

GEOLOGICAL SOCIETY OF HONG KONG
NEWSLETTER

Vol 10 No 4
(Dec 1992)



一九九二年十二月
第十卷第四期

香港地質學會通訊



GEOLOGICAL SOCIETY OF HONG KONG PUBLICATIONS

- Bulletin* No 1 (1984). Geology of surficial deposits in Hong Kong, 177 p.
YIM W W S (Editor)
- Bulletin* No 2 (1985). Geological aspects of site investigation, 236 p.
McFEAT-SMITH I (Editor)
- Bulletin* No 3 (1987). The role of geology in urban planning, 601 p.
WHITESIDE P G D (Editor)
- Bulletin* No 4 (1990). Karst geology in Hong Kong, 239 p.
LANGFORD R L, HANSEN A & SHAW R (Editors)
- Marine geology of Hong Kong and the Pearl River mouth* (1985), 96 p.
WHITESIDE P G D & ARTHURTON R S (Editors)
- Marine sand and gravel resources of Hong Kong* (1988), 221 p.
WHITESIDE P G D & WRAGGE-MORLEY N (Editors)
- Abstracts* No 1 (1983). Abstracts of papers presented at the meeting on "Geology of surficial deposits", September 1983, 79 p
- Abstracts* No 2 (1984). Abstracts of papers presented at the conference on "Geological aspects of site investigation", December 1984, 50 p
- Abstracts* No 3 (1986). Abstracts of papers presented a meeting on "Sea-level changes in Hong Kong during the last 40 000 years", May 1986, 51 p
- Abstracts* No 4 (1986). Abstracts of papers presented at the conference on "The role of geology in urban development", December 1986, 65 p
- Abstracts* No 5 (1988). Abstracts/Extended Abstracts of six papers presented at a meeting on "Future sea-level rise and coastal development", April 1988, 79 p
- Abstracts* No 6 (1990). Abstracts of papers presented at the conference on "Karst geology in Hong Kong", January 1990, 58 p
- Abstracts* No 7 (1991). Abstracts of papers presented at the international conference on "Seismicity in Eastern Asia", October 1991, 63 p
- Abstracts* No 8 (1992). "The logging and interpretation of transported soils in offshore boreholes." Proceedings of a workshop organized by the Geological Society of Hong Kong and the University of Hong Kong, June 1992, 78 p

Newsletter

Vol 1 (7 issues) 1982-3	Vol 2 (6 issues) 1984	Vol 3 (6 issues) 1985
Vol 4 (4 issues) 1986	Vol 5 (4 issues) 1987	Vol 6 (1 issue) 1988
Vol 7 (4 issues) 1989	Vol 8 (4 issues) 1990	Vol 9 (4 issues) 1991
Vol 10 (3 issues) 1992		

Prices (including postage in Hong Kong):

Bulletin No 1	\$40 (\$60)	Newsletter, single issue	
Bulletin No 2	\$50 (\$70)	Vols 1-3	\$10 (\$20)
Bulletin No 3	\$100 (\$120)	Vols 4-6	\$20 (\$30)
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Annual Society subscription: \$150 (Students \$50)

Geological Society of Hong Kong Newsletter

Vol 10 No 4 (December 1992)

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EDITORIAL

After this issue goes to the printer, I am handing over control of the Newsletter to Ron Neller. I have been actively involved in production of this publication since Volume 7 (1989), when the Editor was Ed Chau. With Volume 8 (1990) I took over all editorial responsibilities, and have tried since then to continue improvements to content, appearance and regularity.

The overall appearance of the Newsletter has, in most people's eyes, improved considerably. The change to a more reliable, better quality printer has helped. The colour front cover has been well received, and thankfully does not add a great deal to the cost.

Regularity continues to be the biggest problem with a magazine which is run entirely on a voluntary basis. Assuming that the Editor receives enough material, there are often not enough hours in the day to prepare our Newsletter. Usually there are just not enough articles to make up a reasonable minimum of 20 pages. Now that I am no longer Editor, I hope I can help by writing articles!

In this issue we have an excellent review by Ron Neller which proves that there is plenty of geological research in Hong Kong. All we need now is for this work to generate more articles for the Newsletter.

Keith Nicholls shows what can be produced when a geologist questions what he finds. Observations such as these are being made every day in Hong Kong, but nobody is writing them down. I can only appeal once again to the consultants and contractors out there to dip into their resources and see what they can produce for us.

The extensive resources of the Geological Survey have again helped with the preparation of the Newsletter. Most of the photographs have come from the archive of over 5,000 slides. I would like to thank the Geotechnical Engineering Office for their support of the Newsletter, which has made my job so much easier.

Finally, I would like to extend my very best wishes to the new Editor, with the hope that our Newsletter will continue to thrive.

Stearns
21.7.1993

CURRENT EARTH SCIENCE RESEARCH IN ACADEMIC INSTITUTIONS IN HONG KONG

R J Neller

The Chinese University of Hong Kong, Sha Tin, New Territories, HONG KONG

The following is a summary of geologic, geomorphologic and related earth science research currently being undertaken within academic institutions in Hong Kong.

The survey includes only those institutions funded by the University and Polytechnics Grants Committee and includes the University of Hong Kong, The Chinese University of Hong Kong, The Hong Kong University of Science and Technology, Hong Kong Polytechnic, City Polytechnic of Hong Kong and the Hong Kong Baptist College.

This summary is not confined to research within the territorial boundary of Hong Kong, rather it includes research worldwide that is being undertaken by Hong Kong academics and research students (at both the Master and Ph.D. levels). This provides a more comprehensive view of the capabilities and research interests of the various institutions concerned.

For brevity, only those articles published or accepted for publication since 1990 are included in this summary. More complete lists of publications on a particular research theme can be obtained from the authors or departments concerned.

THE UNIVERSITY OF HONG KONG

Department of Geography and Geology

Donoghue S L, BSc(hons), PhD(Massey University, NZ)

Lecturer

Late Quaternary volcanic stratigraphy of the Southeastern Mt Ruapehu Ring Plain, New Zealand

Recently completed PhD thesis in physical volcanology, focusing on establishing a stratigraphy and chronology (0-22,500 years BP) of late Quaternary tephra and lahar deposits sourced from Mt. Ruapehu (Tongariro Volcanic Centre, NZ) and methods for fingerprinting andesitic tephra of Tongariro Volcanic Centre.

Publications

Palmer B A, Purves A M, Donoghue S L (in press). Controls on accumulation of a volcanoclastic alluvial fan, the Whangaehu Fan, Ruapehu Volcano (North Island, New Zealand). *Bulletin of Volcanology*

Donoghue S L (1991). Volcanic hazards at Mount Ruapehu. *Geological Society of New Zealand Miscellaneous Publication 59a* p 53

Donoghue S L (1991). The Tufa Trig Formation: Recent (0-1,800 Years BP) eruptives from Mount Ruapehu. *Geological Society of New Zealand Miscellaneous Publication 59a* p 54

Donoghue S L, Hodgson K A, Neall V E & Palmer A S (1991). Volcanic hazards - southeastern ring plain of Ruapehu Volcano (Field Trip Guide). *Geological Society of New Zealand Miscellaneous Publication 56b* p 56-88

Donoghue S L, Stewart R B & Palmer A S (1991). Morphology and chemistry of olivine phenocrysts of Mangamate Tephra, Tongariro Volcanic Centre, New Zealand. *Journal of the Royal Society of New Zealand* Vol 21 No 3 p 225-236

Donoghue S L (1990). Lahar stratigraphy of the southeastern Mount Ruapehu ring plain. *Geological Society of New Zealand Miscellaneous Publication 50a* p 50

Lee Cho Min, MPhil Candidate (part-time, completed)

(See also Hong Kong Polytechnic)

The tectonic framework of Hong Kong and vicinity and its relationship to regional seismicity

Using data obtained from numerous sources a systematic classification has been established for fold and fracture structures in Hong Kong. Features of these fracture sets, such as *mechanical properties and other characteristics* of the component faults, their length and distribution, are examined. A dynamothermal metamorphic zone and the ductile shear belts in Hong Kong are described. These details are then placed in regional context. The thesis was supervised by Dr D R Workman and Dr W W S



C M Lee and D R Workman studying the mylonitized contact between the Tsing Shan granite pluton and the Jurassic Tuen Mun Formation meta-andesites

Yim and was accepted for the degree of MPhil in 1992.

