Quaternary Australasia

The Newsletter of the Australasian Quaternary Association

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QUATERNARY AUSTRALASIA, VOL. 14/2, December 1996

Material for the next issue should reach the editor by **30th April 1997**:

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The **AUSTRALASIAN QUATERNARY ASSOCIATION (AQUA)** is an informal grouping of people interested in the manifold phenomena of the Quaternary. It seeks to encourage research by younger workers in particular, to promote scientific communication between Australia and New Zealand, and to inform members of current research and publications. It holds biennial meetings and publishes the journal *Quaternary Australasia* twice a year. *Quaternary Australasia* is edited by Bill Boyd, with assistance from Colin Murray-Wallace. The annual subscription is $A20 or $10 for students, unemployed or retired persons. President is Dr Ian Thomas, Department of Geography, University of Melbourne. An application form for membership is appended to this issue (last page), and should be returned to Dr Geoff Hope, Membership Secretary, Division of Archaeology and Natural History, Research School of Pacific and Asian Studies, Australian National University, Canberra, 0200. Members joining after September gain membership for the following year. Existing members will be sent a reminder in December.

COMMITTEE MEMBERS

QUATERNARY AUSTRALASIA, VOL. 14/2, December 1996

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EDITORIAL

I begin this editorial with an expression of sincere thanks for the support and assistance I have received from members of AQUA whilst I have been preparing this latest volume of QA. In particular I must thank Bill Boyd who whilst on sabbatical in Cambridge has kept a watchful computer assisted eye on my progress and matters of interest to Quaternarists in general. Likewise Colin Murray-Wallace, Peter Kershaw & Geoff Hope are to be thanked for their advice and encouragement.

In looking for ideas and copy for this issue I have considered both tradition and expediency. When preparing the annotated bibliography of this Newsletter for the 20th Anniversary edition (Boyd & Cotter, QA 1994) I observed that a particular feature of many of the earlier newsletters was reportage of work in progress both within different states and at different University establishments. In keeping with this tradition, and in the best interests of self-promotion and provincialism, this issue presents some Quaternary research being the Centre for Coastal Management at Southern Cross University. One of the many areas of interest of the Centre is the identification and understanding of acid sulfate soils, the curious legacy of sea level rises and inundation during the Holocene. Angus Ferguson, a PhD student studying aspects of the Richmond River estuary provides informative commentary upon his attendance at the 2nd National Acid Sulfate Soil Conference held at Coffs Harbour recently. In addition, Malcolm Clark provides details of the Quaternary geology of the Wynnum area in the city of Brisbane as derived from his Masters research into heavy metal cycling in mangral sediments. Finally Tim Smith presents a brief & partial abstract of hi Honours these which investigated bioavailable phosphorous level in sediments of several coastal river channels including Brisbane, Richmond & the Bellinger rivers.

By now I'm sure that all readers of QA are aware that the proposed Field Meeting to be held at Apollo Bay during the long weekend in October was cancelled. I was disappointed with this cancellation for two reasons. Firstly, I was hoping to meet those of the AQUA membership who had 'unwittingly' placed some degree of faith in me to produce this edition. More importantly however, Bill in his last editorial made the suggestion that any field notes, abstracts and or research papers arising from the Field Meeting should be published in this edition of QA. For an acting editor what could be more enticing then a wealth of Field Meeting notes and research papers just waiting to be published? Perhaps it was just an elaborate con designed to trap a gullible Postgraduate? Nevertheless given that planning has begun for the Lake Eyre Field Trip scheduled for next April I can but suggest that all you avid Field Trippers take Bill up on his suggestion and prepare copy for QA in 1997.

Anyone at all interested in Quaternary Science in Australia must be eagerly awaiting the December issue of *Antiquity* to read the scientific reportage of the research undertaken by Richard Fullager, Lesley Head, David Price et al in the Northern Territory as already publicly reported in the *Sydney Morning Herald* Saturday August 31st 1996. I am no exception and indeed am looking forward to the lively discussion their research will undoubtedly engender at the forthcoming Australian Archaeological Association Annual Conference to be held at Dinzitari, 80km South of Adelaide on the 5-7th December. Although of course given the dramatic and spectacular events surrounding the it is likely that a few glaciologists & limnologists have been far more preoccupied with trying to get to Iceland before all the research topics newly developed near Lake Grimsvötn have been scooped up

Well that is enough rambling from me. Thanks again for your support! I now look forward to Bill's imminent return to the Editor's desk.

