.pt/~w3cepunl>)

August 3-12

INTERNATIONAL UNION FOR QUATERNARY RESEARCH (INQUA) (15th Congress), "The Environmental Background to Hominid Evolution in Africa", Durban, South Africa. (Contact: Dr. D. Margaret Avery, INQUA XV CONGRESS, P.O. Box 61, South Africa Museum, Capetown 8000, South Africa. Tel: +27 21 243 330; Fax: +27 21 246 716; E-mail: mavery@samuseum.ac.za; WWW: <http://inqua.geoscience.org.za>)

August 4-12

AFRICA, CRADLE OF HUMANKIND DURING THE QUATERNARY (XV INQUA Congress), Durban, South Africa. (Contact: Prof. T.C. Partridge, Climatology Research Center, University of Witwatersrand, 13 Cluny Rd., Forest Town, Johannesburg 2193, South Africa. Tel: +27 11 646 3324; Fax: +27 11 486 1689; E-mail: 141tcp@cosmos.wits.ac.za)

August 6-11

INTERNATIONAL ASSOCIATION OF MATHEMATICAL GEOLOGISTS (Annual International Conference) and IUGS Commission on Fossil Fuels, Trondheim, Norway. (Contact: IAMG 199, c/o Stephen Lippard, Department of Geology and Mineral Resources Engineering, 7034 Trondheim, Norway. Tel: +47-73 594828; Fax: 47-73 594814; E-mail: iamg99@geo.ntnu.no)

August 9-12

SOIL DYNAMICS AND EARTHQUAKE ENGINEERING (SDEE '99) (9th International Conference), Bergen, Norway. (Contact: K. Atakan, SDEE '99 LOC, Institute of Solid Earth Physics, University of Bergen, Allegaten 41, 5007 Bergen, Norway. Tel: +47-55 583420; Fax: +47-55 589669; E-mail: sdee99@ifjf.uib.no; Website: <http://www.ifjf.uib.no/seismo/sdee99.html>; abstract deadline: January 31, 1999)

August 14-25

CARBONIFEROUS-PERMIAN (XIV International Congress), Calgary, Alberta, Canada. (Contact: Dr. Charles Henderson, Associate Professor, Department of Geology and Geophysics, The University of Calgary, N.W. Calgary, Alberta, Canada T2N 1N4. Tel: 403 220 6170; Fax: 403 285 0074; E-mail: henderson@geo.ucalgary.ca)

August 22-25

SOCIETY FOR GEOLOGY APPLIED TO MINERAL DEPOSITS (SGA) (5th Biennial Meeting) and International Association on the Genesis of Mineral Deposits (IAGOD, 10th Quadrennial Meeting) (Joint Meeting), "Mineral Deposits: Processes to Processing," London, UK. Imperial College Natural History Museum. (Contact: Dr. Chris Stanley, Department of Mineralogy, Natural History Museum, Cromwell Road, London, SW7 5BD, UK. Tel: +44 171 938 9361; Fax: +44 171 938 9268; E-mail: cjs@nhm.ac.uk)

August 22-27

GOLDSCHMIDT CONFERENCE (9th Annual, International), Cambridge, Massachusetts, USA. (Contact: Stein B. Jacobsen, Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA 02138, USA. Tel: +1-617 495 5233; Fax: +1-617 496 4387; E-mail: goldschmidt@eps.harvard.edu; Website: <http://cass.jsc.nasa.gov/meetings/gold99/>)

August 24-26

SEDIMENTOLOGY (19th Regional European Meeting), Copenhagen, Denmark. (Contact: Conventum Congress Service, Carit Etlarsvej 3, DK-1814, Frederiksberg C, Denmark. Tel: +45 31 31 08 47; Fax: +45 31 31 63 99; or Lars B

Clemmensen, Geological Institute, Oster Voldgade 10, DK-1350, Copenhagen K, Denmark. Tel: +45 35 32 24 49; E-mail: larsc@geo.geol.ku.dk)