Publications

- Lee C M & Workman D R. Geological controls of seismic activity in Hong Kong. *Proceedings of the International Conference on Seismicity in Eastern Asia, Geological Society of Hong Kong* (in preparation)
- Lee C M & Workman D R. The impact of regional earthquakes in Hong Kong. *Proceedings of the International Conference on Seismicity in Eastern Asia, Geological Society of Hong Kong* (in preparation)
- Shui T, Lee C M & Chan C H (1991). Research on the Tsing Shan ductile brittle shear belt, Hong Kong. *Science Bulletin* Vol 7 No 1 p 30-36 (in Chinese)

Peart, Mervyn Richard, BA (Manc), PhD (Exon)

Lecturer

Hydrological and environmental monitoring with special reference to Hong Kong

A study involving establishing and instrumenting a small drainage basin. Water quality and sediment production are being examined. Funded by CRCG and other internal funds. The project is on-going.

An investigation of a soil pipe system in Hong Kong

In a small drainage basin a soil pipe system is being monitored to examine water chemistry and sediment production. The project continues and is linked to the above mentioned research. The project is UPGC funded.

Publications

- Peart M R (1992). Afforestation and sediment production in Hong Kong. In: *Sediment management. Proceedings '5th International Symposium on River Sedimentation, Karlsruhe* Vol 2 p 1071-1078
- Peart M R (1990). Soil erosion and suspended sediment production in Hong Kong: development of an assessment strategy. In: *Research needs and applications to reduce erosion and sedimentation in tropical steepplands. Proceedings of the Fiji Symposium, June, IAHS publication No 192* p 84-93

So, Albert Chak-Lam, BA (Hong Kong), BSc/Special (London), MA (Hong Kong), PhD (London)

Reader

Beach changes in Hong Kong

A study of beach changes in general and the effect of typhoons on the beach sand budget in particular, yielding a data base for designing beach conservation.

Publications

- So C L (1990). Some problems of beach changes in Hong Kong. *Proceedings of International Symposium on the Coastal Zone (Beijing)* p 82-92

Suspended sediment concentrations associated with swash and backwash

An investigation into the spatial and temporal variations of suspended sediment loads in *intertidal zones, providing an evaluation* of the contribution of sediment suspension and re-suspension to cut and fill in beach compartments.

Tomboles

A research project on the origin and morphological changes of linking spits with a view of assessing their future development, organized and conducted on a global basis for the Commission on the Coastal Environment, International Geographical Union.

Coastal and drainage development in and around the Pearl River Delta

An investigation into deltaic changes and flood hazards under marine and fluvial processes

in an attempt to identify environmental assets and constraints, conducted jointly with the Institute of Coast and Estuary, Zhongshan University.

Slope instability and landslide hazards

A study of landslide susceptibility and remedy in Hong Kong through monitoring soil moisture and associated changes brought about by rainstorm activity on slopes and the generation of data for slope conservation design, with a phase of the project sponsored by the International Atomic Energy Agency.

Other publications

- Peng C J, Sit F S & So C L (1991). *A geography of Hong Kong and Macau*. Commercial Press, Beijing, 289 p
- So C L & Chan K W (Ed) (in press). *Geographical research and development*. Hong Kong University Press, c 200 p
- So C L & Lam K C (in press). History of geomorphology: Hong Kong. In: Walker H J & Grabau W (Eds). *History of Geomorphology*, Wiley

Wang Wei, BSc (South China Normal), MSc (South China Normal)

PhD Candidate (full time)

Baybars in Southeast Lantau

A geomorphological study of the origin and changes of baybars in Silver Mine Bay, Pui O (cover photograph) and Cheung Sha, using data derived from field surveys, boreholes and laboratory analyses of sediment samples. The research is supervised by Assoc Prof C L So.

Workman, David Richard, BSc, PhD (Leeds), CGeol, FGS

Senior Lecturer in Geology

Study of ductile-brittle deformation of rocks in Hong Kong and nearby areas

A joint project with Lee Cho Min (Hong Kong Polytechnic), staff of the Institute of Geology, Zhejiang Province, the State Seismological Bureau of China, and the Micro-structure laboratory of the Chinese Academy of Geological Sciences. Funded by the Hui Oi Chow Trust and the National Science Foundation of China.

The study aims to determine the characteristics, depth and thermodynamic conditions of brittle and ductile deformation in the main tectonic belts in Hong Kong and vicinity, including investigations of the nature, slip sense and rate of tectonic movement.

Geology and mineral resources of the Indochina area

Compilation of national data into a regional tectonic framework.

Publications

- Workman D R (1990). *Lao People's Democratic Republic - mineral resources of the ESCAP region*. Vol 7. Publication E. 90 IIF, 19 pages, 2 maps, United Nations
- Workman D R (1991). The South China Sea Basin, its mineral resources and their exploitation. *Proceedings of the Conference on Territorial Claims in the South China Sea, Centre of Asian Studies, University of Hong Kong* p 9-20
- Workman D R (in press). Laos; Thailand; Indochina (with H Fontaine); Vietnam (with H Fontaine). In: Moores E M & Fairbridge R W (Eds). *The encyclopedia of World Regional Geology, Part II: Eastern Hemisphere*. Van Norstrand Reinhold, New York

Yee, Samuel Chin-ming, BA (Hong Kong) MPhil Candidate (part time)

Beach changes on Lamma Island.

An investigation into beach changes on selected beaches in Central Lamma, applying field techniques in beach levelling and laboratory tests and analyses of beach sediment samples. The research is supervised by Assoc Prof C L So.

Yim, Wyss Wai-Shu, BSc, MPhil (London), PhD (Tasmania), DIC, Dip Min Tech (Camborne), MIMM, CEng, FGS, CGeol, MHKIE, FHKMETS Lecturer

Cainozoic geology of offshore sediments in Hong Kong and applications

To study the Cainozoic geological history of Hong Kong through the offshore sedimentary record and to examine applications to the future coastal development of Hong Kong.

Publications

- Pearl M R & Yim W W S (1992). Flood hazard in the coastal land reclamation of Hong Kong. *Proceedings second US-Asia conference on engineering for mitigating natural hazards damage, June 1992, Jogjakarta* p F14/1-8
- Wu Z J, Yu K F & Yim W W S (in press). Palynological evidence for Late Quaternary palaeogeography in Hong Kong. *Proceedings conference on geography of research*

and development, Hong Kong, Department of Geography & Geology, The University of Hong Kong (in Chinese)

- Yim W W S (in press). Future sea-level rise in Hong Kong and possible environmental effects. *Proceedings international workshop on climatic change, sea level, severe tropical storms, and associated impacts. United Nations Environment Programme. Cambridge University Press, Cambridge*
- Yim W W S (in press). A discussion on future sea-level rise and coastal land reclamations for urbanization in Hong Kong. *Joint School Geography Association Twentieth Anniversary Annual*



Dredging the trench for the Eastern Harbour Crossing in 1987. Source of the shell sample analyzed by Yim et al (1990). Photograph courtesy of R Shaw

- Yim W W S & Yu K F (in press). Evidence for multiple Quaternary transgressions in a bore-hole from the West Lamma Channel, Hong Kong. *Proceedings third international conference on the evolution of the East Asian environment since the Mid-Tertiary. Centre of Asian Studies, University of Hong Kong*
- Yim W W S (1992). Late Quaternary environmental change in eastern Victoria Harbour, Hong Kong. *Second international conference on Asian marine geology, August 1992, Tokyo*, p 03/4/1-2
- Yim W W S (1992). The offshore record of Quaternary sediments in Hong Kong. *Twenty-ninth International Geological Congress, August 1992, Kyoto*, p 383
- Yim W W S (1992). Offshore Quaternary sediments and their engineering significance in Hong Kong. *Twenty-ninth International Geological Congress, August 1992, Kyoto*, p 855

- Yim W W S (1992). The logging and interpretation of transported soils in offshore boreholes. *Hong Kong Engineer Vol 20 No 8* p 11-14
- Yim W W S (Ed) (1992). The logging and interpretation of transported soils in offshore boreholes. *Geological Society of Hong Kong Abstracts No 8* p 78
- Yim W W S (1992). A bibliography for the logging and interpretation of transported soils in offshore boreholes. In: Yim W W-S (Ed). The logging and interpretation of transported soils in offshore boreholes. *Geological Society of Hong Kong Abstracts No 8* p 61-68

