

PERSATUAN GEOLOGI MALAYSIA

WARTA GEOLOGI

NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA

Jil. 15, No. 4 (Vol. 15, No. 4)

Jul-Aug 1989

KANDUNGAN (Contents)

CATATAN GEOLOGI (Geological Notes)

Abdul Ghani Rafek & Ibrahim Komoo: Kegagalan cerun di Lebuh Raya Timur Barat: Survey dari Jeli ke Sri Banding 167

K. F. G. Hosking: The role of library research in mineral exploration 181

PERTEMUAN PERSATUAN (Meetings of the Society)

Peter Vail: Sequence Stratigraphy - Tectonic vs Eustacy 185

Tectonic and Structural Working Group - Bahau Fieldtrip report 188

BERITA-BERITA PERSATUAN (News of the Society)

Keahlian (Membership) 191

Pertukaran Alamat (Change of Address) 191

Pertambahan Baru Perpustakaan (New Library Additions) 192

BERITA-BERITA LAIN (Other News)

National Mineral Policy - UN role 193

National Mineral Policy - Technical Committee Meeting, Kuala Lumpur 194

New Publications of CCOP 195

GEOINFO IV - International Conference on Geoscience Information 196

AAPG Annual Meeting 1990 - Call for papers 197

Circum-Pacific Energy and Mineral Resources Conference - Call for papers 198

Kursus-kursus Latihan & Bengkel-bengkel (Training Courses & Workshops) 200

Kalendar (Calendar) 202



DIKELUARKAN DWIBULANAN
ISSUED BIMONTHLY

PERSATUAN GEOLOGI MALAYSIA
(GEOLOGICAL SOCIETY OF MALAYSIA)

Majlis (Council) 1989/90

Pegawai-pegawai (Officers)

- Presiden
(President) : Hamzah Mohamad
Jabatan Geologi, Universiti Kebangsaan
Malaysia
- Naib Presiden
(Vice-President) : Ahmad Said
PETRONAS
- Setiausaha Kehormat
(Honorary Secretary) : Ibrahim Komoo
Jabatan Geologi, Universiti Kebangsaan
Malaysia
- Penolong Setiausaha Kehormat
(Honorary Assistant Secretary) : Jimmy Khoo
Geological Survey Malaysia
- Bendahari Kehormat
(Honorary Treasurer) : Ahmad Tajuddin Ibrahim
Jabatan Geologi, Universiti Malaya
- Pengarang Kehormat
(Honorary Editor) : Teh Guan Hoe
Jabatan Geologi, Universiti Malaya
- Presiden Yang Dahulu
(Immediate Past President) : John Kuna Raj
Jabatan Geologi, Universiti Malaya
- Ahli-ahli Majlis, 1989-91
(Councillors, 1989-91) : Albert Loh
Malaysia Mining Corp.
S. Paramanathan
Jabatan Sains Tanah, Universiti Pertanian
Malaysia
Nik Ramli Nik Hassan
FORAD Group
Noor Azim Ibrahim
Petroleum Research Institute, PETRONAS
- Ahli-ahli Majlis, 1989-90
(Councillors, 1989-90) : Fateh Chand
Geological Survey Malaysia
Tan Boon Kong
Jabatan Geologi, Universiti Kebangsaan
Malaysia
Idris Mohamad
Jabatan Geologi, Universiti Malaya
Chin Lik Suan
Ahli Kajibumi (Persendirian)
- Juruodit Kehormat
(Honorary Auditor) : Peter Chew

*Published by the Geological Society of Malaysia, Department of Geology,
University of Malaya, 59100 Kuala Lumpur (Tel. 03-7577036).*

Printed by Art Printing Works Sdn. Bhd., 29 Jalan Riong, 59100 Kuala Lumpur.

KEGAGALAN CERUN DI LEBUH RAYA TIMUR BARAT: SURVEI DARI JELI KE SRI BANDING

Abdul Ghani Rafek,
Jabatan Geologi, Universiti Kebangsaan Malaysia, Bangi.

Ibrahim Komoo,
Jabatan Geologi, Universiti Kebangsaan Malaysia, Bangi.

Sinopsis

Survei kegagalan cerun di sepanjang lebuhraya timur-barat dari Jeli ke Sri Banding, menunjukkan terdapat tiga jenis kegagalan cerun potongan yang utama: kegagalan cerun tanah, cerun batuan dan kegagalan hakisan. Sejumlah cerun tambakan juga menunjukkan kegagalan bersaiz besar. Kegagalan cerun tanah terutamanya disebabkan oleh ketaksesuaian geometri cerun, kekuatan ricih bahan terluluhawa yang rendah, morfologi zon luluhawa dan kehadiran air bawah tanah. Ciri-ciri ketakselantaran iaitu orientasi, keamatan, kekasaran permukaan dan bahan pengisi mempengaruhi kestabilan cerun batuan. Kegagalan hakisan dikawal oleh sifat peroi bahan gred V profil luluhawa dan air laluan.

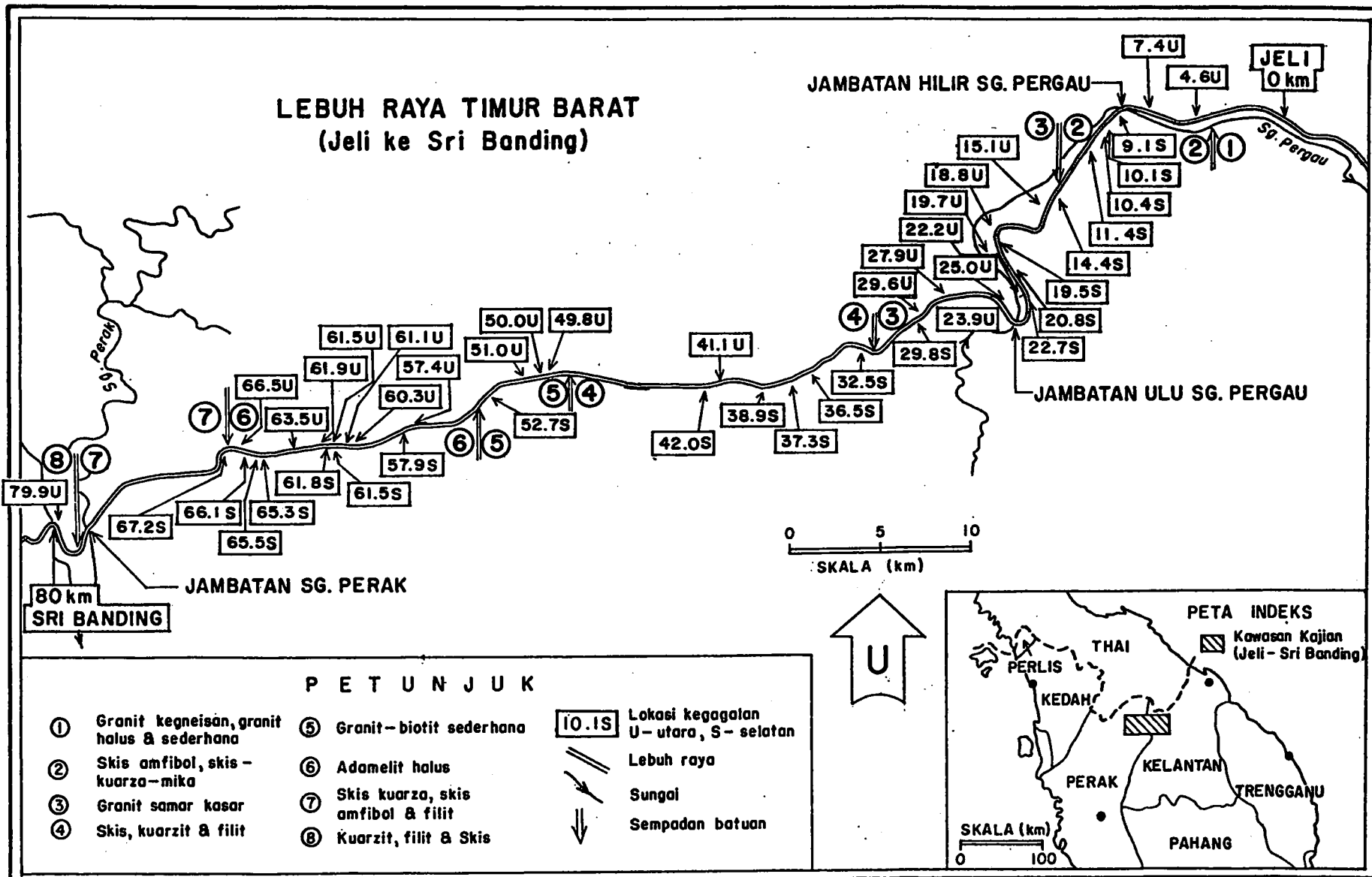
Synopsis

Survey of slope failures along the east-west highway from Jeli to Sri Banding, shows three main types of slope cut failures: soil slope failure, rock failure and erosional failure. A number of embankment slopes also show major failures. Soil slope failures are mainly due to unsuitable slope geometry, low shear strength of weathered material, morphology of weathered zone and the presence of water below ground. Discontinuous characters that include orientation, intensity, surface roughness and fill material control rock slope stability. Erosional failure is controlled by the efflorescence property of grade V weathering profile material and flowing water.

Pengenalan

Lebuhraya timur-barat dari pekan Gerik di Perak ke pekan Jeli di Kelantan merupakan sistem perhubungan tunggal di utara Semenanjung Malaysia yang menyambung pantai timur dan barat. Lebuhraya ini mempunyai panjang 117 km dan melalui topografi yang berbukit dengan perbezaan ketinggian melebihi satu ribu meter. Sejak dibuka dalam tahun 1982 masalah kestabilan cerun potongan dan tambakan telah menjejaskan penggunaan lebuhraya tersebut. Mulai tahun 1985 lebuhraya ini terpaksa dibaikpulih, dan kerja-kerja ini masih berterusan sehingga kini. Satu survei kegagalan cerun telah dilakukan bermula dari pertengahan tahun 1986 bertujuan mengenalpasti jenis kegagalan cerun yang utama sambil meninjau faktor penyebab utama. Kertas ini hanya mempersembahkan hasil survei kegagalan cerun yang telah dilakukan dari Jeli ke Sri Banding (Rajah 1).

Dibentangkan dalam Persidangan Tahunan Geologi 1987.



Rajah 1: Peta kedudukan kawasan kajian dan lokasi kegagalan cerun.

Pendekatan kajian

Pengelasan jenis kegagalan cerun dilakukan mengikut pengelasan yang dikemukakan oleh Ibrahim Komoo (1985). Mengikut sistem ini, kegagalan cerun dibahagikan pada tiga kumpulan utama iaitu kegagalan cerun tanah, kegagalan kegagalan cerun batuan dan kegagalan jenis khas (Jadual 1 dan Fotograf 1-4).

Kegagalan cerun tanah dibahagikan pada gelinciran, gelonsoran, aliran, rayapan dan kompleks manakala kegagalan cerun batuan dibahagikan kepada kegagalan lingkaran, satah, baji dan jatuhan. Kegagalan hakisan dikelaskan sebagai kegagalan khas (Jadual 1).

Dalam kajian ini semua bentuk kegagalan cerun yang melibatkan bahan gagal melebihi 10 meter padu dikaji. Memandangkan terlalu banyak kes kegagalan cerun, saiz yang lebih kecil daripada ini diabaikan. Berdasarkan kepada saiz kegagalan cerun telah dibagikan kepada tiga: kecil (isipadu 10-50 m³), sederhana (isipadu 50-500 m³) dan besar (isipadu melebihi 500 m³). Semasa survei maklumat yang dikumpul meliputi geometri cerun, keadaan geologi, ciri luluhawa dan ketakselajaran, jenis kegagalan cerun dan tafsiran faktor penyebab utama.

Hasil kajian

Kekerapan jenis kegagalan dan julat isipadu untuk semua jenis kegagalan cerun yang dikaji (50 kes) ditunjukkan pada Jadual 2. Hasil kajian menunjukkan kegagalan cerun tanah, iaitu gelinciran (T1) dan gelonsoran (T2) berlaku dengan kekerapan yang tinggi sekali (46%) dan ia melibatkan isipadu bahan gagal yang besar (65% bersaiz besar). Mengikut kekerapan pula, kegagalan cerun batuan mengambil tempat kedua dan diikuti oleh kegagalan hakisan. Kebanyakan kegagalan cerun batuan mempunyai isipadu yang kecil (44%) dan sederhana (44%). Kegagalan hakisan pula berisipadu sederhana dan besar.

Analisis kegagalan cerun tanah (Jadual 3) menunjukkan semua jenis batuan utama terlibat, atau dengan lain perkataan kegagalan jenis ini tidak dikawal oleh litologi. Kebanyakan kegagalan berisipadu besar dan perkara ini boleh membahayakan pengguna lebuhraya. Bahan yang gagal umumnya bergred luluhawa dari IV hingga VI, mengikut IAEG (1981). Satah gelinciran untuk kebanyakan kegagalan ialah sempadan antara gred luluhawa IV dan V. Untuk skis terdapat kes istimewa di mana satah gelinciran ialah sempadan antara gred luluhawa III dan IV. Darjah luluhawa merupakan faktor penyebab utama, sementara ketebalan profil mempengaruhi isipadu bahan gagal. Faktor lain yang menyebabkan kegagalan ialah sudut cerun yang curam dan kehadiran air bawah tanah.