September

THE CONTINENTAL PERMIAN OF THE SOUTHERN ALPS AND SARDINIA (ITALY): Regional reports and general correlations (International Field Conference), Brescia, Italy. (Contact: Prof. G. Cassinis, Dipartimento di Scienze della Terra, Università di Pavia, Via Ferrata, 1, I-27100 Pavia, Italy. Tel: 39 382 505834; Fax: 39 382 505890; E-mail: cassinis@ipv36.unipv.it)

September

INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS (29th Congress), Bratislava, Slovakia. (Contact: Prof. L. Melioris, Comenius University, Mylinska Dolina, 84215 Bratislava, Slovakia. Tel/Fax: +42 7 725 446; E-mail: podzvody@fns.uniba.sk)

September

INTERNATIONAL SOCIETY OF ROCK MECHANICS (9th International Congress), Paris, France. (Contact: Dr. S. Gentier, Secrétaire Général du CFMR, BRGM/DR/GGP, Avenue Claude Guillemin, B.P. 6009, F-45060 Orléans Cedex 2, France. Tel: +33 2 38 64 38 77; Fax: +33 2 38 64 30 62)

September 6-9

BIOGEOIMAGES 99 (International Conference sponsored by SEPM, Association de Paleontologie Française, and others), Dijon, France. (Contact: BGI 99, Biogeosciences-Dijon, UMR 5561 CNRS, 6 blvd Gabriel, 21000 Dijon, France. E-mail: BGI99@u-bourgogne.fr; Website: <http://www.u-bourgogne.fr/BIOGEOSCIENCE/BGI99.htm>)

September 6-10

INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS "Hydrogeology and Land Use Management" (29th Congress), Bratislava, Slovakia. (Contact: Marian Fendek, Geological Survey of Slovak Republic, Mylinska Dolina 1, 81704 Bratislava, Slovakia. Tel: +421-7 3705355; Fax: +421-7 371940; E-mail: IAHCONG@GSSR.SK)

September 6-12

MINING AND THE ENVIRONMENT II (International Meeting), Sudbury, Ontario, Canada. (Contact: Sudbury '99, Centre in Mining and Mineral Exploration Research (CIMMER), Laurentian University, Sudbury, Ontario, P3E 2C6, Canada. Tel: +705 673 6572; Fax: +705 673 6508; E-mail: cmosher@nickel.laurentian.ca or bevans@nickel.laurentian.ca)

September 12-15

OIL & GAS IN THE 21ST CENTURY — DAWN OF THE THIRD AGE (AAPG International Conference and Exhibition), Birmingham, UK. (Contact: AAPG Convention Dept., P.O. Box 979, Tulsa, OK 74101-0979, USA. Tel: 1 918 560 2679; Fax: 1 918 560 2684; E-mail: convene@aapg.org; Website: www.aapg.org)

September 16-17

NON-VOLCANIC RIFTING OF CONTINENTAL MARGINS: A COMPARISON OF EVIDENCE FROM LAND AND SEA (International Conference of Geological Society of London), London, United Kingdom. (Contact: R.B. Whitmarsh, Challenger Division, Southampton Oceanography Centre, European Way, Southampton U.K. SO14 3ZH; Fax: +44 1703 596554; E-mail: bob.whitmarsh@soc.soton.ac.uk; Website: http://www.soest.hawaii.edu/margins/; abstract deadline: April 16, 1999)

September 19-24

ABRAHAM GOTTLLOB WERNER (1749-1817) AND HIS TIMES, Freiberg, Germany. Organized by TU Bergakademie Freiberg and the International Commission on the History of Geological Sciences (INHIGEO). (Contact: Dr. Peter Schmidt. Tel: +49 (0) 3731 39-3235; Fax: +49 (0) 3731 39-3289; E-mail: pschmidt@ub.tu-freiberg.de or Prof. Dr. Helmuth Albrecht. Tel: +49 (0) 3731 39-3406; Fax: +49 (0) 3731 39-3406; E-mail: halbrecht@vwl.tu-freiberg.de)