- Yim W W S (1992). Future sea-level rise and coastal land reclamations for urbanization in Hong Kong. *Bulletin Hong Kong Meteorological Society Vol 2 No 2* p 3-11
- Yim W W S (1991). Hong Kong. *Annual Report International Geological Correlation Programme Project 274 Coastal Evolution in the Quaternary, Supplement, UNESCO*, p 26
- Yim W W S (1991). Young age bias of radiocarbon dates

in pre-Holocene marine sediments. In: R Gillespie (Ed). *Quaternary dating workshop 1990. Department of Biogeography & Geomorphology, Australian National University*, p 13-14

- Yim W W S (1991). Relative sea-level change and long term ground settlement in coastal land reclamations - their assessment and future monitoring. In: P Blacker (Ed). *Reclamations - important current issues. Geotechnical Division, Hong Kong Institution of Engineers*, p 139-151
- Yim W W S (1991). Future sea level rise and coastal land reclamations for urbanization in Hong Kong. In: R Frassetto (Ed). *Impact of sea level rise on cities and regions. International Centre 'Cities on Water', Venice*, p 136-142
- Yim W W S (1991). Coastal management problems associated with land reclamations in Hong Kong. In: A V Arakel (Ed).

Proceedings of 1990 workshop on coastal zone management. Geo-Processors Pty Ltd, p 331-334

Yim W W S (1991). Coastal engineering and Quaternary research in Hong Kong. In: J Chen & J L Beck (Eds). *Proceedings international workshop on infrastructure '91, Hong Kong*, p 559-575

Yim W W S & He X X (1991). Occurrence of foraminifers in Late Quaternary sediments at the East Dam site, High Island, Hong Kong. *Journal Southeast Asian Earth Sciences* Vol 6 p 1-11

Yim W W S & Yu K F (1991). Late Quaternary palaeoenvironments of Hong Kong. *Abstracts, third international conference on the evolution of the East Asian environment since the Mid-Tertiary, Kunming*, p 4-5

Yim W W S & Yu K F (1991). Late Quaternary sea-level changes in Hong Kong. *Abstracts, thirteenth international union for Quaternary research congress, Beijing*, p 411

Apsimon H, Thornton I, Fyfe W, Hong Y, Legget J, Nriagu J O, Pacyna J M, Page A L, Price R, Skinner B, Steinnes E & Yim W W S (1990) Anthropogenically induced global change. *Global & Planetary Change* Vol 2 p 97-111

Quantification of microfabric of offshore soils of Hong Kong

A joint project with Dr N K Tovey (School of Environmental Sciences, University of East Anglia). Algorithms in image analysis will be developed; parameters will be related to mechanical properties and geological history to assist coastal land reclamations including the new airport.

Publication

Yim W W S (1992). Evidence from stratigraphy, fossils and dating. In: W W S Yim (Ed). The logging and interpretation of transported soils in offshore boreholes. *Geological Society of Hong Kong Abstracts* No 8 p 19-30

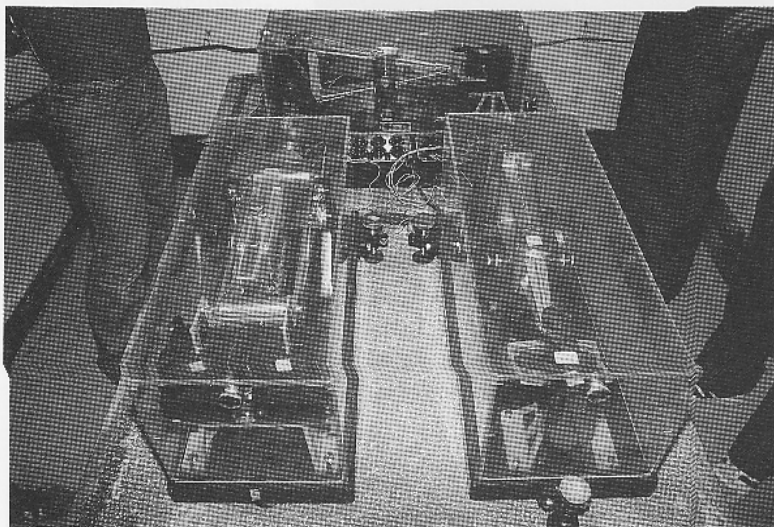
Analysis of the seismic record in Hong Kong and Southern China since 1960

A joint project with Dr P F Chen (Research Associate, Department of Geography & Geology, The University of Hong Kong). To study the seismic record in Hong Kong and southern China in order to determine the possible causes of seismicity and to obtain information on crustal stability.

Publications

Yim W W S (1991). Tide gauge record and crustal stability in the vicinity of the Pearl River mouth. In: International conference on seismicity in Eastern Asia. *Geological Society of Hong Kong Abstracts* No 7 p 52-53

Yim W W S & Chen P F (1991). An analysis of micro-seismic events in Hong Kong during the period 1/11/1979 to 31/7/1985. In: International conference on seismicity in Eastern Asia. *Geological Society of Hong Kong Abstracts* No 7 p 53



Three-component long-period seismometer in southern Hainan Island. Photograph courtesy of R L Langford

Yim W W S, Ivanovich M & Yu K F (1990). Young age bias of radiocarbon dates in pre-Holocene marine deposits of Hong Kong and implications for Pleistocene stratigraphy. *Geo-Marine Letters* Vol 10 p 165-172

Yim W W S & Yu K F (1990). Occurrence of dolomitic limestone in Tolo Harbour and speculation on the age of its subaerial exposure. In: R L Langford, A Hansen & R Shaw (Eds). *Karst geology of Hong Kong*. *Geological Society of Hong Kong Abstracts* No 6 p 21

Geology of placer deposits

To study the genesis of placer deposits by examining their heavy mineral provenance and stratigraphic control.

Publications

Yim W W S (1991). Ancient landscapes of southeastern Australia and Precambrian ion-probe ages of detrital zircons from Lake Tyrell, Victoria. *South Australia field trip report*, *Geological Society, Australian National University*, p 29-30

Yim W W S (1991). Tin placer genesis in

northeastern Tasmania. In: M A J Williams, P De Deckker & A P Kershaw (Eds). *The Cainozoic in Australia: a reappraisal of the evidence. Special Publication No 18, Geological Society of Australia Incorporated* p 235-257

Yim W W S (1990). Geochronology of stanniferous placers in northeastern Tasmania, Australia. *Abstracts, seventh international conference on geochronology, cosmochronology and isotope geology. Australian National University, Canberra*, p 113

Other publications

Yim W W S, Ng C Y & Thornton I (1992). Follow-up stream sediment geochemical reconnaissance surveys in the vicinity of Tai Mo Shan, New Territories, Hong Kong. *Abstracts, Association of Southeast Asian Institution of Higher Learning Seminar on 'The role of the ASAIHL in combating health hazard of environmental pollution', 17-20 June, The University of Hong Kong*, p 58

Miki T, Matsueda H & Yim W W S (1990). Petrography and geochemistry of Cretaceous red beds in Hong Kong. *Journal Southeast Asian Earth Sciences* Vol 4 p 99-106

THE CHINESE UNIVERSITY OF HONG KONG

Department of Geography

Cheung, Paul Chi-tak, BSc (National Taiwan), MSc (Windsor), MIMM, CEng, FGS, CGeol

Geotechnical Engineering Office

PhD Candidate (part-time)

Quaternary depositional environments of Mirs Bay

An investigation of the Quaternary depositional environments of Mirs Bay using a combination of seismic, borehole and laboratory data. Various techniques of time-stratigraphic correlation will be examined for consistency and robustness. The research commenced in 1992 and is supervised by Dr R J Neller.

Leung, Dominic Yu-fai, BSocSc (CUHK)

MPhil Candidate (part-time, completed)

Trail degradation in the Pat Sin Leng Country Park

A field and laboratory examination of the environmental site characteristics that account for variations in physical degradation along a hiking trail in the Pat Sin Leng Country Park.



Pat Sin Leng range, north New Territories. Photograph courtesy of K W Lai

The research commenced in 1990 and is supervised by Dr R J Neller.

The thesis is currently under examination.