Kegagalan tambakan juga berbentuk gelinciran (T1) dan gelonsoran (T2). Kemungkinan kaedah tambakan yang kurang sempurna menjadi penyebab utama. Pada beberapa kes kehadiran air bawah tanah jelas berperanan menyebabkan kegagalan. Isipadu yang terlibat lazimnya sangat besar dan sering memusnahkan struktur lebuhraya.

Jadual 1: Pengelasan kegagalan cerun (disesuaikan daripada Ibrahim Komoo (1985)).

KEGAGALAN CERUN TANAH (T)

GELINCIRAN (T1)

Gelinciran Cetek (T1-a)
Gelinciran Dalam (T1-b)

GELONSORAN (T2)

Gelonsoran tunggal (T2-a)
Gelonsoran Berganda (T2-b)

ALIRAN (T3)

Aliran Tanah (T3-a)
Aliran Puing (T3-b)

RAYAPAN (T4)

KOMPLEKS (T5)

Gelinciran - aliran (T5-a)
Gelonsoran - aliran (T5-b)

KEGAGALAN CERUN BATUAN (B)

KEGAGALAN LINGKARAN (B1)

Batuan Lemah (B1-a)
Batuan Hancur (B1-b)

KEGAGALAN SATAH (B2)

Bahan Blok (B2-a)
Bahan Puing (B2-b)

KEGAGALAN BAJI (B3)

Bahan Blok (B3-a)
Bahan Puing (B3-b)

JATUHAN (B4)

Jatuhan Blok (B4-a)
Jatuhan Puing (B4-b)
Tebalikan (B4-c)

KEGAGALAN JENIS KHAS (TB)

KEGAGALAN HAKISAN (TB1)

Hakisan Keping (TB1-a)
Hakisan Bentuk Takar & Alur (TB1-b)

Jadual 2: Kekerapan jenis kegagalan cerun dan julat isipadunya.

Jenis Kegagalan	Kekerapan mengikut isipadu Isipadu [m ³]			Jumlah kegagalan
	10-50	50-500	0500	
T1	2	8	10	20
T2	-	-	3	3
B1	-	2	2	4
B2	2	4	-	6
B3	3	2	-	5
B4	3	-	-	3
TB-1	1	4	4	9
Jumlah keseluruhan				50

Jadual 4 mengemukakan analisis kegagalan untuk cerun batuan. Kegagalan jenis ini tidak begitu merbahaya kerana isipadu yang terlibat adalah kecil dan sederhana. Faktor penyebab utama kegagalan ialah orientasi satah ketakselanjaran dan keamatannya. Keamatan ketakselanjaran yang sangat tinggi hingga tinggi menghasilkan blok-blok kegagalan yang kecil (< 1 m³) dan juga mempengaruhi isipadu keseluruhan jasad kegagalan. Semua jenis batuan terlibat dan bahan yang gagal bersifat terluluhawa sedikit hingga sederhana (gred II dan III). Faktor-faktor lain yang menyebabkan kegagalan ialah bahan pengisi ketakselanjaran dan air bawah tanah. Untuk granit perlonggaran ketakselanjaran akibat pengurangan beban (bahan di permukaan terhakis) merupakan satu lagi faktor yang menyebabkan kegagalan.

Untuk kegagalan hakisan, darjah luluhawa dan tindakan air laluan merupakan dua faktor yang memainkan peranan penting. Gred luluhawa V untuk kedua-dua jenis batuan utama iaitu granit dan metasedimen merupakan bahan yang mengalami hakisan yang tertinggi sekali (Jadual 5). Bahan gred VI terlibat kerana bila gred V terhakis oleh air laluan, bahan di atasnya terangkut sama. Di beberapa bahagian bahan gred IV boleh turut terhakis. Isipadu yang terlibat boleh bersaiz kecil hingga besar. Kedalaman kegagalan hakisan dipengaruhi oleh ketebalan profil luluhawa, pada batuan granit umpamanya ketebalan bahan gred V yang tinggi menyebabkan isipadu bahan terhakis menjadi sangat besar.

Jadual 3: Analisis kegagalan cerun tanah

Jenis Kegagalan	Lokaliti	Litologi	Gred luluhawa	Isipadu (1)	Faktor penyebab utama
T1-a	9.1S	Skis kuartza mika	IV-VI	sederhana	sudut cerun, luluhawa
T1-b	15.1U	Granit kasar	V	sederhana	luluhawa, air
T1-b	19.7U	Bahan tambakan granit	-	besar	kaedah tambakan
T1-b	22.2U	Bahan tambakan granit	-	besar	kaedah tambakan, air
T1-a	25.0U	Granit kasar	IV-VI	kecil	luluhawa
T1-a	29.6U	Granit kasar	IV-VI	sederhana	luluhawa, air
T1-b	32.4S	Skis	IV-V	besar	luluhawa, air
T1-b	36.5S	Skis	III/IV	sederhana	sudut cerun, luluhawa
T1-b	41.1U	Filit, Sabak, Kuartzit	IV-VI	besar	luluhawa
T1-b	50.0U	Granit biotit sederhana	IV/V	sederhana	sudut cerun, luluhawa
T1-b	57.4U	Bahan tambakan granit	-	besar	kaedah tambakan, air
T1-b	60.3U	Granit-biotit halus	IV/V	sederhana	luluhawa
T1-b	61.5S	Bahan tambakan granit	-	besar	kaedah tambakan
T1-b	61.8S	Bahan tambakan granit	-	besar	kaedah tambakan
T1-a	63.5U	Granit biotit halus	V	kecil	luluhawa, sudut cerun
T1-a	65.3S	Bahan tambakan granit	-	besar	kaedah tambakan, air
T1-b	65.5S	Bahan tambakan granit	-	besar	kaedah tambakan
T1-a	66.1S	Granit kasar	V/VI	sederhana	luluhawa, sudut cerun
T1-b	67.2S	Bahan tambakan Skis	-	besar	kaedah tambakan
T2-b	18.8U	Bahan tambakan granit	-	besar	kaedah tambakan
T2-a	61.8S	Bahan tambakan	-	besar	kaedah tambakan
T2-b	66.5S	Bahan tambakan	-	besar	kaedah tambakan

Penjelasan: (1) Isipadu [m³] 10-50 kecil; 50-500 sederhana, > 500 besar.

Jadual 4: Analisis kegagalan cerun batuan

Jenis kegagalan	Lokaliti	Litologi	Gred luluhawa	Orientasi dan keamatan ketakselanjaran		Isipadu (2)	Faktor penyebab utama
				Orientasi (Jurus/Kem.)	Keamatan (1)		
B1-b	42.0S	Kuarzit; batuan terhancur	V	-	-	besar	tanah runtuh lama bergerak
B1-b	51.0U	Granit biotit tericih	II/III		s.tinggi	sederhana	batuan hancur tirisian air.
B1-b	57.95	Granit biotit halus	II/III		s.tinggi	sederhana	perlonggaran bahan batuan.
B1-b	61.1U	Granit biotit halus	III/IV		s.tinggi	besar	bahan longgar.
B2-a	20.8S	Granit kasar	II	265/45	sederhana	sederhana	Orientasi kts. bahan pengisi
B2-a	22.7S	Granit kasar	III	310/45	tinggi	kecil	Orientasi kts. perlonggaran.
B2-a	41.1U	Filit, Sabak, Kuarzit	III	170/65	s.tinggi	sederhana	Orientasi kts. perlonggaran
B2-a	52.8S	Granit biotit sederhana	II/III	220/30	tinggi	kecil	Orientasi kts. perlonggaran.
B2-a	61.9U	Granit biotit halus	II	105/45	tinggi	sederhana	Orientasi kts. bahan pengisi.
B2-a	79.9U	Filit/Kuarzit	II	170/60	s.tinggi	sederhana	Orientasi kts. air.
B3-b	11.4S	Skis kuarzit mika	IV	170/70; 245/80;	s.tinggi	kecil	Orientasi kts. luluhawa.
B3-a	19.3S	Granit sederhana dan kasar	II	195/90; 140/65; 110/85;	sederhana	kecil	Orientasi kts.
B3-b	35.4R	Skis kuarzit mika	III	330/60; 230/55; 305/75	s.tinggi	besar	Orientasi kts. lembab.
B3-b	37.0R	Filit/Skis	III/IV	345/35 285/90	s.tinggi	kecil	Orientasi kts. luluhawa.
B3-a	77.9L	Filit/Kuarzit	II	170/60 70/60 05/30	s.tinggi	sederhana	Orientasi kts. air.
B4-a	10.4R	Skis amfibol	II	265/75 225/70 340/65 300/60	s.tinggi	kecil	Orientasi kts. sudut cerun air.
B4-a	14.5R	Granit kasar	II/III	-	s.tinggi	kecil	luluhawa
B4-a	19.3R	Granit sederhana dan	I/II	195/90 140/65 110/85	sederhana	kecil	Orientasi kts.

Penjelasan: (1) Keamatan ketakselanjaran 90,5/m: rendah 1,0-5/m: tinggi
0,5-1,0/m: sederhana 0 5/m : sangat tinggi

(2) Isipadu [m³] 10-50:- kecil: 50-500:- sederhana > 500:- besar

Jadual 5: Analisis kegagalan hakisan.

Jenis Kegagalan	Lokaliti	Litologi	Gred Luluhawa	Isipadu (1)	Faktor penyebab utama
TB1-b	10.1S	Skis kuratza mika	V, VI	sederhana	sifat bahan, air laluan.
TB1-b	15.1U	Granit	IV	kecil	luluhawa, air laluan.
TB1-b	23.9U	Granit	IV, V	sederhana	air laluan, juga menyebabkan jatuhan bongkah.
TB1-b	25.0U	Granit	V	besar	air laluan.
TB1-b	27.9U	Granit	IV, V	besar	air laluan.
TB1-b	38.9S	Skis, Filit	V, VI	besar	air laluan.
TB1-b	49.8U	Granit biotit sederhana	IV, V	besar	air laluan, sifat bahan
TB1-b	75.4U	Granit biotit halus	IV,V,VI	besar	air laluan, sifat bahan
TB1-b	63.5U	Granit biotit halus	V	sederhana	air laluan, sifat bahan.

Perjelasan: (1) Isipadu [m³] 10-50:- kecil; 50-500:- sederhana; >500:- besar

Kesimpulan

Kedalaman profil luluhawa memainkan peranan utama penyebab kegagalan cerun tanah. Faktor sampingan termasuk kekuatan ricih bahan terluluhawa yang relatif rendah, geometri cerun yang curam dan faktor air bawah tanah. Semua jenis batuan induk terlibat, gelinciran (T1-a dan b) jelas mengikut sempadan antara bahan gred VI/V dan IV. Saiz kegagalan bergantung kepada ketebalan zon bahan terluluhawa ini. Kawasan granit dengan profil luluhawa yang dalam menghasilkan isipadu kegagalan yang besar berbanding dengan kawasan metasedimen.

Orientasi, keamatan dan ciri permukaan ketakselanjarian serta bahan pengisi ketakselanjarian merupakan faktor penyebab utama kegagalan cerun batuan. Air bawah tanah dan sifat bahan batuan merupakan faktor sampingan. Orientasi ketakselanjarian menentukan sama ada kegagalan mungkin berlaku serta jenis dan arah kegagalan. Isipadu jasad kegagalan dikawal oleh keamatan ketakselanjarian. Kekasaran permukaan dan bahan pengisi menentukan sifat geseran satah ketakselanjarian pada batuan skis. Keamatan ketakselanjarian yang tinggi, permukaan yang licin dan orientasinya ke arah cerun menghasilkan blok-blok kegagalan dengan julat isipadu yang kecil hingga sederhana. Pada batuan granit, perluluhawaan pada satah ketakselanjarian menghasilkan bahan pengisi lemah yang menjadi penyebab gelinciran. Blok-blok kegagalan pada batuan granit berisipadu lebih besar berbanding dengan blok kegagalan pada skis kerana keamatan ketakselanjariannya yang sederhana.

Sifat peroi bahan gred V profil luluhawa yang senang dihakis oleh air laluan merupakan faktor penyebab utama kegagalan hakisan. Oleh kerana granit terluluhawa lebih dalam berbanding dengan skis dan mempunyai lapisan gred V yang tebal, maka kegagalan hakisan lebih ketara untuk kawasan granit.