September 26 - October 2

VII INTERNATIONAL SYMPOSIUM ON MESOZOIC TERRESTRIAL ECOSYSTEMS, Buenos Aires, Argentina. (Contact: Georgina Del Fueyo, Avda. Angel Gallardo 470, 1405 Buenos Aires, República Argentina. Tel/Fax: 54-1 983-4151; E-mail: imposio@musbr.org.secyt.gov.ar)

September 26 - October 6

FIFTH INTERNATIONAL CONGRESS ON RUDISTS, Erlangen, Germany (with post-conference excursion to the Alps). (Contact: Prof. Dr. Richard Höfling, Institut für Paläontologie, Universität Erlangen-Nürnberg, Loewenichstrasse 28, D-91054 Erlangen, Germany. Tel: +49 9131-85 22 710; Fax: +49 9131-85 22 690; E-mail: richie@pal.pal.uni-erlangen.de)

September 27-30

PALEOCEANOLOGY OF REEFS AND CARBONATE PLATFORMS: MIOCENE TO MODERN (International Meeting), Aix-en-Provence, France. (Contact: Gilbert F. Camoin, Cerege BP 80, F-13545, Aix-en-Provence, cedex-4, France. Tel: +33 4 42 97 15 49; E-mail: camoin@cerege.fr)

October 3-6

VII INTERNATIONAL CONGRESS ON PACIFIC NEOGENE STRATIGRAPHY, Mexico City, Mexico. (Contact: Prof. A. Molina-Cruz, Inst. Cien. Mar. y Limnol., UNAM, Ap. Post 70-305, Ciudad Universitaria, Mexico D.F. 04510. Tel: 52-5-6225816; Fax: 52-5-6160748; E-mail: amolina@mar.icymyl.unam.mx)

October 13-17

FOSSIL ALGAE (7th International Symposium), Nanjing, China. (Contact: Mu Xian, Nanjing Institute of Geology and Palaeontology, Academia Sinica, 39 East Beijing Road, Nanjing 210008, China. Fax: +86-25 335 7026; E-mail: algae@pub.jlonline.com)

October 25-28

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; WWW: http://www.geosociety.org/meetings/index.htm)

October 30 - November 4

SOIL SCIENCE SOCIETY OF AMERICA (Annual Meeting), Salt Lake City, Utah, USA. (Contact: SSSA, 677 So. Segoe Rd., Madison, WI 53711, USA. Tel: 1 608 273 8090; Fax: 1 608 273 2021; E-mail: rbarnes@agronomy.org)

November 7-10

ENVIRONMENTAL HYDROLOGY AND HYDROGEOLOGY (4th USA/CIS Joint Conference), San Francisco, California, USA. (Contact: American Institute of Hydrogeology, 2499 Rice Street, Suite 135, St. Paul, Minnesota 55113-3724, USA. Tel: +1 651 484 8169; Fax: +1 651 484 8357; E-mail: AIHydro@aol.com; Website: <http://www.aihydro.org>; abstracts deadline: February 28, 1999)

December 5-8

ADVANCED RESERVOIR CHARACTERIZATION FOR THE TWENTY-FIRST CENTURY (Research Conference sponsored by Gulf Coast Section of Society of Economic Paleontologists and Mineralogists Foundation), Houston, Texas. (Contact: GCSSEPM Foundation, 165 Pinehurst Rd., West Hartland, Conn. 06091-0065, USA. Tel: 800/436-1424; Fax: 860/738-3542; E-mail: gcssepm@mail.snet.net; WWW:<http://www.gcssepm.org>)

2000**January 24-28**

OCEAN SCIENCES (Meeting sponsored by AGU), San Antonio, Texas, 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@kosmos.agu.org; Website: <http://www.agu.org>)