**Neller, Ronald James, BA(Woll),
PhD(UNE)**

Lecturer

Palaeogeographical evolution of Hong Kong's offshore environment

A joint project with Drs R Shaw (Geotechnical Engineering Office), R B Owen (Hong Kong Baptist College) and L Owen (London University), that aims to develop a model of the evolution of Hong Kong's offshore environment. The study initially examines the sedimentological, geochemical and palaeological properties of sediments derived from boreholes, and will eventually correlate stratigraphies using both these and seismic data. Funding for geochemical analyses has been made possible via a UPGC Direct Grant for Research, 1991/92, The Chinese University of Hong Kong.

Publications

Neller R J (1992). Persistence of error: "Soils Ain't Soils, Sol". Geological Society of Hong Kong Newsletter Vol 10 No 4 p

Neller R J, Shaw R & Owen R B (1992). The palaeogeographical evolution of Hong Kong's offshore environment. *Paper presented to the 27th International Geographical Congress, Washington, August*

Shaw R & Neller R J (1991). A preliminary assessment of the variations in sedimentology and geochemistry of offshore sediments in Hong Kong. *Paper presented to the International Union for Quaternary Research, XIII International Congress, Beijing, August*

Fluvial geomorphology of Upper Amazon rivers

An multi-national, interdisciplinary study of the impact of fluvial processes on forest regeneration and management in eastern Peru, and the Quaternary evolution of upper Amazon intraforeland basins.

Data are obtained by a combination of satellite imagery and field work, and the project is funded by the Academy of Finland.

Publications

Kalliola R, Salo J, Puhakka M, Rajisilta M, Häme T, Neller R J, Räsänen M E & Danjoy Arias W A (1992). Upper Amazon channel migration: implications for vegetation perturbation and succession using bitemporal land-sat MSS images. *Naturwissenschaften* Vol 79

p 75-79

Neller R J, Salo J S & Räsänen M (1992). On the formation of blocked valley lakes by channel avulsions in upper Amazon foreland basins. *Zeitschrift für Geomorphologie* Vol 36 No 4 p 401-411

Räsänen M, Neller R J, Salo J & Jungner H (1992). Recent and ancient fluvial depositional systems in the Amazonian foreland basin, Peru. *Geological Magazine* Vol 129 No 3 p 293-306

Urban fluvial processes

Catchment-based studies in a variety of climatic environments that examines the stability of urban river channels. A combination of paired catchment studies, historical morphologic evidence and sedimentary depositional records are used to monitor and reconstruct the impact of urbanization on fluvial systems.

Publications

Neller R J (In press). The concentration of suspended sediments in small Turku catchments: implications for the quality of Finnish urban runoff. *Aqua Fennica*

Stock E C & Neller R J (1990). Geomorphic transitions and the Brisbane river. In: *The Brisbane River - a source book for the future*. Australian Littoral Society, p 43-54

HONG KONG BAPTIST COLLEGE

Geography Department

**Owen, Richard Bernhart, BSc (Sheff),
PhD (Lond), FGS**

Lecturer

Sedimentology and palaeogeography of East African Rift Lakes

A series of studies of the modern sediments and diatoms from several lakes in the East African Rift system. Various facies types have been identified and their distributions are related to tectonic structures. A large number of cores have been recovered and studied by lithological, geochemical and microfossil techniques in order to trace Holocene lake level changes. Funding is provided by the British Overseas Development Administration and the International Development Research Centre of Canada.

Publications

Owen R B & Crossley R (In press). Spatial and temporal diatom variability in Lake Malawi and ecological implications. *Journal of*

Paleolimnology

Williams T M & Owen R B (In press). Geochemistry and origins of lacustrine ferromanganese nodules from the Malawi Rift, Central Africa. *Geochimica et Cosmochimica Acta*

Owen R B, Crossley R, Williams T M & Sefe F (1992). Facies distributions associated with a submerged fault-controlled platform in Lake Malawi, Central Africa. *Journal of African Earth Science* Vol 13 p 449-456

Renaut R W & Owen R B (1991). Shore-zone sedimentation and facies in a closed rift-lake: The Holocene beach deposits of Lake Bogoria, Kenya. In: Anadon P, Cabrera L & Kelts K (Eds). *Advances in lacustrine facies analysis*. Special Publication of the Inter-

Palaeogeographical evolution of Hong Kong's offshore environment

A joint project with Drs R Shaw (Geotechnical Engineering Office), R Neller (The Chinese University of Hong Kong) and L Owen (London University). The research examines the palaeogeography of Hong Kong's marine areas. R B Owen will be concentrating on studies of microfossils from core sediments.

Publications

Neller R J, Shaw R & Owen R B (1992). The palaeogeographical evolution of Hong Kong's offshore environment. *Paper presented to the 27th International Geographical Congress, Washington, August*



Fieldwork in the Amazon jungle

national Association of Sedimentologists p 177-197

Owen R B & Crossley R (1991). Recent sedimentation in the Malawi Rift basin, Africa. *Abstract, 13th international sedimentology congress, August 1990*, p 113

Sedimentology and diatoms of the saline lakes of British Columbia

A study of the evaporite deposits of several diverse saline lakes of the Fraser Plateau in British Columbia, Canada. Studies of diatom dissolution are also in progress. Funding has been provided by a Faculty Research Grant from the Hong Kong Baptist College.

Publications

Renaut R W & Owen R B (In press). The saline lakes of the Fraser Plateau, British Columbia, Canada. In: Gierlowski-Kordesch E & Kelts K (Eds). *The geological record of Lake Basins*. Cambridge University Press

**HONG KONG
POLYTECHNIC**

*Department of Civil and
Structural Engineering*

**Atherton, Maurice Joseph,
BSc, DIC, MHKIE, FGS, FIQ
Senior Lecturer**

and

**Lee, Cho Min, MPhil(HK)
Lecturer**

Stratigraphy of Hong Kong

A joint project with the Nanjing Institute of Geology and Palaeontology, Academia Sinica, to collect and identify the fossils of Hong Kong and to relate the fossils to local stratigraphy. Funding was made possible through the Hong Kong Polytechnic (1988-1990).

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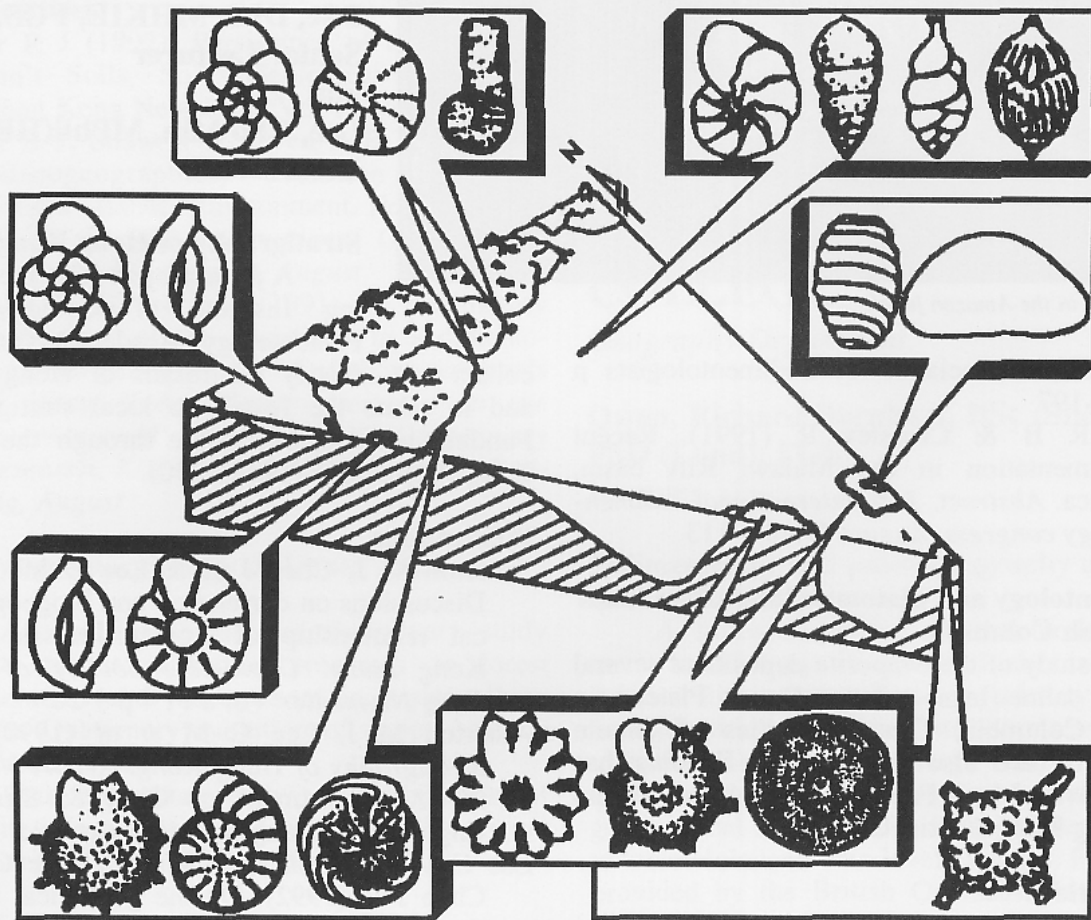
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The Lighter Elements