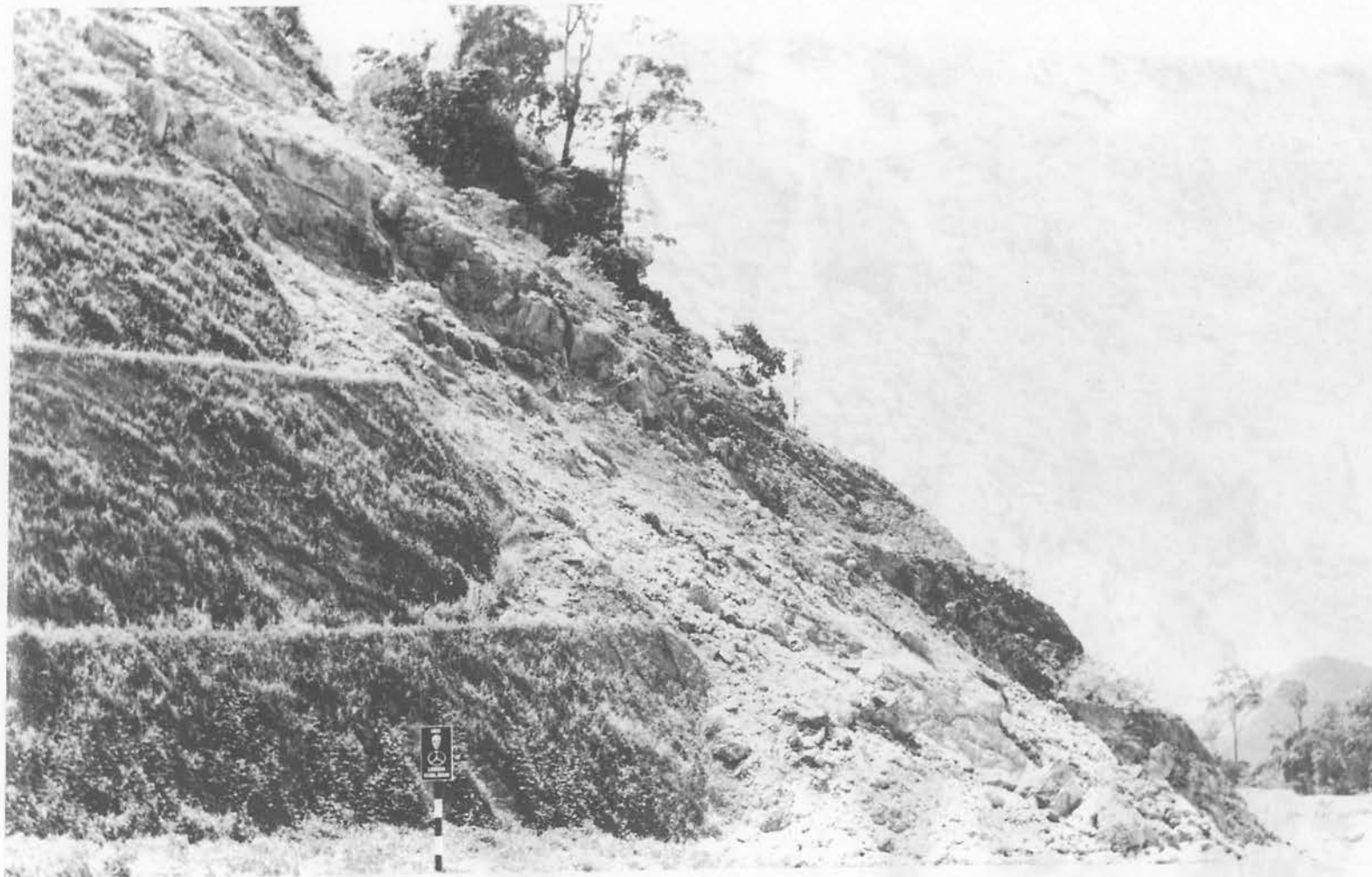
Fotograf 1: Gelinciran dalam pada cerun tambakan (T1-b) di lokasi 65.5S.



Fotograf 2: Gelonsoran berganda pada cerun tambakan (T2-b) di lokasi 66.5S.



Fotograf 3: Kegagalan lingkaran (B1-b) pada cerun batuan akibat sifat jasad batuan yang hancur di lokasi 61.1U.



Fotograf 4: Kegagalan satah (B2-b) pada cerun batuan kuarzit di lokasi 101.4S. Bahan gagal bersifat puing.

Kegagalan cerun tambakan (gelinciran atau gelonsoran) tidak dapat dipastikan faktor penyebab utamanya. Memandangkan kekerapannya yang tinggi, berlaku pada semua litologi dan bersaiz sangat besar, faktor yang termungkin ialah kaedah tambakan yang kurang sempurna. Pada beberapa kes faktor air bawah tanah telah dikesan sebagai faktor penyebab kegagalan.

Rujukan

Ibrahim Komoo, 1985. Pengelasan kegagalan cerun di Malaysia. *Ilmu Alam*, Bil. 14 & 15, ms. 47-58.

International Association of Engineering Geology, 1981. Rock and soil description and classification for engineering geological mapping. *Bull. Ins. Asso. Engng. Geol.*, Bil. 24, ms. 235-274.

Manuskrip diterima 3hb Oktober 1987

BULETIN PERSATUAN GEOLOGI MALAYSIA

BULLETIN OF THE GEOLOGICAL SOCIETY OF MALAYSIA

KANDUNGAN (CONTENTS)

- 1 **Polyphase deformations and quartz development at Bandar Baru, Bangi (South), Selangor**
H.D. Tjia & Zaiton Harun
- 21 **Depth of penetration of geophysical exploration methods as applied in shallow engineering geological investigations**
Abdul Ghani Rafek
- 29 **Estuarine sediment geochemistry**
Tan Teong Hing
- 41 **A comparative study of the mineralogy of rice soils of the Kedah and Kelantan coastal plains of Peninsular Malaysia**
S. Paramanathan
- 59 **Magnesium and calcium concentrations in limestone groundwaters, Peninsular Malaysia**
J. Crowther
- 85 **Structural geology of Datai beds and Macincang Formation, Langkawi**
H.D. Tjia
- 121 **A brief account of lead mineralization at Phaungdaw Prospect, Pyawbwe Township, Mandalay Division, Burma**
Khin Zaw & P.J. Goosens
- 133 **The Wang Phar tungsten deposits**
Tan Say Biow
- 147 **The occurrence of turquoise and faustite in Tras, Pahang**
K.N. Murthy
- 157 **Conservation of geological features in Peninsular Malaysia**
Frank Yong Siew Kee
- 199 **Palynology of the lowland Seberang Prai and Kuala Kurau areas, NW Peninsular Malaysia**
Kamaludin bin Hassan

Editor
G.H. Teh



AUGUST 1989

No. 23

THE ROLE OF LIBRARY RESEARCH IN MINERAL EXPLORATION

K.F.G. Hosking,

1-B, Penlu Tuckingmill, Camborne, Cornwall, TR148NL, U.K.

Abstract

Well planned library research should always constitute an important ingredient of any programme designed for the search for ore deposits, yet it is likely that all too often this has not been the case. A few examples, Malaysian and others, are provided which serve to support the view that amongst other things library research, of which there are a number of varieties, may point to exploration targets and, on occasion, facilitate assessment of the potential of a selected target before work on the ground has started or is far advanced.

Although it would seem to be a glimpse of the obvious to make oneself as familiar as possible with published and other available details of an area before setting out to test its mineral potential in the field, the fact remains that it is not always done in a comprehensive manner. Failure to do so may result in the expenditure of unnecessary sums of money and/or in delaying the discovery of, or even failing to find, any ore deposits that it contains.

Study of maps, air photographs and satellite images, which can fairly be regarded as library research, may prove to be most rewarding provided one is on the lookout for such phenomena as distribution patterns of known mineral deposits which, by extrapolation, might point to likely sites of virgin deposits. Also 'give away' names of features such as Sungai Mas (gold river) and hills that are strange, for example, by virtue of the fact that they are treeless (bald) in terrain which is generally afforested. Sierra Pelada (literally, Bald Mountain), Brazil, a hill exploited for its rich gold deposit, might have been discovered earlier if somebody had bothered to ask the questions 'why is the feature called the bald mountain?' and 'why is it free of trees in such generally profusely vegetated terrain?'.

Study of early newspapers that were circulated in the region of interest, and early numbers of mining journals and transactions, has pointed to exploration targets. I understand that in recent years a gold deposit was discovered in Ireland as a result of information resulting from a newspaper survey.

Accounts of 'early' explorers and 'not so modern' texts, dealing particularly with the distribution of a particular metal or type of ore deposit, may suggest exploration targets. Page 149 of Wallace's great work, 'The Malay Archipelago (1869)' provides an example of the first type. There it is recorded that an engineer had visited Timor in order to test the view held by some that viable copper deposits occurred there. He reported that "copper ore exists in several places, but always too poor in quality. The best would pay well if situated in England..... Gold also occurs, but very sparingly and of poor quality. A fine spring of pure petroleum was discovered far in the interior.....". Some years ago

I mentioned this account to a senior exploration geologist of a major mining group. I understand he sent a geological team to Timor, for a short period, in order to assess its mineral potential. I believe the results were very disappointing.

Perhaps Timor should be subjected to further exploration, in part because a little while ago a theoretical assessment by Dorian *et al.* (1986) suggested that the island "may be well-endowed in non-fuel mineral resources". I think it is not irrelevant to note that there is nothing to suggest that Dorian and his co-workers were aware of the remarks re the mineral potential of Timor that were recorded by Wallace. A lack of library research?

The Sungei Besi Mines property consists essentially of a N-S-trending valley infilled with stanniferous placer material. The western side of the valley is limestone and the eastern is granite. In 1969 a number of rich stanniferous replacements were encountered, most of them by accident, in the granitic valley side of the No. 2 opencast. The money received from the cassiterite they yielded coincided with the proposed modernisation of the opencast mines and so was available at a time when the Company had considerable need of it. It was, therefore, fortunate that these hard-rock deposits were not discovered by the Company earlier, yet they might well have been had appropriate library research been indulged in. Fawns (1905, p. 42) records that "..... at Sungei Besi Chinamen were shafting on the hill, and bringing up blocks of angular tin ore with ironstone (probably gozzan, K.H.) and granitic rocks." In a footnote (p. 42) Fawns notes that the section from which the above extract was taken "is condensed" from the account given by C.G. Warnford Lock in his book "Mining in Malaya for Gold and Tin". Were I presently concerned with the search for gold and/or tin in Peninsular Malaysia I should certainly read Lock's book!

The fact that the Chinese were sinking shafts at Sungei Besi a long time ago was known by directors of Tronoh Mines Ltd., who had a considerable financial interest in property. In the report of the Tronoh Directors to the shareholders, on December 3rd, 1910, Mr. Osborne replied to a speech made by Dr. Browne in which the latter had cast doubt on the occurrence of rich tin deposits at Sungei Besi and in which he said that a number of previous owners had been financially ruined by the mine. Mr. Osborne (p. 3) remarked "I have no doubt when Dr. Browne said that in the old days the men who worked the Sungei Besi Mine were ruined he had in his mind what happened was because the deposit was so rich that it was impossible to keep the Chinese coolies from taking the tin. A special law was passed to prevent it, and men were haled to prison. They they devised a scheme by which they could overcome this difficulty, and they started building houses and getting shop licenses and sinking shafts through the floors of their shops in order to get the tin, and many of these were ruined by having their shops pulled down and being sent off to prison." Interestingly, Mr. Osborne must have thought that the illegal shafts were sunk solely in the placer deposits: neither he, nor any of his co-directors, seem to have considered the possibility that some of the shafts may have been sited with a view to tapping *in situ* tin deposits in the granite. That some of the shafts were clearly sunk to exploit such deposits was demonstrated quite conclusively in the late sixties and early seventies. It is of some interest to note that one such shaft that was then discovered had stopped, in the granite, only about one metre short of a rich orebody!

I know of areas in Malaysia, that contained stanniferous placers, and were opened by miners, when I lived in the country, in the belief that they contained virgin tin ground, only to discover that much, or virtually all of the tin-rich parts had been exploited earlier. In one such area, in Pahang, the early tin workings had been covered by tailings on which rubber trees had been planted. Another such deposit, in Pahang, yielded a coin whose date indicated that the early working had taken place not more than about forty years earlier. For a number of reasons no records may exist of such early workings, but one wonders to what extent early records in the Mines Department, Geological Survey, and elsewhere, are examined before exploiting a given area.

Hopefully, what appears above will serve to indicate that as far as the searcher for ore deposits is concerned library research should be regarded as an essential component of all exploration programmes and, in particular, it should figure prominently in the early phases.

References

- Dorian, J.P., Clark, A.L. and Djumani, 1986. A geological and mineral resource assessment of Indonesia. *Journal of Southeast Asian Earth Sciences*, 1, No. 1, 33-44, Pergamon Journals, Oxford.
- Fawns, S., 1905. *Tin deposits of the World*. The Mining Journal, London (306 pages).
- Tronoh Mines Ltd., report of meeting of the shareholders. Reprinted from the *Mining World*, Dec. 3rd, 1910 (3 pages).
- Wallace, A.R., 1869. *The Malay Archipelago*. (The volume that I have used was published by New Dover Publications, Inc., N. York, in 1972 (515 pages). It is an unabridged republication of the last revised edition of the work that was first published in 1869 by Macmillan and Co., London.)

Manuscript received 22 June 1989.