March 6-9

SOCIETY FOR MINING, METALLURGY, AND EXPLORATION (Annual Meeting), Salt Lake City, Utah, USA. (Contact: SME, 8307 Shaffer Parkway, P.O. Box 625002, Littleton, CO 80162-5002, USA. Tel: 1 303 973 9550; E-mail: smenet@aol.com)

March 8-9

THE NATURE AND TECTONIC SIGNIFICANCE OF FAULT ZONE WEAKENING (International Research Meeting, sponsored by UK Tectonic Studies Group), London, UK. (Contact: R.E. Holdsworth, Department of Geological Sciences, University of Durham, Durham DH1 3LE, UK. Fax: +44 0191 374 2510; E-mail: R.E.Holdsworth@durham.ac.uk; Website: <http://www.dur.ac.uk/~dglms/reh.htm>; abstract deadline: 30 September 1999)

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April 6-9

NATIONAL EARTH SCIENCE TEACHERS ASSOCIATION (Annual Meeting), Orlando, Florida, 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)

April 16-19

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (Annual Meeting), New Orleans, Louisiana, USA. (Contact: AAPG Conventions Department, P.O. Box 979, 1444 S. Boulder Ave., Tulsa, OK 74101-0979, USA. Tel: +1 918 560 2679; Fax: +1 918 560 2684; E-mail: dkeim@aapg.org)

May 7-11

SALT SYMPOSIUM, The Hague, The Netherlands. (Contact: Secretariat Organizing Committee, 8th World Salt Symposium, P.O. Box 25, 7550 GC Hengelo Ov, The Netherlands. Tel: 31 74 244 3908; Fax: 31 74 2443272; E-mail: Salt.2000@inter.NL.net)

May 15-18

GEOLOGY AND ORE DEPOSITS 2000: THE GREAT BASIN AND BEYOND (Conference), Reno-Spark, Nevada, USA. (Contact: Geological Society of Nevada, P.O. Box 12021, Reno, Nevada 89510, USA. Tel: +1-702 323 3500; Fax: +1-702 323 3599; E-mail: gsn symp@nbmg.unr.edu; Website: <http://www.seismo.unr.edu/GSN>)

May 23-25

TRACERS AND MODELLING IN CONTAMINANT HYDROLOGY (International Conference), Liege, Belgium. (Contact: TraM'2000, LGIH, University of Liege, B19 Sart-Tilman, 40000 Liege, Belgium. Tel: +32 4 366 2216; Fax: +32 4 366 2817; E-mail: adassarg@lgih.ulg.ac.be)

June 24-30

INTERNATIONAL PALYNOLOGICAL CONGRESS (10th), Nanjing, China. (Contact: Secretary of the Organizing Committee for 10th International Palynological Conference, Nanjing Institute of Geology and Palaeontology, Academis Sinica, 39 East Beijing Road, nanjing 210008, China. Website: <http://members.spree.com/sip/spore/index.htm>)

July 16–22

APPLIED MINERALOGY — ICAM 2000 (6th International Congress), Gottingen & Hannover, Germany. (Contact: ICAM 2000 Office, P.O. Bx 510153, D-30631 Hannover, GERMANY. Tel: +49-511 643 2298; Fax: +49-511 643 3685; E-mail: ICAM2000@bgr.de; Website: www.bgr.de/ICAM2000; abstract deadline: September 1, 1999)

July 18–23

INTERNATIONAL ASSOCIATION OF VOLCANOLOGY AND CHEMISTRY OF THE EARTH INTERIOR (IAVCEI) GENERAL ASSEMBLY 2000, Bandung, Indonesia. (Contact: Secretariat, Volcanological Survey of Indonesia, Jalan Diponegoro 57, Bandung 40122, Indonesia. Tel: +62-22 772606; Fax: +62-22 702761; E-mail: iavcei@vsi.dpe.go.id; Website: <http://www.vsi.dpe.go.id/iavcei.html>; abstract deadline: February 29, 2000)