“Microbes which can infect a slice of cheesecake”

Courtesy of Alan Fyfe

(distribution of larger foraminiferal assemblages in the northwestern South China Sea)

ORIGIN OF SOLUTION CAVITIES IN THE YUEN LONG FORMATION

K H Nicholls

Advisory Division, Geotechnical Engineering Office, 8/F Civil Engineering Building, 101 Princess Margaret Road, KOWLOON

ABSTRACT

A model for the development of solution features involving the presence of organic carbon is proposed for the Yuen Long area. Evidence from a borehole is described confirming the presence of organic materials at substantial depths within the rocks of the area. Structural considerations, and the likely role of organic carbon in the solution process, imply that the features of the Yuen Long area are of vadose zone origin.

INTRODUCTION

Following the disclosure that marble is present below a large area of the North Western New Territories, (Ha et al 1981), considerable effort has been made to investigate the geological and geotechnical characteristics of karstic features found within Carboniferous strata of the Yuen Long area. The recent publication (Langford et al 1990) of Conference Proceedings dedicated to the subject has substantially added to our understanding of the nature of the features. The strong influence of karstic bedrock on the engineering of surface structures in terms of foundation design and construction as a result of cavity development is now well known.

A number of authors have discussed the origin of the solution features, and suggest the following basic mechanisms for development:

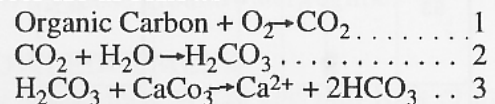
- solution in groundwater (Shaw 1990; Langford et al 1989)
- groundwater flow (Yuen 1990)

To date, the potential involvement of organic carbon in establishing the solution mechanism at depth in Hong Kong strata has not been discussed. It has been shown elsewhere (Wood 1985) that the presence of particulate carbon, introduced into a rock mass by recharging groundwater, may cause an acceleration of the rate of solution in carbonate rocks. Shaw (1990), noted the rapid solution on surfaces buried beneath soil horizons.

THE INFLUENCE OF ORGANIC MATERIAL IN CARBONATE SOLUTION

The basic mechanisms of solution involving organic materials were outlined by Wood

(1985). The chemical equations for the dissolution process are as follows :



Most carbonate rocks are unlikely to contain sufficient organic material, and are likely to be similarly restricted in the required influx of dissolved organic carbon to allow the solution process outlined above to proceed. Wood (1985) suggests that this apparent restriction can be overcome if the source of the carbon is fine particulate organic material transported into the unsaturated (vadose) zone by recharging groundwater. This carbon may have a surface derived origin associated with downward percolating groundwater, or, in the case of Yuen Long may be derived from graphite schist strata known to be associated with the Carboniferous rocks of the area.

The carbon may take the form of particulate organic carbon, dissolved organic carbon, or carbon sorbed on mobilised inorganic material (clay particles for example). This process allows the groundwater at depth within a rock mass to become thermodynamically subsaturated with respect to calcite. Thus solution occurs along deeply buried joints and fractures. It is important to note that having introduced carbon at substantial depths within a vadose zone rock mass, following oxidation (equation ...1, above), the concentrations of carbon dioxide produced can be hundreds of times the equivalent concentration associated with formation of carbonic acid in the atmosphere.

BOREHOLE EVIDENCE FOR ORGANIC MATERIAL

Figure 1 shows part of a borehole log drilled to investigate foundation strata for a bridge structure to the south of Yuen Long. The section shown covers the strata from 60 m to 80 m below ground level. The poor rock mass quality of the strata is immediately apparent, associated with intense weathering and substantial faulting.

Between depths of 40.51-42.31 m and (as shown) 62.20-62.50 m cavity/fissure infill

Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
100				N = 18	59.70 60.20			[Symbol: Triangles]	V	Medium dense to dense brown completely decomposed sandy GRAVEL of siltstone, sandstone in a clayey matrix (Fault Breccia?)
100				N = 18	61.20 61.70	62.20				
							62.20		V	Black mottled grey loose slightly clayey sandy GRAVEL, completely weathered (fissure infill)
100				N = 27	62.70 63.20	62.50				
							64.10		II	Loose to medium dense brown mottled grey sandy GRAVEL with occasional cobbles
53		0			64.24	64.25		II-V		
							66.34		II-IV	Moderately weak white MARBLE Weak, grey mottled olive brown slightly to completely weathered SILTSTONE
40		0		N = 6	65.80 66.34	66.34				
							67.85		V	Stiff grey sandy silty CLAY with occasional gravel, thinly laminated, completely decomposed siltstone
100				N = 206	68.00 68.50					
										Stiff brown gravelly CLAY, residual soil of decomposed SILTSTONE
100				N = 11	69.50 70.00					
							73.70		VI	
100				N = 33	71.70 72.20					
										Moderately light brown very fine grained highly fractured quartzitic SILTSTONE (Lok Ma Chau Formation)
100				N = 204	73.20 73.70					
							76.39		III	
55	0	0			74.70 75.20					
70	0	0			76.39					
77	0	0			77.07					
66	0	0			78.07					
80	15	15			78.93 79.53					

Figure 1 - Part of a drillhole record for a bridge structure to the south of Yuen Long, showing the presence of organic material from 62.2-62.5 m depth

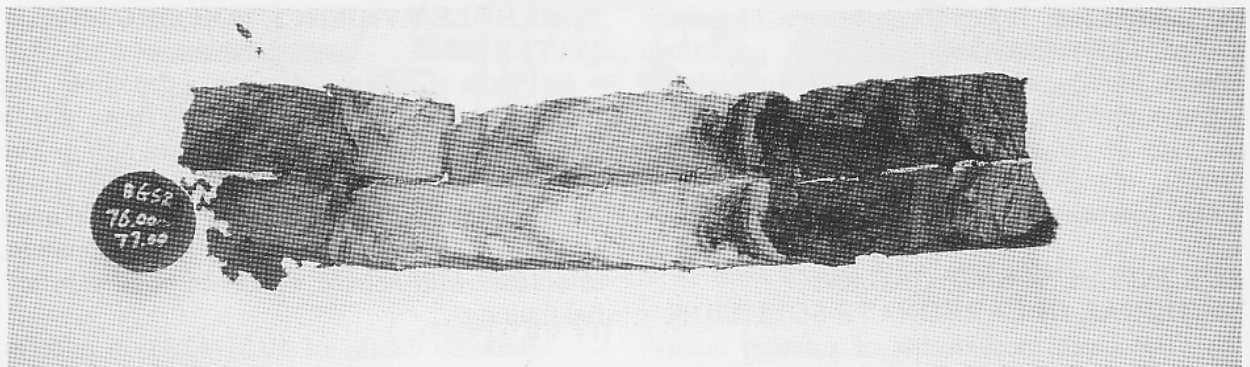


Plate 1 - Cavity infill material at 76.00-77.00 m in a borehole from Yuen Long

materials were encountered. A notable feature of these materials is the significant clay content, and black colour, which is thought to indicate the presence of carbon. Similar descriptions of black organic materials have been reported by Frost (1992) in other boreholes in the area. Plate 1 shows a split Mazier sample recovered from a depth of 77 metres below ground level, which is described by Yuen (1990) and Frost (1992). Clear evidence of organic cavity infill material is apparent.