Forthcoming Bulletin

BULLETIN 24 (October 1989)

Among the papers appearing:-

1. **Wan Fuad Wan Hassan**
Some characteristics of the heavy detrital minerals from Peninsular Malaysia
2. **E.H. Tan & Mahan Singh**
Groundwater supply studies in Northern Kelantan
3. **Mohammad Sayyadul Arafin & C.Y. Lee**
Diagnostic resistivity sounding curves of karstic aquifers in the Chuping Limestone
4. **Abdul Ghani Rafek**
Contoh penggunaan Kaedah Kerintangan Geoelektrik untuk penjelajahan bawah tanah
5. **Kamaludin bin Hassan**
Significance of palynology in Late Quaternary sediments in Peninsular Malaysia
6. **Fan Choon Meng & P.C. Aw**
Processing of illite powder in Bidor, Perak: A study of the process and the potential uses of illite clay
7. **Kwan Tai Seong**
K/Ar mica dates for granites from the Bujang Melaka area
8. **M.B. Idris & M.S. Azlan**
Biostratigraphy and palaeoecology of fusulininids from Bukit Panching, Pahang
9. **C.S. Hutchison**
Chemical variation of biotite and hornblende in some Malaysian and Sumatran granitoids
10. **Mohd. Suhaimi, Abd. Khalik, Zaini Hamzah & Che Seman**
Beberapa aspek penggunaan teknik analisis pengaktifan neutron dalam kajian Geologi
11. **Tajul Anuar Jamaluddin**
Struktur sedimen dalam Formasi Crocker di kawasan Tamparuli, Sabah
12. **Yusuf bin Bujang**
Penyiasatan terperinci hidrogeologi di kawasan Jebungan, Mukah, Sarawak
13. **Henry Litong Among**
Pembinaan perigi-perigi mendatar di Kampung Paloh, Bahagian Sarikei, Sarawak

PERTEMUAN PERSATUAN (MEETINGS OF THE SOCIETY)

CERAMAH TEKNIK (TECHNICAL TALKS)

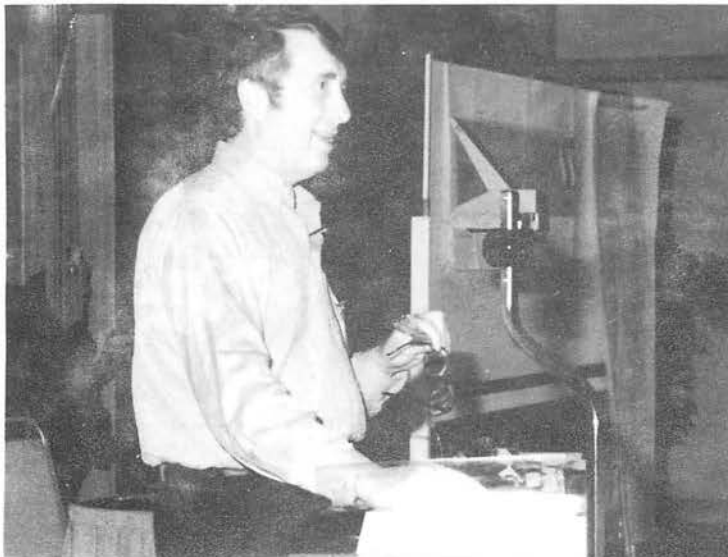
Peter Vail: Sequence Stratigraphy - Tectonic vs Eustacy

Dr. Peter Vail of Rice University, USA, presented a talk entitled "Sequence Stratigraphy - Tectonic vs Eustacy", on the 10 August, 1989 at the Equatorial Hotel in Kuala Lumpur. The talk was jointly organized by the Geological Society of Malaysia and Esso Production Incorporation of Malaysia. The speaker was introduced to the audience by Dr. George Ramsayer of Esso who was previously working with Dr. Vail in Houston.

The talk has attracted about 50 geoscientists, who are mainly from the petroleum companies. The concept of sequence stratigraphy as introduced by Dr. Vail is an integrated interpretation of stratal patterns from seismic, well and outcrop data, together with the associated depositional environments and lithofacies. The sequence stratigraphy process develops a chronostratigraphic framework of cyclic, genetically related strata bounded by surfaces of stratal discontinuity created by erosion or by non-deposition, or by their correlative conformities. Within this chronostratigraphic framework the interpretation process develops the distribution of depositional environments and their associated lithofacies. These lithofacies units may be confined to synchronous intervals that are bounded by stratal surfaces, or may occur as diachronous intervals that step across stratal surfaces.

Following the talk, discussions were mainly focussed on the applicability of the concept to continental deposits and at active margins.

Tea and cakes were later served by the poolside to all who attended the talk.



PETER VAIL

Report & Photo by Noor Azim Ibrahim

GEOLOGICAL SOCIETY OF MALAYSIA PUBLICATIONS

BULLETIN OF THE GEOLOGICAL SOCIETY OF MALAYSIA
WARTA GEOLOGI - NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA

ADVERTISING SPACE ORDER FORM

RATES:	WARTA GEOLOGI		BULLETIN	
	Black & White	Colour	Black & White	Colour
Inside full page per issue	M\$300	M\$600	M\$1000	M\$1500
Inside half page per issue	M\$200	M\$500	M\$500	M\$800
Inside full page for 6 issues	M\$1500	M\$3000	-	-
Inside half page for 6 issues	M\$1000	M\$2500	-	-

Artwork and positive films or slides (for colour or black & white) should be supplied by the advertiser.

Please send the completed form below together with remittance payable to "Geological Society of Malaysia" to

The Editor,
 Geological Society of Malaysia
 c/o Dept. of Geology,
 University of Malaya,
 59100 Kuala Lumpur, Malaysia.

For further information, please ring 03-7577036.

The Editor,
 Geological Society of Malaysia,
 c/o Dept. of Geology,
 University of Malaya,
 59100 Kuala Lumpur.

We would like to take up advertising space in WARTA GEOLOGI/BULLETIN in the form (please tick as appropriate):

	WARTA GEOLOGI		BULLETIN	
	Black & White	Colour	Black & White	Colour
Inside full page	one issue <input type="checkbox"/>	one issue <input type="checkbox"/>	one issue <input type="checkbox"/>	one issue <input type="checkbox"/>
	six issues <input type="checkbox"/>	six issues <input type="checkbox"/>	issues <input type="checkbox"/>	issues <input type="checkbox"/>
Inside half page	one issue <input type="checkbox"/>	one issue <input type="checkbox"/>	one issue <input type="checkbox"/>	one issue <input type="checkbox"/>
	six issues <input type="checkbox"/>	six issues <input type="checkbox"/>	issues <input type="checkbox"/>	issues <input type="checkbox"/>

Artwork/Positive film/slide* enclosed not enclosed

Company

Address

Enclosed cheque/money order/bank draft* for M\$

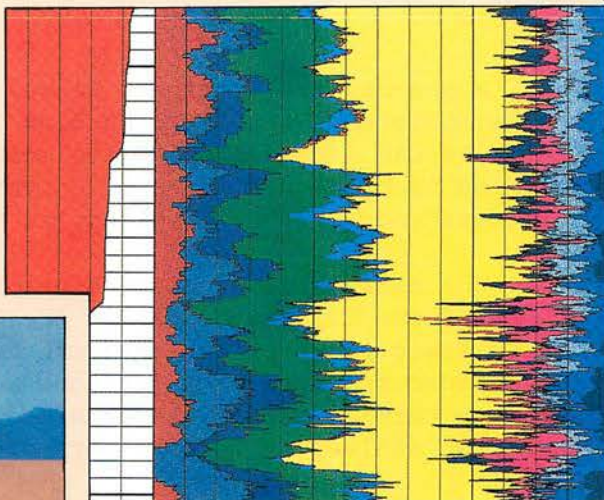
Person to be contacted Tel

Designation Signature

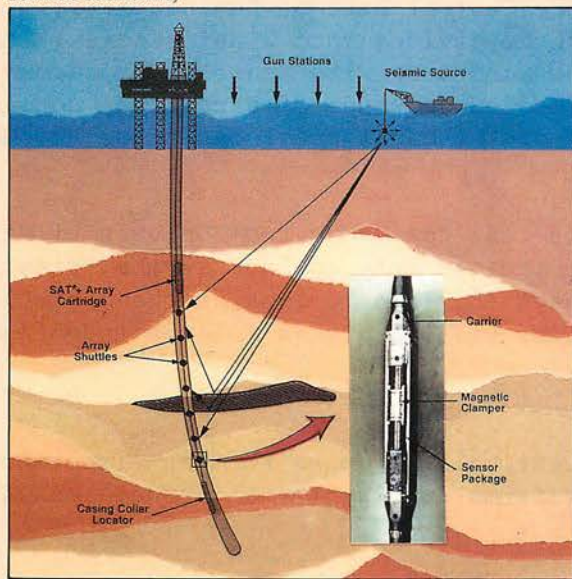
* Please delete as appropriate

WIRELINE, TESTING, DATA PROCESSING & SEISMIC SERVICES

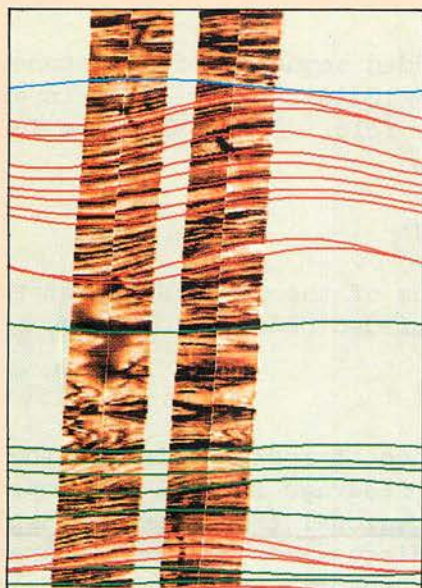
Geochemical Log



Downhole Seismic Array

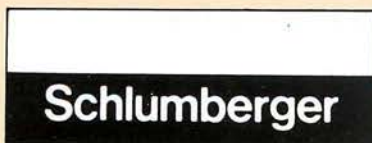


Array Sonic Service



The Formation Microscanner Log

Pioneering and advancing Wireline Technology is our commitment to the oil industry.



Schlumberger (Malaysia) Sdn. Bhd.
Welllog (Malaysia) Sdn. Bhd.

32nd Floor, Menara Promet, Jalan Sultan Ismail, 50250 Kuala Lumpur.
Tel: 03-2485533/2485621/2485947. Telex: SCHLUM MA 31335.
Cable: SCHLUMEAD. Fax: 03-2421291.

TECTONIC AND STRUCTURAL WORKING GROUP - BAHAU FIELDTRIP REPORT

A one-day field trip to Bahau, Negeri Sembilan, was organised by the Tectonic and Structural Working Group on Saturday, 19th of August 1989. It was attended by 20 geologists and students. The field trip was ably led by Prof. H.D. Tjia of Universiti Kebangsaan Malaysia in collaboration with Dr. Kamal Roslan and Dr. Syed Sheikh Almashoor.

The main topic of discussion of the field trip was the structural styles of the Triassic rocks in the Central Belt of Peninsular Malaysia. The Triassic rocks of the area can be divided into 2 main facies: the interbedded sequence of tuffaceous sandstone with shale of the Gemas or Semantan Formations and the interbedded sequence of sandstone, conglomerates and minor shales, said to be part of the basal conglomerate of the Gemas Beds.

The bus load of participants left for Bahau from Universiti Malaya at about 8:45 am. The field trip managed only to look at the Triassic and Paleozoic rocks but did not have the time to look at the Jurassic and Cretaceous ones. The localities visited are as follows (see figure):-

Bahau 1 (4 km south of Bahau)

This river exposure shows vertically dipping Permian limestone beds, tightly folded into isoclinal antiformal and synformal structures with sub-vertical axial planes.

Bahau 2 (Bukit Jeram Padang)

The outcrop comprises an interbedded sequence of sandstone, shale and conglomerate called Bahau Arenite, Middle-Late Triassic in age. The rocks have been folded into a recumbent fold. *Posidonia* were found during the trip in one of the shale beds.

Serting 1 (Road-cut 0.5 km from Serting)

The N-S striking sub-vertical beds of the Gemas/Semantan Formation show slump structures, load casts and graded bedding.

Serting 2 (Road-cut 22 km from Serting)

The outcrop show a similar sequence of rocks as in Serting 1 locality, with the same general strike, but here cleavage is well developed. The cleavages strike N-S, parallel to the regional trend for Peninsular Malaysia. Quartz veins are abundant. The field discussions centred on whether the rocks here are older than the Gemas or Semantan Formation since folded cleavage have also been found here indicating the rocks are much more deformed than the Gemas/Semantan Formation. Another possibility discussed was if they were of the same age, the deformation is more intense here because the area lies along a fault zone. No fossils were found.

Bukit Penagoh

The two road-cuts visited exposed chaotic assemblages of tuffaceous rudite to argillite that occur as NW striking regularly bedded sequence intercalated with slumps and disrupted sequences belonging to the Early Silurian to Early Devonian Karak Formation. A complex system of faults in a 15 m wide zone transects the rocks.

At the end of the field trip, the leader of the trip, Prof. H.D. Tjia raised the question for all to ponder upon, that is, "Do the Triassic rocks of Central Belt exhibit similar structural styles with that of the Lower Paleozoic rocks?". The bus reached the University of Malaya campus at 8.00 pm.

Mustaffa Kamal Shuib
Secretary

Tectonic & Structural Working Group

TECTONIC & STRUCTURAL WORKING GROUP - BAHAU FIELDTRIP



Jimmy Khoo showing participants the geological map of Bahau area.

TECTONIC & STRUCTURAL WORKING GROUP - BAHAU FIELDTRIP



Dr. Kamal Roslan giving an account of the geology at Bukit Jeram Padang.



Prof. H.D. Tjia explaining the structure seen.

BERITA - BERITA PERSATUAN (NEWS OF THE SOCIETY)

KEAHLIAN (MEMBERSHIP)

The following applications for membership were approved:

Full Members

1. Tan Yong Phang, TB-1785, Taman Gek Poh, Jalan Kuhara, 91800 Tawau, Sabah.
2. A.J. Thomas Romain, Core Lab., Lot 10-B, Jalan 51A/223, 46100 P.J.
3. Hilton MacRae, H.M.L. House, 28-42 Ventnor Ave., West Perth, W. Australia.
4. Zulkifli Salleh, Petronas P.R.I. Lot 1026, PKNS Industrial Estate, 54200 Ulu Klang.
5. Wajid Abdul Rahman, Pej. Peny. Kajibumi, Jln. Tunku Kurshiah, 70400 Seremban, N. Sembilan.
6. Wong Chung Lee, Sarawak Shell Bhd., XGS/2, 98100 Lutong, Sarawak.