July 31 – August 4

JOINT WORLD CONGRESS ON GROUNDWATER, Fortaleza, Brazil. (Contact: ABAS, Ceara Chapter, Avienda Santos Dumont, 7700 Papicu, Fortaleza, CEP 60 150-163, Brazil. Tel: +55 85 265 1288; Fax: +55 85 265 2212)

August 6–17

31ST INTERNATIONAL GEOLOGICAL CONGRESS, Geology and Sustainable Development: Challenges for the Third Millennium, Rio de Janeiro, Brazil. (Contact: 31st IGC Secretariat Bureau, Av. Pasteur, 404-ANEXO 31 IGC, Urca, Rio de Janeiro RJ, CEP 22.290-240 Brazil. Tel: +55 21 295 5847; Fax: +55 21 295 8094; E-mail: 3ligc@crystal.cprm.gov.br; Website: www.3ligc.org. To request current Circular, send e-mail to <mailto:address@3ligc.org>)

September 3–8

GOLDSCHMIDT 2000 (International Conference), Oxford, UK. (Contact: P. Beattie, Cambridge Publications, Publications House, P.O. Box 27, Cambridge UK CB1 4GL. Tel: +44-1223 333438; Fax: +44-1223 333438; E-mail: Gold2000@campublic.co.uk; Website: <http://www.campublic.co.uk/science/conference/Gold2000/>)

October

INTERNATIONAL MILLENNIUM CONGRESS ON GEOENGINEERING, Melbourne, Australia. (More information soon)

October 15–18 (Provisional)

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (International Meeting), Bali, Indonesia. (Contact: AAPG Conventions Dept., P.O. Box 979, Tulsa, OK 74101-0979, USA. Tel: 1 918 560 2679; Fax: 1 918 560 2684)

October 23–27

INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS (30th Annual Meeting), Cape Town, South Africa.

November 13–16

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Reno, Nevada, 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; WWW: <http://www.geosociety.org/meetings/index.htm>)

November 19–24

GEOTECHNICAL AND GEOLOGICAL ENGINEERING — GEOENG 2000 (International Conference), Melbourne, Australia. (Contact: GeoEng2000, ICMS Pty. Ltd., 84 Queensbridge Street, Southbank, Vic 3006, Australia. Tel: +61 3 9682 0244; Fax: +61 3 9682 0288; E-mail: geoeng2000@icms.com.au; Website: <http://civil-www.eng.monash.edu.au/discipl/mgg/geo2000.htm>)

2001**March 22–25**

NATIONAL EARTH SCIENCE TEACHERS ASSOCIATION (Annual Meeting), St. Louis, Missouri, 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)

April 8–11

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (Annual Meeting), Denver, Colorado, USA. (Contact: AAPG Conventions Department, P.O. Box 979, 1444 S. Boulder

Ave., Tulsa, OK 74101-0979, USA. Tel: +1 918 560 2679; Fax: +1 918 560 2684; E-mail: dkeim@aapg.org)

August 23–28

INTERNATIONAL CONFERENCE ON GEOMORPHOLOGY (5th), Tokyo, Japan. (Contact: Prof. K. Kashiwaya, Dept. of Earth Sciences, Kanazawa University, Kanazawa, 920-1192 Japan. E-mail: kashi@kenroku.kanazawa-u.ac.jp)

November 5–8

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Boston, Massachusetts, 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; WWW: <http://www.geosociety.org/meetings/index.htm>)

2002

March 10–13

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (Annual Meeting), Houston, Texas, USA. (Contact: AAPG Conventions Department, P.O. Box 979, 1444 S. Boulder Ave., Tulsa, OK 74101-0979, USA. Tel: +1 918 560 2679; Fax: +1 918 560 2684; E-mail: dkeim@aapg.org)

March 20–27

NATIONAL EARTH SCIENCE TEACHERS ASSOCIATION (Annual Meeting), San Diego, California, 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)

October 28–31

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; WWW: <http://www.geosociety.org/meetings/index.htm>)