INFLUENCE OF STRUCTURAL CONTROL ON SOLUTION FEATURES

A number of authors have described the influence of joint control on development of the Yuen Long karst features (Yuen 1990; Frost 1989). This is indicative of a vadose origin, and gives rise to the typical karstic features shown on Figure 2. The influence of the rock mass structure on development of solution cavities is clearly shown on Plate 2, a photograph of an abandoned karst channel, intimately associated with a sub-vertical fault plane, seen at Heng Gang, Shenzhen.

Solution features associated with phreatic development are more likely to be planar in origin, reflecting the form of the regional groundwater table (Shaw 1990), such as those associated with doline development in South Africa (Parrish 1985).

CONCLUSIONS

The presence of organic materials at depth within the Yuen Long Formation has been demonstrated. Consideration of the possible role of organic material in the solution process, together with the presence of structural control on the solution cavity network implies a vadose zone origin for the solution cavities. The geochemical and structural conditions which are capable of giving rise to dissolution of the marble are thought to be restricted to a timespan when the underlying strata would have been subject to a vadose groundwater regime.

ACKNOWLEDGEMENT

My thanks to K W Lai and Phil Kirk of the Hong Kong Geological Survey for discussion relating to the core materials. This paper is published with the permission of the Director of Civil Engineering, Hong Kong Government.

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Plate 2 - Karst channel developed along a sub-vertical fault plane, Shenzhen

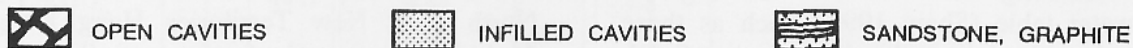
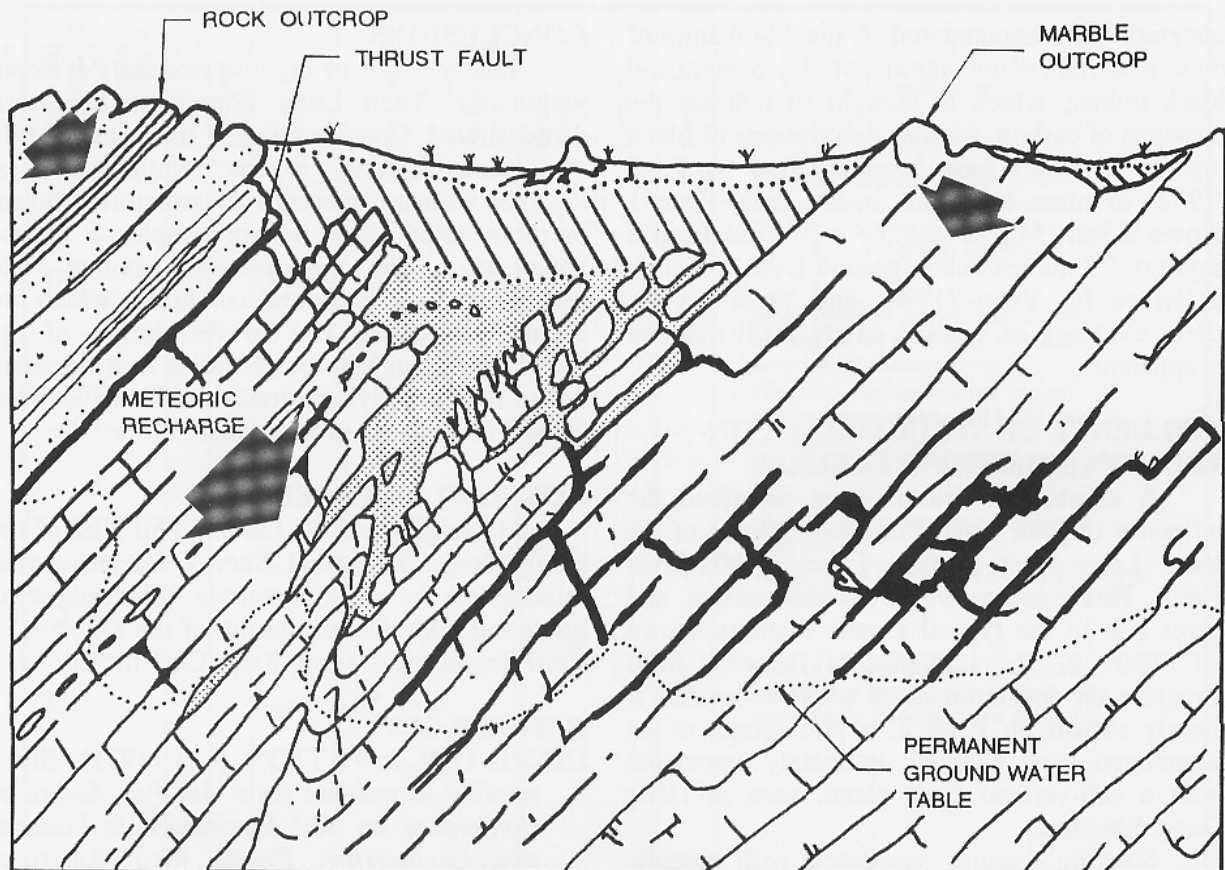


Figure 2 - Development of vadose zone solution cavities (modified from Deere & Patton 1971)

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PERSISTENCE OF ERROR-‘SOILS AIN’T SOILS SOL’

A COMMENT ON THE WORKSHOP “THE LOGGING AND INTERPRETATION OF TRANSPORTED SOILS IN OFFSHORE BOREHOLES”

R J Neller

The Chinese University of Hong Kong, Sha Tin, New Territories, HONG KONG

The title of this recently organised workshop perpetuates the misuse of a simple, commonly used term, and it is somewhat disappointing that a Department of Geography and Geology should be in part responsible for this misuse. I refer to the use of the term “transported soil” to describe sediments that have been deposited in what is now the offshore environment of Hong Kong.

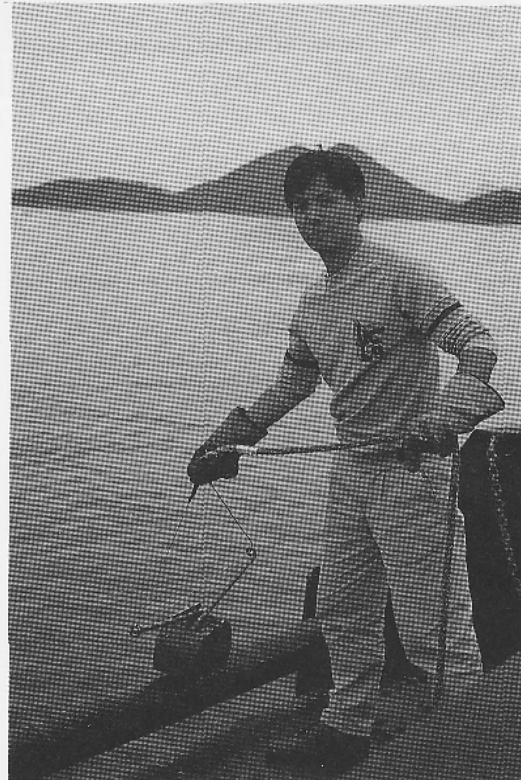
Admittedly “soil” is a difficult term to define and no single, universally accepted definition exists. Indeed, during a quick recent review of numerous texts on the subject I found that many authors avoid defining the term. An engineer’s view differs markedly from that of a pedologist, which differs again from that of a geographer. The problem with defining soil is further complicated by the transitional nature of soil boundaries, both with other soil types and with non-soil environments.

Following the Russian tradition, many soil scientists view soil as “.....weathered mineral and organic matter found in genetically related horizons in response to subaerial processes.” (Corbett 1969). The action of “pedogenic processes” is also frequently referred to - “Most soil scientists now recognize the soil as a natural body, clearly distinguished from inert rock material by....a structural organization which reflects the action of pedogenic processes.....” (White 1979 p 7). Others, however, such as the United States Department of Agriculture, see no reason to infer horizonation, or if horizons are present, that these need be genetically related. “Soil,...does not need to have readily discernable horizons,....” (USDA 1960), as for example, an Entisol. Thus, marsh deposits, built up by successive yet genetically unrelated depositional events, can be defined as a soil.

Does this mean then that offshore sediments, reflecting a variety of depositional environments, and exhibiting genetically unrelated horizons, are also soils? Not at all!