Student Member

1. Hamlee Ismail, Jabatan Geologi, 43600 UKM, Bangi.

Institutional Members

1. Ashton Mining Ltd., 20 Floor, 444 Queen Street, Brisbane, Old. 4000, Australia. Attn: Technical Librarian
2. Kuwait Foreign Petroleum Expl. Co., P.O. Box 26565, 13126 Safat, Kuwait. Attn: Mm. John Small/Hugh Reynolds

PERTUKARAN ALAMAT (CHANGE OF ADDRESS)

The following member has informed the Society of his new address:

1. E.F. Durkee, International Petroleum Ltd., 801 Reed Street, Lakewood, CO. 80215, U.S.A.

PERTAMBAHAN BARU PERPUSTAKAAN (NEW LIBRARY ADDITIONS)

The Society has received the following publications:

1. Report no. 4 of the IGCP Project 224: Pre-Jurassic evolution of eastern Asia, 1989.
2. U.S. Geological Professional Paper 1988: 1475, 1434, 1455, 1364, 1469, 1467, 1484, 1452, 1466-A, 1399, 1459, 1457, 1447-A, 1449, 1343, 1479, 1353, 1474, 1358, 1476.
3. Episodes, vol. 12, no. 2, 1989.
4. IMM Section A: Jan-April 1989.
5. U.S. Geological Survey Circular, 1989: 1027, 890, 1024, 1030, 930-H
6. U.S. Geological Survey Circular, 1988: 1013, 1023, 930-G.
7. Journal of Geosciences, Osaka City University, vol. 32, 1989.
8. AAPG Explorer, June & Aug, 1989.
9. U.S. Geological Survey Bulletin, 1988: 1807, 1817, 1853, 1754-B, 1787-E, 1842-B, 1713-D, 1589-C, 1710-E, 1742-B, 1784, 1747-B, 1733-D, 1754-C, 1669, 1845, 1633A-C, 1791, 1856, 1699, 1822, 1849, 1816, 1789, 1743-C, 1814, 1821.
10. AGID News no. 58, 1989
11. Commonwealth Science Letter, Mar-Apr 1989.
12. Earthquakes & Volcanoes, vol. 20, no. 3, 1988.
13. Seatrad Centre, Report of investigation no. 72, 1989, nos 56 & 57, 1988.
14. Southeast Asia collection: accessions list, National Library, S'pore, July 1989.
15. Annales Academiae Scientiarum Fennicae, Series A, no. 150, 1989.
16. Bulletin of the National Science Museum, vol. 15, no. 1 & 2, 1989.
17. Acta Micropalaeontologica Sinica, vol. 5, no. 4, 1988, & vol. 6, no. 1, 1989.
18. Acta Palaeontologica Sinica, vol. 27, no. 6, 1988 & vol. 28, no. 1 & 2, 1989.
19. Journal of Stratigraphy, vol. 12, nos 3 & 4, 1988.
20. Engineering geology in tropical terrains, 1989.
21. Seatrad Bulletin, vol. X, no. 2, 1989.

BERITA - BERITA LAIN (OTHER NEWS)

NATIONAL MINERAL POLICY

On June 20, 1988 the Government of Malaysia and the United Nations entered into an agreement whereby Government approved United Nations experts will, with the assistance and advice of local counterparts, review and formulate draft documents relating to minerals policies and practices in Malaysia.

The objective of the project is to provide Malaysia with access to international expertise, information, and policy recommendations in the form of draft documents that will contribute to economic development through increased investment in the non-petroleum minerals sector. At the request of Malaysia, the project has six major planned outputs which will be produced over a two year period. These outputs are (1) a draft National Minerals Policy, (2) a draft mineral tax and investment regulation paper, (3) a draft National Mining Code, (4) a draft Model Mineral Agreement, (5) a draft mineral title management paper, and (6) a draft mineral sector development plan. This comprehensive set of mineral studies will better prepare Malaysia to attract and regulate mineral sector investment in a direction and on terms that contribute to national economic development.

The project will be coordinated by the appointed National Project Director, Encik Fateh Chand (Geological Survey) and United Nations Chief Technical Advisor, Dr. James Otto. In order that the project objectives are met in accordance with the requirements of Malaysia, it has been agreed that two committees, a Steering and a Technical Committee, will be formed to advise and assist the project's technical experts by providing comment and review of the project's draft documents.

In order to better define mineral sector prospects and problems, a series of informal meetings will be held whereby the opinions and views of the local minerals industry, the international mining community, investors, and Federal and State government officials and leaders can be heard.

Dr. James Otto
United Nations Chief Technical Advisor

NATIONAL MINERAL POLICY - NOTES OF TECHNICAL COMMITTEE
MEETING ON 25TH JULY, KEMENTERIAN PERUSAHAAN UTAMA, KUALA LUMPUR.

1. Agreed that the States will retain sovereignty over land and existing benefits. The National Mineral Policy is not meant to "federalise" land matters and existing mining legislations. The legal implications will be studied further - may end up as just guidelines for the States to adopt as appropriate.
2. Some reservations were expressed on the proposed formation of a National Mineral Council (NMC) as a sub-committee of the National Land Council although it has some merits. To discuss further and refer to Steering Committee as appropriate.
3. Agreed to the establishment of a One-Stop Information Centre in Kuala Lumpur and a One-Stop Mineral Application Agency in each state. The latter would coordinate all applications and renewals.
4. Agreed that State Mineral Resource Committees be set up to coordinate and process all mineral title applications.
5. Agreed that the proposed new system of title management should distinguish small scale mining from large scale mining (UN would recommend criteria for division). Large scale operators have to follow more stringent conditions governing exploration and mining.
6. The minerals to be covered will be finalised later. Questions were raised as to whether rock aggregates should be included.
7. Next meeting will be held in Johor Bharu on 22nd - 23rd August 1989 to discuss in greater detail:-
 - (a) Proposed model state mineral code, and
 - (b) mineral title management.

These will include the rights and obligations of operators in areas earmarked for large scale mining, and implementation and enforcement of large scale exploration activities.

M.K. Choo

NEW PUBLICATIONS OF CCOP

1. THE PRE-TERTIARY FOSSILS OF SUMATRA AND THEIR ENVIRONMENTS

by: Henri Fontaine and Suudi Gafoer

This publication (CCOP/TP 19) is the result of joint research between CCOP, France and the Geological Research and Development Centre (GRDC) of Indonesia. Dr. H. Fontaine, senior expert on pre-Tertiary Geology and Palaeontology whose services have been provided to CCOP on a non-reimbursable basis by the French Government, conducted this co-operative study within the CCOP work programme for development of knowledge on the pre-Tertiary geology of Southeast Asia. It is strongly believed that the result of this study will certainly assist the mapping programme of Sumatra at a scale 1:250,000 undertaken by the GRDC in providing data on ages of diverse strata.

Copies of this 357-page publication are obtainable from the CCOP Technical Secretariat at the given prices.

Surface mail: US\$18.00

Airmail: US\$22.00 for destinations in Asia
US\$24.00 for destinations in Europe and Australia
US\$26.00 for destinations in North America and elsewhere.

The publication will be mailed to interested buyers upon receipt of bank drafts or checks in US dollars made payable to CCOP.

2. CCOP TECHNICAL BULLETIN, VOLUME 19

The above publication was edited and printed by the Geological Survey of Japan as one of its important contributions to the work of the Committee. Copies are now available at the CCOP Technical Secretariat at US\$12 per copy for surface mail. For delivery to countries in Asia, Europe and Australia and North America & elsewhere, the prices of the Bulletin inclusive of airmailing fees amount to US\$15, 16 and 17 respectively. This volume is devoted to one paper, a comprehensive treatise on the late Palaeozoic to Mesozoic palaeontology of West Thailand by Dr. H. Fontaine *et al.*

In this paper, the formations from Devonian to Cretaceous in West Thailand are described systematically with detailed palaeontological evidence shown for each locality and unit. The occurrences of significant fossils are reported in detail. Many new discoveries both palaeontologic and stratigraphic are reported. Excellent descriptions of important fossils with clear photographs by the authorities of the field are annexed in eight appendices. The literature cited is extensive and complete.

This is indeed a very exhaustive and comprehensive reference paper regarding the late Palaeozoic to Mesozoic palaeontology of the area and undoubtedly will be an indispensable guide for those who are interested in the geology of Southeast Asia.

This 228-page publication by H. Fontaine and Varavudh Suteethorn contains 8 Chapters and 8 Appendices.

At the end of the book, readers will find a round-up of the tables of contents of the Technical Bulletin Volumes 1-19.

Interested readers wishing to place an order for this publication are requested to make out their cheques payable to "CCOP" for the amounts relevant to their destinations. Upon receipt of such remittance, the book will be immediately dispatched to them.

GEOINFO IV - 4TH INTERNATIONAL CONFERENCE ON GEOSCIENCE INFORMATION

Ottawa, Canada
June 24-29 1990

GeoInfo IV is being hosted by the Geological Survey of Canada and is co-sponsored by the International Union of Geological Sciences, the Geoscience Information Society, the Geological Information Group of the Geological Society of London, and the Australian Geoscience Information Association.

Background

GeoInfo IV will be the fourth in a series of international conferences (London, England, 1978; Golden, Colorado, U.S.A., 1982; Adelaide, Australia, 1986) designed to stimulate the exchange of ideas, data and experiences among those concerned with the collection, management and dissemination of information in the earth sciences.

Program

GeoInfo IV will concentrate on five key themes:

- Placing a value on information
- Handling information with digital and analog systems (geographic and expert systems)
- Constructing and managing databases
- Managing collections and archives (conservation and preservation)
- Strategies for improving the flow and communication of information: in-house, nationally, internationally.

The conference will include plenary sessions and concurrent workshops, seminars, posters and discussion sessions, formal and informal. There will also be demonstrations, hands-on sessions, exhibits, visits to local institutions working in the field of information sciences, and geological field trips.

Those wishing to offer contributions related to the key themes are invited to indicate this on the pre-registration form and to submit a one-paragraph abstract before September 1, 1989.

Mail all correspondence to:

David Reade,
GeoInfo IV Secretary-Treasurer,
GEOSCAN Centre,
601 Booth Street,
Ottawa, K1A 0E8,
CANADA.
Telephone: 613-992-9550
Telex: 0533117 EMAR-OTT
Telefax: 613-996-9990

1990 AAPG ANNUAL MEETING - CALL FOR PAPERS

The 1990 Annual Meeting of the American Association of Petroleum Geologists (AAPG) and its divisions, the Division of Professional Affairs (DPA) and the Energy Minerals Division (EMD), along with the Society of Economic Paleontologists and Mineralogists (SEPM), will be held in San Francisco, California, June 3-6, 1990. The site of the convention will be the Moscone Convention Center.

The technical program will include poster and oral sessions, workshops, research symposia, short courses, and field trips devoted to the theme, "Challenges of the 90s."

- Transition from domestic to international exploration
- Reallocation of people and resources from domestic exploration to developmental geology
- Increased emphasis on environmental geology

In addition to the technical program, pre- and post-meeting field trips will examine ancient and modern sedimentary rocks, tectonic features and petroleum geology in the California region. Short courses will consider structural geometry in extensional terranes, strike-slip basins, core workshops and marine sedimentation. The variety of field trips and short courses will provide abundant choices of topics and areas for participants.

Abstracts for all presentations should be typed in 250 words or less on the attached form. No figures will be permitted. Please proofread your abstract carefully, because neither the Technical Program Committee nor AAPG will be responsible for making changes or grammatical corrections.

All abstracts are due November 1, 1989 and must be sent to:

1990 Abstracts
AAPG Convention Department
P.O. Box 979
Tulsa, OK 74101-0979 or
1444 S. Boulder
Tulsa, OK 74119-3604

Presenters will receive notice of acceptance or rejection in December 1989. Speaker and poster kits, as well as presentation schedules and guides for effective presentations, will be sent to all presenters after December 15, 1989.

CIRCUM-PACIFIC ENERGY AND MINERAL RESOURCES CONFERENCE - CALL FOR PAPERS

Honolulu,
July 29 - August 3, 1990.

The capital city of Hawaii plays host once again to the Fifth Circum-Pacific Energy and Mineral Resources Conference and Exhibition, Sunday, July 29 through Friday, August 3, 1990. The conference and exhibition will be held at the recently remodeled and enlarged Hilton Hawaiian Village on beautiful Waikiki Beach. The traditional Icebreaker Cocktail Party will open the conference on Sunday, July 29 while technical sessions will be held Monday through Friday, July 30-August 3 with pre-conference workshops on July 28-29 and geological field trips both preceding and following the conference.

The 1990 conference theme, Circum-Pacific Region: Resources for an Expanding Economy, will be carried through the technical program as well as the scientific and trade exhibition. Emphasis will be on newly identified significant energy and mineral resources of the Pacific and the impact of new developments in methodology and technology in the coming decade.

The conference will provide a forum for the presentation of:

- Topical scientific papers on tectonics, volcanism, sedimentation geology, geophysics, mineralization, etc., relative to resources in the Circum-Pacific region.
- Applied science papers relevant to mineral, coal, oil and gas and geothermal exploration and development in the Circum-Pacific region.
- Special discussion/poster display sessions where recently acquired, publicly available geophysical and geological data from frontier Pacific/Antarctic areas will be exhibited.
- A special series of papers updating the results of the Ocean Drilling Project plus a poster session dedicated solely to the ODP.