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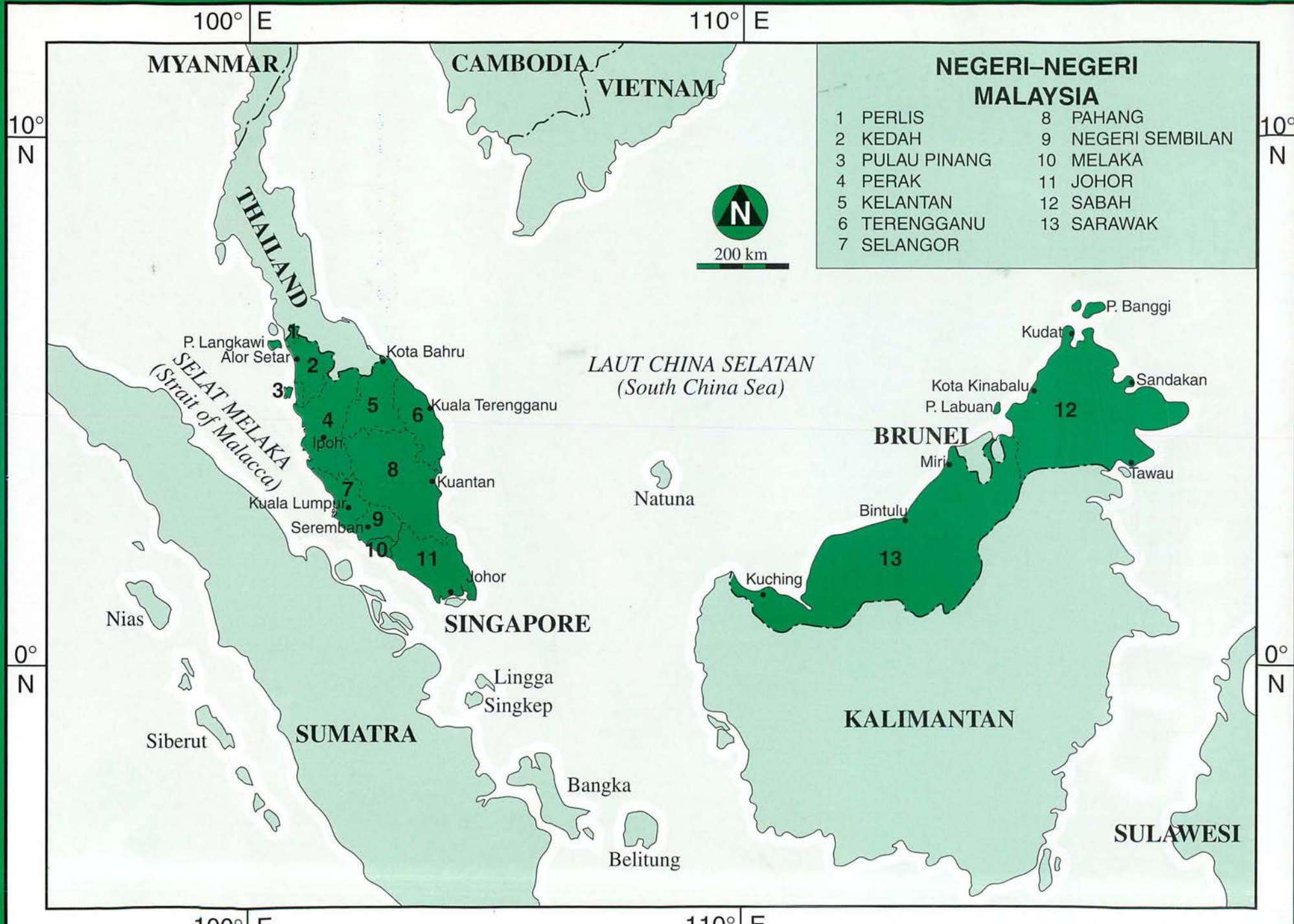
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