One characteristic of a soil that is generally agreed upon is that “Areas are not considered to have soil when the surface is permanently covered deeply enough by water that only floating plants are present,....” (USDA 1960). Put in another way, “....soil is at the interface

between the atmosphere and lithosphere....” (White 1979 p 4), and though evidence of pedogenic processes, such as horizonation, need not be readily apparent (because of young age or inappropriate material), pedogenesis is nevertheless possible. A soil should have “....a capacity to respond to environmental change which may alter the balance between gains and losses within the profile, and predetermine the formation of a different kind of soil in equilibrium



Seabed grab sampling by the Hong Kong Geological Survey offshore Sai Kung in 1988. Part of a systematic marine sediment sampling programme for geological map compilation in the east New Territories

with the new set of environmental conditions.” (White 1979 p 7).

The title of the workshop is, however, “transported soils” and we need to explore how this term, derived from the engineering literature, differs from “soil”. “In engineering terminology, all unconsolidated sediments, whether deposited as shallow terrestrial deposits (eg,



Typical seabed sample (shelly gravelly SAND) collected by the Hong Kong Geological Survey - is this a marine sediment or a transported soil?

pediment deposits) or as deep accumulations of marine sediments, are classified as transported soils." (Brink, Partridge & Williams 1982). If "...all unconsolidated sediments..." are classified as transported soils one wonders why the generic free term "unconsolidated sediments" is not used instead? A soil does not retain its characteristics when eroded, as might be implied by the term "transported soil", nor is the material so deposited necessarily derived from a soil in the first place! For stratigraphic as opposed to engineering investigations more precise descriptors than "transported soils" are clearly needed and fluvial deposits should not be loosely grouped with marine deposits. Mitchell (1976) provides an excellent example of this. Although he occasionally uses the term "transported soils"; he more frequently uses the terms "sediments" and "deposits" when discussing depositional environments. The limitations of the engineering use of the term "transported soil" are especially apparent when interdisciplinary studies are undertaken. Standard works such as Attewell & Farmer's (1976) *Principles of Engineering Geology*, and Fookes & Vaughan's (1986) *A Handbook of Engineering Geomorphology* do not use the terms "transported soil" or "soil" so loosely.

One could of course be pedantic and argue that at the time of deposition some of the offshore sediments in Hong Kong's territorial

waters were exposed to pedogenic processes (ie, they have not always been covered by water). For some horizons this is so, in which case they are more correctly identified as "relict" soils rather than "transported" soils. However, for the above mentioned workshop, the term "relict soil" alone would also be a misnomer, since many of the horizons in the offshore sediments of Hong Kong are (as we are led to believe) marine in origin (Yim & Yu 1991), and have never seen the light of day. A more correct workshop title would thus be "The logging and interpretation of relict soils interbedded with marine deposits in offshore boreholes".

But why be pedantic? The term "sediment", referring to "...particles derived from rock or biological material that are, or have been, transported..." (Goudie 1988), is simple and accurate. This term correctly describes all but the lowest part of the offshore borehole profiles, at which point in situ weathered material may be encountered. Various adjectives can then be used to describe the source, depositional environments and/or chemical and mineralogical characteristics of these sediments.

To return to the title, "soils ain't soils Sol". Some of you may recognize this as a distortion of an old Caltex television commercial. A gangster in a dark pin-striped suit, flanked by mobsters totting machine guns, interrogates a mechanic named Sol who is servicing his car.

FAREWELL TO THE BROTHERS

GEOLOGICAL SOCIETY OF HONG KONG FIELD TRIP TO THE BROTHERS ISLANDS, 4 OCTOBER 1992

R L Langford

Hong Kong Geological Survey, 11/F Civil Engineering Building, 101 Princess Margaret Road, KOWLOON

When we visited The Brothers islands in October, it was just months before the levelling of the islands began. Landings were made on both West Brother (Tai Mo To) and East Brother (Siu Mo To), with enough time to circumnavigate Reef Island (Tsz Kan Chau). The islands are composed of Carboniferous sedimentary strata, and have scientifically unique features that we all hope will be preserved following the period of excavation by the Provisional Airport Authority (PAA).

The party of about 25 members and their children left Tuen Mun at 9.30 am in a large kaido. This boat, with ample fixed seating but little horsepower, is the same as the scheduled ferries that ply between the mainland, Ma Wan and the small north Lantau communities. The days of this leisurely form of transport are clearly numbered, as construction for the North Lantau expressway claws into the hillsides and speculators eagerly eye up land in Tung Chung.

We anchored a safe distance off East Brother, our first stop, and prepared for the familiar transfer to shore by sampan. What we had not banked on was the reluctance of the usually reckless sampan helmsman to drive his boat up onto the beach. This was in no small measure due to the unforgiving boulders of sandstone that have refused to decompose and disappear.

After much searching for a safe landing, the first party opted for wet feet. Luckily, this is one instance where engineers were a welcome addition to a geological field trip, as stones and wood were rapidly assembled into a dry bridge-head for the next landing party (Plate 1). To be honest, the construction of this engineering marvel was more an indication of the skills of geologists than of engineers, as it required constant redesigning and rebuilding. Even then it was not a guarantee of dry feet, but it was fun.

Once ashore, the field guide explained how

Persistence of error - 'Soils aint soils Sol'

Continues

On being told by the mechanic that he used an ordinary oil (not Caltex!) in the engine (oils is oils, boss!), the gangster responds firmly with "oils aren't oils Sol", to the background sound of machine guns being cocked. I trust that we don't need to use similar standover tactics to convince some geologists that occasionally "soils ain't soils".

The workshop was an excellent idea and the list of speakers did it credit. But if we are to "interpret" as the title suggests, let us first of all be quite clear what we are interpreting.

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to make a sandwich (Plate 2), as by that time it was lunchtime, and geology once more took a back seat. The island has a synclinal form, with steeply dipping limbs, and does not, as thought by Ruxton, dip consistently to the east. Most of the party eventually got right round the island, proving to themselves that it was synclinal in form, and stopping to wonder at the beauty of the sedimentary structures in the siltstones and sandstones.

On the way up the west coast to the northern tip there are exposures of slope deposits that have decomposed in situ (Plate 3). These deposits lie on weathered bedrock just above high water mark. Given the fragile nature of the exposure, and its state of weathering, it probably indicates that sea-levels have not been at higher levels throughout the Holocene. This observation was later contrasted with the stranded deposits on West Brother.

The northern tip of the island is in the axial zone of a tight syncline that gives East Brother its characteristic shape. The axial zone displays a rapid change in dip from about 70° east to 50° west, with a complex, broken transition zone. Although levelling of the island, which starts in early 1993, will destroy the characteristic "hogs back" shape of the island, it is hoped that the syncline axis will still be visible outside the construction site boundary. Observable major fold axes are virtually unknown in Hong Kong,

and this one may be easy to reach once a permanent jetty is installed.

West Brother is much easier to land on than East Brother, with the remains of the jetty for the graphite mine still providing a reasonable approach in deep water. The mine (Woods & Langford, *Newsletter* Vol 9 No 2 p 24-35) is largely overgrown, which is just as well considering the potential dangers of old adits. However, the children delighted in finding "pencil rocks" on the beach, and most of the party then set off for the old spoil heaps (cover photograph, *Newsletter* Vol 10 No 2).

Access to the spoil heaps is far from easy, with two possible routes up to the old mining area. The first is to clamber up into the trees that fringe the shore, and then jump onto the remains of the ore haulage path. The second is to negotiate the ladder left at the foot of the Pleistocene alluvial fan (Langford & Woods, *op cit*, Plate 3) by a passing field geologist. The ladder was not safe, and steadily disintegrated with the load, leaving a happy band of mineral collectors with good specimens of graphite, but no easy way down. A few foolhardy souls (author included) tried to push through the undergrowth to reach the southern shore, and although successful, bore the scars to prove that it was a mistake.

Levelling of West Brother will see destruction of all the old mine buildings, the spoil



Plate 1 - Bridgehead on East Brother, as the field party make the final assault before lunch



Plate 2 - Dr Langford demonstrates the synclinal structure of East Brother before the downcast field party is allowed to stop for lunch. Photograph courtesy of R P Martin

heaps and the adits. However, the PAA has been persuaded to try and protect the alluvial fan.

The Geological Survey has recently reappraised this deposit, and there is now a strong possibility that it is a Pleistocene storm beach linked to a global high sea-level around 140,000 years ago. Whether marine or alluvial, it is still considered to be Pleistocene in age, and is a remarkable and unique exposure that warrants long-term protection.