Abstracts must be typewritten, double-spaced and 250 words or less.

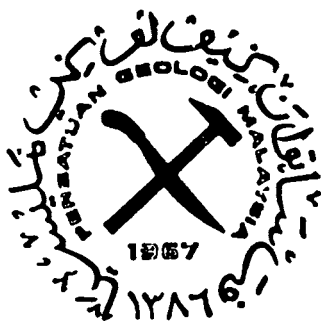
Abstracts for oral and poster presentations should be received no later than December 1, 1989 at the following address:

1990 Circum-Pacific Abstracts,
AAPG Convention Department,
P.O. Box 979,
1444 S. Boulder,
Tulsa, OK74101-0979 USA.

Papers presented at the conference will be published in a special transactions volume to be printed shortly following the conference. If the abstract is accepted, the final copy of the manuscript must be received no later than June 1, 1990 in order to be included in this transactions volume. Papers received after June 1 may not be included in the volume. Papers will be limited to 15 double-spaced typewritten 8½ X 11-inch pages of copy and may be accompanied by up to eight (8) illustrations.

Further information, contact AAPG Convention Department, P.O. Box 979, Tulsa, OK74101-0979 U.S.A.; telephone: (918) 584-2555; fax: (918) 584-0469; telex: 49-9432; or cable: AAPG TUL.

PETROLEUM GEOLOGY SEMINAR '89



Shangri-La Hotel, Kuala Lumpur
4-5th December, 1989

KURSUS-KURSUS LATIHAN & BENGKEL-BENGKEL (TRAINING COURSES & WORKSHOPS)

1989

September - October, 1989

GROUNDWATER TRACING TECHNIQUES (Graz, Austria). Five-week course organized every other year by the Institute of Technical Geology, Petrography and Mineralogy and sponsored by Unesco. Language: English. For Information: Institute of Technical Geology, Petrography and Mineralogy of the University of Technology, Rechbauerstrasse 12, A-8010 Graz, Austria.

September - October, 1989

REMOTE SENSING AND DIGITAL IMAGE ANALYSIS (Sioux Falls, South Dakota, U.S.A.). U.S. Geological Survey training course for non-U.S. natural scientists on manual interpretation and digital analysis of remotely sensed data. For Information: Training Section, Office of International Geology, U.S. Geological Survey, 917 National Center, Reston, VA 20092, U.S.A.

September 1989 - July 1990

PETROLEUM EXPLORATION GEOLOGY (Headington, Oxford, U.K.). An annual diploma course designed by Oxford Polytechnic to prepare post-graduate geologists for the duties of geologists in oil exploration teams. For Information: M. Hoggins, Dept. of Geology and Physical Sciences, Oxford Polytechnic, Headington, Oxford OX3 0BP, U.K.

September 1989 - August 1990

MINERAL EXPLORATION AND EXPLORATION GEOPHYSICS (Delft, The Netherlands). Annual diploma courses organized by the International Institute for Aerospace Survey and Earth Sciences with Unesco. Language: English. For Information: ITC Student Registration Office (ME), P.O. Box 6, 7500 AA Enschede, The Netherlands.

October 1989 - August 1990

HYDROLOGY AND HYDROGEOLOGY (Belgium). Language: French. For Information: Professeur Dr. ir. A. Monjoie, Directeur des Laboratoires de Géologie de l'Ingénieur, d'Hydrogéologie et de Prospection géophysique - Batiment B19, Faculté des Sciences Appliquées, Université de Liège - SART TILMAN, B-4000 Liege, Belgium.

October 1989 - July 1990

ENGINEERING HYDROLOGY (Galway, Ireland). Annual diploma and post-graduate courses organized by the Department of Engineering Hydrology, University College, Galway, Ireland. Sponsored by Unesco-IHP and the World Meteorological Organization. For Information: Prof. J.E. Nash, Department of Engineering Hydrology, University College Galway, Galway, Ireland.

October 1989 - September 1991

FUNDAMENTAL AND APPLIED QUATERNARY GEOLOGY (Brussels, Belgium). Annually organized training course leading to a Master's degree in Quaternary Geology by the Vrije Universiteit Brussel (IFAQ) and sponsored by Unesco. Language: English. For Information: Prof. Dr. R. Paepse, Director of IFAQ, Kwartairgeologie, Vrije Universiteit Brussel, Pleinlaan 2, B-1050, Brussels, Belgium.

November 1989 - December 1989

REMOTE SENSING APPLICATIONS FOR EARTH SCIENCES (Enschede, The Netherlands). Annual short course organized by International Institute for Aerospace Survey and Earth Sciences (ITC), with Unesco. Language: English. For Information: ITC Student Registration Office, P.O. Box 6, 7500 AA Enschede, The Netherlands.

1990

January - July, 1990

GENERAL AND APPLIED HYDROLOGY (Madrid, Spain). An annual, 6-month course sponsored by Unesco. Language: Spanish. For Information: Centro de Estudios y Experimentacion de Obras Publicas y Urbanismo, Alfonso XII, Num. 3, Madrid 7, Spain.

January - July, 1990

GROUNDWATER HYDROLOGY (Barcelona, Spain). An annual 6-month, post-graduate course sponsored by Unesco. Language: Spanish. For Information: Curso Internacional de Hidrologia Subterranea, Calle Beethoven, 15, 3^o, 08021 Barcelona, Spain.

February 1990

METALLOGENY (Quito, Ecuador). Annual 3-week training course for Latin Americans organized by Central University of Quito, the Autonomous University of Madrid (Spain), and Unesco. Language: Spanish. For Information: Director, Curso Internacional de Metalogenia, Escuela de Geologia, Minas y Petroleos, Division de Post-grado, Universidad Central, Apartado Postal 8779, Quito, Ecuador.

February - March 1990

GEOCHEMICAL PROSPECTING TECHNIQUES (Tervuren, Belgium). Annual course sponsored by the Royal Museum of Central Africa and UNDP. Language: French. For Information: Musée royal de l'Afrique centrale, Steenveg op Leuven, 13, B-1980 Tervuren, Belgium.

February - July, 1990

HYDROLOGY (Budapest, Hungary). An annual six-month, post-graduate course organized by the Research Centre for Water Resources Development (Budapest) and sponsored by Unesco. Language: English. For Information: VITUKI International Post-Graduate Course on Hydrology, 11-1453 Budapest, Pf. 227 Hungary.

February - August, 1990

HYDROLOGY (Padova, Italy). An annual, 6-month, postgraduate course sponsored by Unesco. Language: English. For Information: Professor A. Ghetti, Centro Internazionale di Idrologia "Dino Tonini," via sette Chiese, 35043 Monselice, Italy.

February - November, 1990

PHOTOINTERPRETATION APPLIED TO GEOLOGY AND GEOTECHNICS (Bogota, Colombia). Forty-week course organized by the Government of Colombia, the Interamerican Centre of Photointerpretation (CIAF), International Institute for Aerial Survey and Earth Sciences (The Netherlands) and Unesco. Language: Spanish. For Information: Academic Secretariat of the CIAF, Apartado Aereo 53754, Bogota 2, Colombia.

March - April, 1990

MINERAL EXPLORATION (Paris, France). A 4-week annual course organized by the Ecole Nationale Supérieure des Mines and sponsored by Unesco. Language: French. For Information: Prof. K.D. Khan, Ecole des Mines, 35 rue St. Honoré, 77305 Fontainebleau Cedex, France.

March - November, 1990

PHOTOINTERPRETATION APPLIED TO GEOLOGY AND GEOTECHNICS (Bogota, Colombia). Annual post-graduate diploma courses organized by the Government of Colombia, Centro Interamericano de Fotointerpretacion, International Institute for Aerial Survey and Earth Sciences and Unesco. Language: Spanish. For Information: Academic Secretariat of the CIAF, Apartado Aereo 53754, Bogota 2, Colombia.

June - August, 1990.

TECHNIQUES OF HYDROLOGIC INVESTIGATIONS (Washington, D.C. and Denver, Colorado, U.S.A.). Annual training course for international participants. For Information: Office of International Hydrology, Water Resources Division, U.S. Geological Survey, 470 National Center, Reston, VA 22092, U.S.A.

July - August, 1990

CRYSTALLOGRAPHY, MINERALOGY, METALLOGENY (Madrid, Spain). Annual course organized by the Department of Geology and Geochemistry of the Universidad Autonoma de Madrid and sponsored by Unesco. Language: Spanish. For Information: Departamento de Geología y Geoquímica, Facultad de Ciencias, Universidad Autonoma de Madrid, Canto Blanco, Madrid 34, Spain.

October 1990 - September 1992

GEOLOGICAL EXPLORATION METHODS (Nottingham, U.K.). Two-year MSc course starting every other year with emphasis on applied methodology, data acquisition and interpretations). For Information: Dr. M.A. Lovell, Department of Geology, University of Nottingham NG7 2RD, U.K.

December 1990 - January 1991

METHODS AND TECHNIQUES IN EXPLORATION GEOPHYSICS (Hyderabad, India). Diploma course organized every second year by the National Geophysical Research Institute of the Council of Scientific and Industrial Research, Hyderabad, India, and sponsored by Unesco. Language: English. For Information: The Director, International Training Course on Methods and Techniques in Geophysical Exploration, National Geophysical Research Institute, Hyderabad, 500 007 (A.P.) India.

1991

February - March, 1991

STRUCTURAL GEOLOGY (Dehra Dun, India). A six weeks training course organized every second year by the Wadia Institute of Himalayan Geology, sponsored by the Government of India and Unesco. Language: English. For Information: The Organizer of the Regional Training Course in Structural Geology, Wadia Institute of Himalayan Geology, 33 General Mahadev Singh Road, Dehra Dun 24 8001, India.

May - November 1991

GENERAL HYDROLOGY with emphasis on groundwater (Buenos Aires, Argentina). A six-month post-graduate diploma course organized every other year and sponsored by Unesco. Language: Spanish. For Information: Comité Nacional para el Programa Hidrológico Internacional de la Republica Argentina, Av. 9 de Julio 1925 - 15^o piso, 1332 Buenos Aires, Argentina.

August - October, 1991

GEOCHEMICAL PROSPECTING METHODS (Prague, Czechoslovakia). Certificate course organized every second year by the Geological Survey of Czechoslovakia and sponsored by Unesco, IAGC and Czechoslovakia. Language: English. For Information: GEOCHIM Unesco CSSR, Geological Survey of Prague, Malostranské nám. 19, 11821 Prague 1, Czechoslovakia.

KALENDAR (CALENDAR)

1989

August 1-3, 1989

PLATINUM (5th International Symposium), Espoo, Finland. Co-sponsored by IAGOD. (Prof. H. Papunen, Department of Geology, University of Turku, SF-20500 Turku, Finland).

August 3-12, 1989

WATER-ROCK INTERACTION (6th IAGC International Symposium), Malvern, England. (Dr. W.M. Edmunds, British Geological Survey, Wallingford, Oxon OX10 8BB, U.K.).

August 13-18, 1989

SOIL MECHANICS AND FOUNDATION ENGINEERING (12th International Conference), Rio de Janeiro, Brazil. (Organizing Committee, XII ICSMFE, Caixa Postal 1559, 2000 Rio de Janeiro, RJ, Brazil).

August 14-17, 1989

PRECAMBRIAN GRANITOIDS: Petrogenesis, Geochemistry, and Metallogeny (IGCP-217 and IGCP-247 Symposium), Helsinki, Finland. (Precambrian Granitoids Symposium, Department of Geology, University of Helsinki, P.O. Box 115, SF-00171 Helsinki, Finland).

August 14-29, 1989

SPELEOLOGY (10th International Congress), Budapest, Hungary. (10th International Congress of Speleology, c/o Magyar Karszt -'es Barlangkutatas Tarsulat, Anker köz 1, H-1061 Budapest, Hungary).

August 22-25, 1989

CLASTIC TIDAL DEPOSITS (2nd International Research Symposium), Calgary, Alberta, Canada. (Ray Rahmani, Canadian Hunter Exploration Ltd., 435 - 4th Avenue SW, Calgary, Alberta, Canada T2P 3A8).

August 28-31, 1989

ROCK AT GREAT DEPTH (Symposium), Pau, France. (Symposium, Elf Aquitaine, CSTCS, Bat. L5, 64018 Pau Cedex, France).

August 28 - September 2, 1989

AIPEA (9th International Clay Conference), Strasbourg. (Y. Tardy, Institut de Géologie, 1 rue Blessig, 67084 Strasbourg, France).

September 3-9, 1989

GEOMORPHOLOGY (2nd International Conference), Frankfurt/Main, F.R.G. (A. Semmel, Institut für Physische Geographie, Universität Frankfurt, Senckenberganlage 36, Postfach 11 19 32, D-6000 Frankfurt/Main, F.R.G.).

September 4-7, 1989

CHALK (International Symposium), Brighton, U.K. (Dr. R.N. Mortimore, Department of Civil Engineering, Brighton Polytechnic, Moulsecoomb, Brighton BN2 4GJ, U.K.).

September 4-8, 1989

NON-METALLIC MINERALS (2nd World Congress), Beijing, China. (Prof. Xu Changyou, Wuhan University of Technology, Wuhan, Hubei Province, P.R. China).

September 4-8, 1989

COASTAL EVOLUTION, MANAGEMENT AND EXPLORATION IN SOUTHEAST ASIA (IGCP-274 International Symposium), Ipoh, Malaysia. (Dr. H.D. Tjia, Jabatan Geologi, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia).

September 4-13, 1989

MICROPALAEONTOLOGICAL COLLOQUIUM (26th), Budapest, Hungary. IPA. (Dr. A. Nagymarosy, Department of Geology, "Eötvös L." University, Budapest VIII, Múzeum krt. 4/A H-1088, Hungary).

September 10-14, 1989

QUATERNARY ENGINEERING GEOLOGY (Conference), Edinburgh, U.K. Co-sponsored by IAEG. (Dr. J.A. Little, Dept. of Civil Engineering, Heriot-Watt University, Riccarton, Edinburgh EH14 4AS, Scotland, U.K.).

September 10-15, 1989

CRUSTAL GEOCHEMICAL CYCLES (American Chemical Society Division of Geochemistry Meeting), Miami Beach, U.S.A. (James Herring, U.S. Geological Survey, MS 939, Box 25406, Denver, Federal Center, Denver, CO 80225, U.S.A.).

September 11-22, 1989

ARCHEAN - PROTEROZOIC TRANSITION (Field Conference), Harare, Zimbabwe. Co-sponsored by IGCP and IUGS. (Apt. 89, Geological Society of Zimbabwe, P.O. Box 8427, Causeway, Harare, Zimbabwe).

September 12-15, 1989

COAL: Formation, Occurrence and Related Properties (International Meeting), Orléans, France. (P. Bertrand, Unité de Recherche en Pétrologie, Organique, Université d'Orléans, 45067 Orléans Cedex 2, France).

September 12-15, 1989

HYDROTHERMAL REACTIONS (3rd International Symposium), Frunze, U.S.S.R. (Symposium on Hydrothermal Reactions, Vernadsky Institute of Geochemistry and Analytical Chemistry, Academy of Sciences, Kosygin Street 19, Moscow 117 334, U.S.S.R.).

September 14-15, 1989

PETROLEUM MIGRATION (Meeting), London, U.K. (W. England, Exploration and Production Division, BP Research International, Chertsey Road, Sunbury-on-Thames, Middlesex TW16 7LN, U.K.).

September 14-19, 1989

EDITING INTO THE 90's (Joint CBE, EASE, AESE Meeting), Ottawa, Canada. (Conference Office, National Research Council of Canada, Ottawa, Ontario, Canada K1A 0R6).

September 17-24, 1989

AGGLUTINATED FORAMINIFERA (3rd International Workshop), Tübingen, F.R.G. (Dr. C.H. Leben, Geologisches Institut der Universität, Sigwartstrasse 10, D-7400 Tübingen, Federal Republic of Germany).

September 17-24, 1989

ENERGY (14th World Congress), Montreal, Quebec, Canada. (World Energy Conf., 34th St. James's Street, London SW1A 1HD, U.K.).

September 18-22, 1989

ORGANIC GEOCHEMISTRY (14th International Congress). Paris, France. (Ms. Yolande Rondot, Institut Francais du Petrole, B.P. 311, 92506 Ruell-Malmaison Cedex, France).

September 24-30, 1989

CARBONIFEROUS STRATIGRAPHY (IUGS Subcommittee Biennial Field and General Meeting), Utah/Nevada, U.S.A. (Walter L. Manger, Department of Geology, University of Arkansas, Fayetteville, AK 72701, U.S.A.).

September 25-28, 1989

MINING LATIN AMERICA (IMM Conference and Exhibition), Rio de Janeiro, Brazil. (The Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, U.K.).

September 28-30, 1989

GEOENGINEERING (International Congress), Turin, Italy. (Suolosottosuolo, Associazione Mineraria Subalpina, c/o Dipartimento di Georisorse e Territorio del Politecnico, corso Duca degli Abruzzi 24, I-10129 Torino, Italy).

October 1989

MINERAL EXPLORATION PROGRAMMES '89 (International Symposium), Madrid, Spain. (Derek Morris, MEP '89, c/o International Mining, 4 Brandon Road, London N7 9TR, U.K.).

October 1989

GODESY AND SEISMOLOGY: DEFORMATION AND PROGNOSIS (Meeting), Erevan, Armenian S.S.R., U.S.S.R. (V.A. Sidorov, Soviet Geophysical Committee, Molodezhnaya 3, Moscow 117 296, U.S.S.R.).

October 1-4, 1989

SINKHOLES AND THE ENGINEERING AND ENVIRONMENTAL IMPACTS OF KARST (3rd Multidisciplinary Conference), St. Petersburg, Florida, U.S.A. (Conference, Florida Sinkhole Research Institute, University of Central Florida, Orlando, FL 32816, U.S.A.).

October 1-6, 1989

GEOCHEMICAL EXPLORATION (13th International Symposium) and BRAZILIAN GEOCHEMICAL CONGRESS (2nd), Rio de Janeiro, Brazil. Co-sponsored by AEG. Languages: Symposium - English; Congress - Portuguese. (D.C. Bruni, 13th IGES, P.O. Box 2432, 20010, Rio de Janeiro, R.J., Brazil).

October 2-4, 1989

FLUVIAL SEDIMENTOLOGY (4th International Conference), Barcelona, Spain. (C. Puigdefàbregas, Servei Geologic de Catalunya, carrer Diputació 92, 08015 Barcelona, Spain).

October 2-5, 1989

BOREHOLE GEOPHYSICS FOR MINERALS, GEOTECHNICAL, AND GROUNDWATER APPLICATIONS (3rd International Symposium), Las Vegas, Nevada. (Mark Mathews, c/o Las Alamos National Laboratory, P.O. Box 1663, MS C335, Las Alamos, NM 87545, U.S.A.).

October 2-5, 1989

GROUNDWATER MANAGEMENT: Quantity and Quality (International Symposium), Benidorm, Alicante, Spain. Language: English. (Secretary General, IAHS, Institute of Hydrology, Wallingford, Oxon, OX10 8BB, U.K.).

October 2-6, 1989

REMOTE SENSING FOR EXPLORATION GEOLOGY (7th Thematic Conference), Calgary, Alberta, Canada. (Robert H. Rogers, ERIM, P.O. Box 8618, Ann Arbor, MI 48107-8618, U.S.A.).

October 13-14, 1989

MINERAL-RESOURCE ASSESSMENT (18th Geochautauqua), Newark, Delaware. Co-sponsored by IAMG. (J.H. Schuenemeyer, Dept. Mathematical Sciences, University of Delaware, Newark, DE 19716, U.S.A.).

October 13-15, 1989

INSTITUTE FOR TERTIARY-QUATERNARY STUDIES (Meeting), Fort Collins, Colorado. (Frank G. Etheridge, Department of Earth Resources, Colorado State University, Fort Collins, CO 80523, U.S.A.).

October 16-20, 1989

MATHEMATICAL METHODS IN GEOLOGY (IAMG Symposium), Pribram, Czechoslovakia. Sekretariat symposia, Hornická Pribram ve Vede a Technice, post. schr. 41,261 02 Pribram, Czechoslovakia).

October 16-27, 1989

REGIONAL MINERAL RESOURCE ASSESSMENTS (Workshop for international participants), Reston, Virginia. (U.S. Geological Survey, Office of International Geology, 917 National Center, Reston, VA 22092, U.S.A.).

October 18-20, 1989

STRUCTURAL AND TECTONIC MODELLING AND ITS APPLICATION TO PETROLEUM GEOLOGY (Meeting), Stavanger, Norway. (Norwegian Petroleum Society, P.O. Box 1897 - Vikja, 0124 Oslo, Norway).

October 22-25, 1989

WORLD GOLD '89 (Meeting), Reno, Nevada, U.S.A. (Society of Mining Engineers, P.O. Box 625002, Littleton, CO 80162, U.S.A.).

October 23-27, 1989

COAL SCIENCE (International Conference), Tokyo, Japan. Language: English. (Secretariat for ICCS, Coal Conversion Department, New Energy Development Organization (NEDO), Sunshine 60 Building, 1-1, Higashi-Ikebukuro 3-chome, Toshima-ku, Tokyo 170, Japan).

November 10-13, 1989

RARE METAL GRANITOIDES (IGCP-282 Meeting), Nanjing, P.R. China. (Prof. Zhu Jinchu, Department of Earth Science, Nanjing University, Nanjing 210008, P.R. China).

November 13-15, 1989

MINERAL EXPLORATION PROGRAMME '89 (Symposium), Madrid, Spain. (MEP '89, 4 Brandon Road, London N7 9TR, England, U.K.).

November 14-16, 1989

ASEAN COUNCIL ON PETROLEUM (Meeting), Singapore. (Salk International, 2950 Airway Avenue, Suite D-1, Costa Mesa, CA 92626, U.S.A.).

November 14-16, 1989

WORLD WATER (Conference), Wembley, London, U.K. (World Water '89, Institution of Civil Engineers, 1-7 Great George Street, Westminster, London SW1P 3AA, U.K.).

November 20-21, 1989

MODERN EXPLORATION TECHNIQUES (Symposium), Regina, Saskatchewan. (Bob Troyer, Saskatchewan Geological Survey, P.O. Box 234, Regina, Sask., Canada S4P 2Z6).

November 23-24, 1989

MESOZOIC EUSTASY RECORD ON WESTERN TETHYAN MARGINS (Meeting), Lyon, France. (Prof. P. Cotillon and Dr. S. Ferry, Université Claude Bernard, Institut TOAEE, Centre des Sciences de la Terre, 29-43 Blvd. du 11 novembre, F-69622 Villeurbanne Cédex, France).

December 4-5, 1989

PETROLEUM GEOLOGY SEMINAR '89, Kuala Lumpur, Malaysia (c/o Organizing Chairman, Geological Society of Malaysia, Geology Department, University of Malaya, 59100 Kuala Lumpur, Malaysia).

December 18-20, 1989

GEO THERMOMETRY AND GEOBAROMETRY (Session in Conference, The Stability of Minerals), London, U.K. (Dr. B.W.D. Yardley, Department of Earth Sciences, University of Leeds, Leeds LS2 9JT, U.K.).

1990

January 29-30, 1990

ADVANCES IN RESERVOIR GEOLOGY (Meeting), London, U.K. (Dr. Ashton, Badley, Ashton & Associates Ltd., Winceby House, Winceby, Horncastle, Lincs. LN9 6PB, U.K.).

February 4-9, 1990

GONDWANA, TERRANES AND RESOURCES (10th Australian Geological Convention), Hobart, Australia. (10th AGC, c/o P.O. Box 56, Rosny Park, Tasmania TAS 7018, Australia).

February 5-9, 1990

BRACHIOPODS (2nd International Congress), Dunedin, New Zealand. (J.D. Campbell, Geology Department, University of Otago, P.O. Box 56, Dunedin, New Zealand).

February 12-14, 1990

PNG PETROLEUM CONVENTION (Conference), Port Moresby, Papua New Guinea. (Mr. M. McWalter, First PNG Petroleum Convention, c/o PNG Chamber of Mines and Petroleum, P.O. Box 7059, Boroko, Port Moresby, Papua New Guinea).

March/April 1990

ENGINEERING GEOLOGY PROBLEMS IN RESIDUAL SOILS (International Symposium), Abidjan-Yamassoukro, Ivory Coast. Sponsored by IAEG. English and French. (G. Cougny, Laboratoire du Bâtiment et des Travaux Publics, O4BP3 Abidjan O4, Ivory Coast).

March 14-17, 1990

ASIA/PACIFIC MINING (2nd Conference), Jakarta, Indonesia. (Asia/Pacific Mining Conference Secretariat, c/o Cahners Exposition Group (S) Pte. Ltd., 1 Maritime Square, #13-02 World Trade Centre, Singapore 0409).

April 4-6, 1990

THRUST TECTONICS (International Conference), Egham, U.K. (Dr. K. McClay, Department of Geology, Royal Holloway and Bedford New College, Egham, Surrey TW20 OEX, U.K.).

May 7-8, 1990

ANNUAL CONFERENCE '90, GEOLOGICAL SOCIETY OF MALAYSIA, Ipoh (Organising Chairman, Geological Society of Malaysia, c/o Geology Department, University of Malaya, 59100 Kuala Lumpur, Malaysia).

May 6-12, 1990

PACIFIC RIM 90 (International Congress), Gold Coast, Queensland, Australia. (The AusIMM-Pacrim 90, P.O. Box 731, Toowong, Qld 4066, Australia).

May 14-18, 1990

WORLD MINING (14th Congress), Beijing, P.R. China. (14th World Mining Congress, 54 Sanlihe Road, Beijing, P.R.C.).

June 1990

GEOCHEMISTRY OF WEATHERING (2nd International Symposium), Aix-en-Provence, France. Sponsored by IAGC. (B. Hitchon, Alberta Research Council, Box 8330, Station F. Edmonton, Alberta, Canada T6H 5X2).

June 2-6, 1990

GEOANALYSIS 90 (International Symposium), Muskoka area, Canada. (Dr. A. Vander Voet, Ontario Geological Survey, 77 Grenville Street, Toronto, Ontario, Canada M7A 1W4).

June 28 - July 3, 1990

INTERNATIONAL MINERALOGICAL ASSOCIATION (15th General Assembly), Beijing, P.R. China. (Prof. Huang Yunhui, c/o Institute of Mineral Deposits, Chinese Academy of Geological Sciences, Baiwan-zhuang Road 26, Fuchengmenwai, Beijing, P.R. China).