Having landed on both islands scheduled for destruction, the party was less than keen to disembark on Reef Island, which will survive unscathed. The rock types are the same as the larger islands, but access is difficult and exposures are limited at anything other than the lowest tides.

After circumnavigating the island, we decided to have a look at progress on Chek Lap Kok before returning to Tuen Mun. It is strange to think of levelling an island and filling in the sea as progress, but geologists do have a distorted view of the world in the eyes of most people.

Thankful that we had seen The Brothers before they were lost forever, the party returned to shore, thinking of their next trip to a spot that will hopefully survive a little longer than The Brothers.

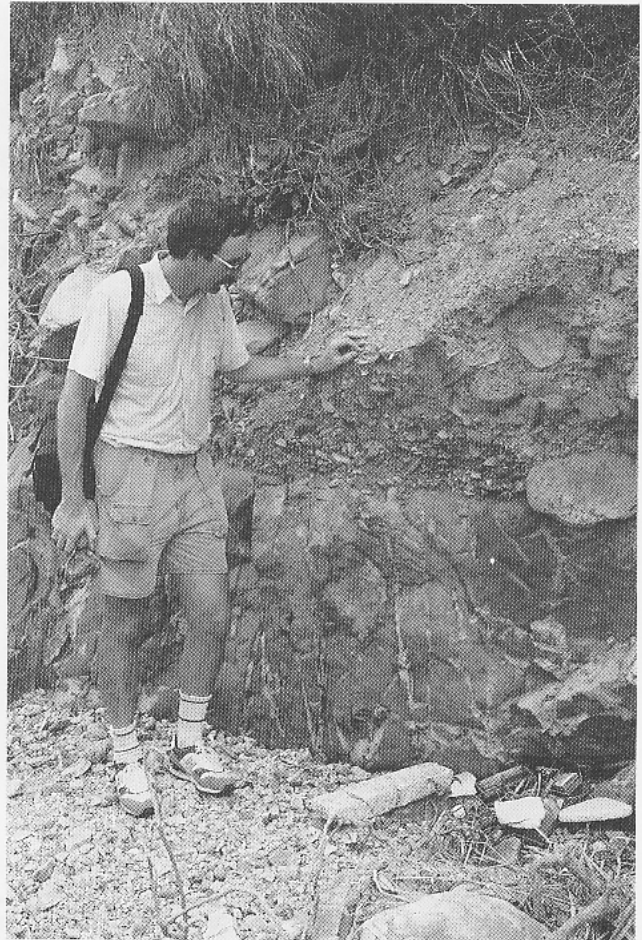


Plate 3 - Weathered in situ slope debris of presumed pre-Holocene age resting on bedrock just above high water mark near the northern tip of East Brother

IDLE SPECULATIONS ON THE AGE OF THE PING CHAU FORMATION

R L Langford & J A Fyfe

So much has been written on the Ping Chau Formation that it has prompted some idle speculation on the trends underlying this work. Research by the authors has resulted in some astonishing discoveries concerning not only the age of the rocks, but also the amount being written about them. The graph below illustrates these two trends; the estimated age of the strata over time, and the cumulative writing on the subject.

When Allen & Stephens produced their excellent account of the geology of Hong Kong in 1971, they believed that the rocks of Ping Chau were Jurassic in age. Peng revised this estimate in the late 1970s, giving a younger Cretaceous age. The most recent work, by K W Lai of the Hong Kong Geological Survey, has resulted in this estimate moving forward again to Eocene (early Tertiary).

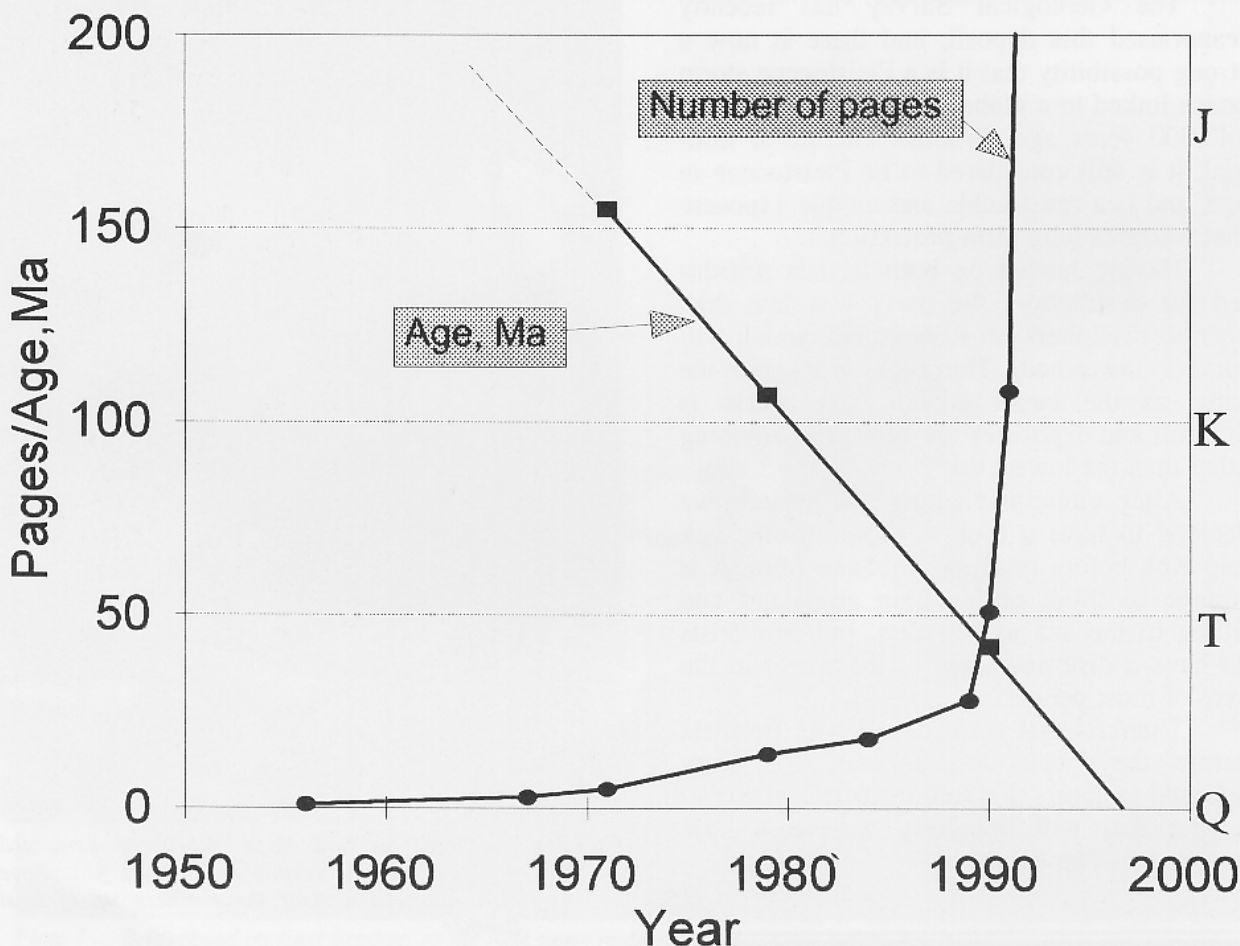
If this trend in revised age estimates continues (see graph), the Ping Chau Formation will cease to exist in 1997, when its age will

probably be determined by some bright geologist as present day or younger!

What makes this trend astonishing is a comparison with cumulative writings on the subject. This trend is for ever more to be written about Ping Chau (see graph), and a logical extrapolation proves that the volume of paper written on the subject will exceed the volume of the island in or around 1997. With Geological Survey Memoir No 5 still to appear, this threat should not be taken lightly.

In conclusion, statistical analysis of trends in age determination and research writing has proven that, in 1997, Ping Chau will miraculously disappear, to be replaced by a mountain of paper.

The question arises as to whether we can save Ping Chau from this fate by not writing or speculating about it. Unfortunately, the authors are painfully aware that their contribution is one more nail in the coffin of this beautiful island.





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Cover photograph: Beach and estuarine deposits at Pui O Wan, south Lantau. Photograph courtesy of Dr R L Langford, Hong Kong Geological Survey.

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The Secretary
Geological Society of Hong Kong
c/o Department of Geography and Geology
University of Hong Kong
Pokfulam Road
HONG KONG

ISSN 1010-335X