July 1990

CAMBRIAN SYSTEM (3rd International Symposium), Novosibirsk, U.S.S.R. (Dr. J.W. Cowie, Department of Geology, University of Bristol, Queen's Building, University Walk, Bristol BS8 1RJ, U.K.).

July 2-6, 1990

GEOLOGY AND MINERAL RESOURCES OF CONTINENTAL MARGINS: ANCIENT AND MODERN (23rd Earth Science Conference, Geological Society of South Africa), Cape Town, South Africa. (Dr. P.G. Gresse, Geological Survey, P.O. Box 1739, Bellville, 7530, South Africa).

July 2-6, 1990

MINERALS, MATERIALS & INDUSTRY (IMM 14th Congress), Edinburgh, Scotland, U.K. (Secretary, Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, U.K.).

July 2-6, 1990

BASEMENT TECTONICS (9th International Conference), Canberra, Australia. (91BT ACTS, GPO Box 2200, Canberra, ACT 2601, Australia).

July 9-13, 1990

GROUNDWATER IN LARGE SEDIMENTARY BASINS (International Conference), Perth, Western Australia. (Groundwater Conference, University of Western Australia, Nedlands, Western Australia 6009).

July 19-28, 1990

INTERNATIONAL UNION OF CRYSTALLOGRAPHY (15th Congress), Bordeaux, France. (Stefan S. Hafner, University of Marburg, 3550 Marburg, Federal Republic of Germany).

July 29 - August 3, 1990

CIRCUM-PACIFIC ENERGY AND MINERALS RESOURCES (Conference), Honolulu, Hawaii. (Mary Stewart, Circum-Pacific Council on Energy and Mineral Resources, 5100 Westheimer Road, Houston TX 77056, U.S.A.).

August 6-10, 1990

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY (6th International Congress), Amsterdam, The Netherlands. English and French. (Dr. L. Primel, L.C.P.C., 58 Blvd. Lefebvre, 75732 Paris Cedex 15, France).

August 12-18, 1990

INTERNATIONAL ASSOCIATION ON THE GENESIS OF ORE DEPOSITS (8th Symposium), Ottawa, Canada. (Dr. L.M. Cumming, 601 Booth Street, Ottawa, Canada K1A 0E8).

August 12-18, 1990

MINERAL DEPOSIT MODELING (International Conference), Ottawa, Canada. Held with 8th IAGOD Symposium. Sponsored by IUGS and Unesco. (R.V. Kirkham, Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario, Canada K1A 0E8).

August 25-31, 1990

GEOCHEMICAL EXPLORATION (14th International Symposium), Prague, Czechoslovakia. (Geological Survey/UUG, Symposium on Geochemical Prospecting, Malostranske nam. 19, 118 21 Prague 1, Czechoslovakia).

August 26 - September 1, 1990

SEDIMENTOLOGY (13th International IAS Congress), Nottingham, U.K. (I.N. McCave, Dept. Earth Sciences, Cambridge University, Downing Street, Cambridge CB2 3EQ, U.K.).

August 26 - September 8, 1990

LATIN AMERICAN CONODONT SYMPOSIUM, La Paz, Bolivia and San Juan, Argentina. (M. Hunicken, Academia Nacional de Ciencias, Casilla Correo 36, 5000 Cordoba, Argentina).

September - October, 1990

IPA GRAPTOLITE WORKING GROUP (4th International Conference), Nanjing, P.R. China. (Chen Xu, Nanjing Institute of Geology and Palaeontology, Academia Sinica, Chi-Ming-Ssu, Nanjing, P.R. China).

September 17-18, 1990

GEOCHEMISTRY OF CLAY-PORE FLUID INTERACTIONS (meeting), London, U.K. (D. Savage, Fluid Processes Research Group, British Geological Survey, Keyworth, Notts. NG12 5GG, U.K.).

September 17-21, 1990

ARCHEAN (Symposium), Perth, Australia. (D.I. Groves, Department of Geology, University of Western Australia, Nedlands, Western Australia 6009).

September 18-20, 1990

HYDROGEOLOGY: Parameter Identification and Estimation for Aquifer and Reservoir Characterization (5th Canadian-American Conference), Calgary, Alberta. (S. Bachu, Alberta Research Council, Box 8330, Station F, Edmonton, Alberta, Canada T6H 5X2).

September 24-29, 1990

GEOCHRONOLOGY, COSMOCHRONOLOGY AND ISOTOPE GEOLOGY (7th International Conference), Canberra, Australia. (Organizing Committee, ICOG 7, Research School of Earth Science, Australian National University, GPO Box 4, Canberra, ACT 2601, Australia).

September 28 - October 2, 1990

BENTHIC FORAMINIFERA (4th International Symposium), Sendai, Japan. (Dr. Yokichi Takayanagi, Institute of Geology and Paleontology, Tohoku University, Sendai, 980 Japan).

1991

March 1991

ECONOMIC EVALUATION OF MINERAL RESOURCES (International Conference), Kosice, Czechoslovakia. Languages: Russian and English. (Intergeoekonomika 1991 CSSR, GEOPOND, Eng. St. Richter, Garbanova 1, 040 11 Kosice, Czechoslovakia).

April 26 - May 1, 1991

ASSOCIATION OF EXPLORATION GEOCHEMISTS (15th International Geochemical Exploration Symposium), Reno, U.S.A. (Richard B. Jones, Nevada Bureau of Mines and Geology, University of Nevada, Reno, Nevada 89557-0088, U.S.A.).

May 1991

QUANTITATIVE METHODS OF INVESTIGATION OF THE STRUCTURE OF SOILS AND ROCKS (IAEG International Symposium), Moscow. (Dr. M. Primel, LCPC, 58 Bd. Lefebvre, 75732 Paris Cedex 15, France).

August 2-9, 1991

QUATERNARY RESEARCH (13th INQUA International Congress), Beijing, P.R. China. (Secretariat, 13th INQUA Congress, Chinese Academy of Sciences, 52 Sanlihe, Beijing 100864, People's Republic of China).

September 16-20, 1991

ROCK MECHANICS (7th International Congress), Aachen, F.R. Germany. (Deutsche Gesellschaft für Erd- und Grundbau, Kronprinzenstrasse 35a, D-4300 Essen 1, F.R.G.).

September 22-27, 1991

CARBONIFEROUS-PERMIAN STRATIGRAPHY AND GEOLOGY (12th International Congress), Buenos Aires, Argentina. Language: English. (Dr. S. Archangelsky, Museo Argentino de Ciencias Naturales, Av. A. Gallardo 470, Buenos Aires 1405, Argentina).

1992

June 1992

WORLD MINING (15th Congress), Seville, Spain. (World Mining Congress, Al Ujazdowskie 1-3, PL-00583, Warsaw, Poland).

June 28 - July 1, 1992

PALEONTOLOGY (5th North American Convention), Chicago, U.S.A. (Dr. Peter R. Crane, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496, U.S.A.).

GEOLOGICAL SOCIETY OF MALAYSIA PUBLICATIONS

General Information

The Society publishes the *Buletin Geologi Malaysia* (Bulletin of the Geological Society of Malaysia) and the *Warta Geologi* (Newsletter of the Geological Society of Malaysia) which is issued bimonthly.

Papers of general interest or on the geology of the Southeast Asian region (South China, Burma, Thailand, Indochina, Malaysia, Singapore, Indonesia, Brunei and the Philippines) and also marine areas within the region are welcome for publication in the *Bulletin*. Short notes, progress reports and general items of information are best submitted to the *Warta Geologi*.

Papers should be as concise as possible. However, there is no fixed limit as to the length and number of illustrations. Therefore, papers of monograph length are also welcome. Normally, the whole paper should not exceed 30 printed pages and it is advisable that authors of papers longer than 30 printed pages should obtain the consent of the Editor before submission of the papers.

The final decision of any paper submitted for publication rests with the Editor who is aided by an Editorial Advisory Board. The Editor may send any paper submitted for review by one or more reviewers. 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 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 to and accepted by the Society.

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

Twenty-five reprints of each paper are free-of-charge. Contributors should notify the Editor of extra reprints (which are of non-profit costs) required.

All papers should be submitted to the Editor, Geological Society of Malaysia, c/o Department of Geology, University of Malaya, 59100 Kuala Lumpur, MALAYSIA

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 papers not exceeding 21 × 33 cm. 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.

Original maps and illustrations or as glossy prints should ideally be submitted with sufficiently bold and large lettering to permit reduction to 15 × 22 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 × 12 cm and preferably larger. Use of metric system of measurements (ISU) is strongly urged wherever possible.

Reference cited in the text should be listed at the end of the paper and arranged in alphabetical order and typed double-spaced. The references should be quoted in the following manner:

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

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.

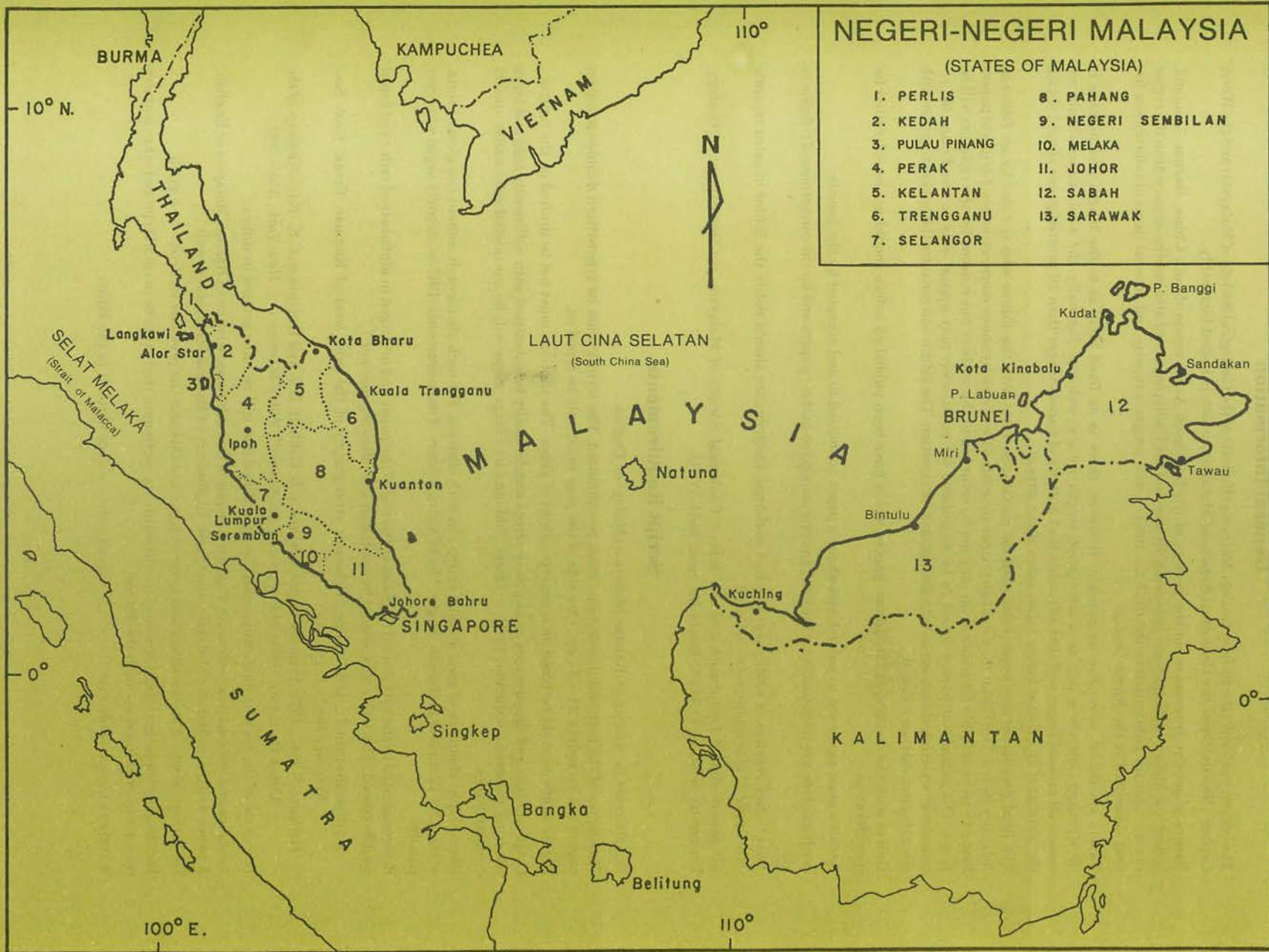
The name of the book or publication must be underlined and will be later printed in italics.

A concise and informative abstract in English is required for each paper written in Bahasa Malaysia or English. A paper written in Bahasa Malaysia must have an abstract in Bahasa Malaysia as well.

For format, kinds of subheadings and general style, use this and the previous *Bulletins* as a guide.

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.

If authors have trouble over the script requirements, please write in to the Editor.



NEGERI-NEGERI MALAYSIA

(STATES OF MALAYSIA)

- | | |
|-----------------|--------------------|
| 1. PERLIS | 8. PAHANG |
| 2. KEDAH | 9. NEGERI SEMBILAN |
| 3. PULAU PINANG | 10. MELAKA |
| 4. PERAK | 11. JOHOR |
| 5. KELANTAN | 12. SABAH |
| 6. TRENGGANU | 13. SARAWAK |
| 7. SELANGOR | |

MALAYSIA
 NEGERI-NEGERI MALAYSIA
 STATES OF MALAYSIA