Maria Cotter
Acting Editor

AQUA

NOTICE OF BIENNAL MEETING

PRELIMINARY NOTICE OF AQUA BIENNIAL MEETING & FIELD TRIP

Lake Eyre 22-26th 1997

Unfortunately the Lorne AQUA Meeting and Field Trip 3-6 1996 October was cancelled. However the good news is that the AQUA Biennial Meeting to Lake Eyre 22 -26 April 1997 will happen!

Details are still being worked out, but this preliminary announcement should help you clear a space in your busy schedules.

Program:
22 April 1997. Arrive Marree, South Australia. Registration and drinks.
23 April. Field visit to south end of Lake Eyre, incl dated palaeo beaches
and other features. Optional flights over the lake.
24 - 26 April Papers at the Marree Hall.
25 April BGM and Conference Dinner
26 April 3pm. Claypan cricket.

Field Trips: These will, of course, be totally dependant on the weather!

27-30 April inclusive. 4WD fieldtrip to eastern Lake Eyre with camping Maree - Mungarannie -return to Marree or on to Birdsville, Queensland.There will be strict limit on numbers on this trip, and it will be fairly expensive, eg $600-800 although the costs are still being worked out. We hope John Magee will agree to guide it.

For those unable to go on this trip we may organise some cheaper self-drive(2WDs escorted by a 4WD) things to do eg Stuart Creek and Lake Eyre South or the northern Flinders Ranges and Lake Frome. Robust 2 WD can also go east from Lyndhurst to L.Callabonna, the Strezlecki track and cross to Tibooburra, NSW (I've done it all in my kombi!).

Accommodation: Unlike previous meetings this is a bring everything effort, except morning and afternoon tea. Maree boasts two campgrounds with on site vans and a pub. There are a sprinkling of stores with take aways. It has unspeakably awful bore water, so you should bring drinking water from further south.

Maree is about 90km north of the end of the bituman at Leigh Creek (Permian coals), and is regarded as having all weather access. You can also reach it via the Oodnadatta Track from AliceSprings, The Birdsville track from Birdsville or the Strezlecki Track via Lyndhurst from Moomba or Tibooburra. Aircraft go there quite frequently as well. We would like to organise some pool transport closer to the date, and it may be economical to hire light buses eg from Adelaide, Melbourne or Canberra.

Costs: Registration will be around $40.00/ $25.00. The Dinner may add another $20.00. We will assist with bookings at the camp grounds etc but otherwise bring your own supplies and money. Contributions to pool transport and field trips will be worked out. A 30min charter flight over Lake Eyre will be around $75.00, but you won't see it any other way.

Conference organisers include Ian Thomas, Eugene Wallensky, Christine Kenyon, Geoff Hope and Kate Harle.

Further details from:

Dr Geoff Hope
Division of Archaeology and Natural History, RSPAS, Australian National University Canberra 0200 Australia
phone: 062 49 3283,
Fax: 062 49 4917
Email:
Geoff.Hope@coombs.anu.edu.au

CONFERENCE AND MEETING NEWS

10-13 December 1996. **The Environmental and cultural history and dynamics of the Australian-Southeast Asian Region.** Monash University, Melbourne, Victoria. Contact: A.P. Kershaw, Department of geography and Environmental Science, Monash University, Clayton Victoria, 3168. Phone: 03 9905 2927, Fax: 03 9905 2948, Email: peter.kershaw@arts.monash.edu.au

28 - 31 January 1997. **The Second Institute of Australian Geographers and New Zealand Geographical Society Joint Conference,** Hobart, Tasmania. Contact: Dr L. J. Wood, Department of Geography and Environmental Studies, University of Tasmania, Box 252C GPO, Hobart, Tasmania, Australia 7001. Phone: (002) 202489, Fax: (002) 202989, Email: L.J.Wood@geog.utas.edu.au

29-31 January 1997. **Federal & International Scientific Permits Workshop**, San Diego, California, USA. Contact: Sally Shelton, Director, Collections Care and Conservation, San Diego Natural History Museum, P.O. Box 1390 San Diego, California, 92112, USA. Phone: (619) 232-3821, Fax: (619) 232-0248, Email:: LIBSDNHM@CLASS.ORG

10 - 13 February 1997. **Sixth Australiasian Archaeometry Conference**, Sydney, Australia. Contact: Mrs Margaret Lanigan, Conference Manager, ANSTO, PMB 1, Menai, N.S.W. 2234, Australia. Phone: (02) 439 8220; Fax: (02) 439 6561; Email: ainse@ansto.gov.au

29 March - 1 April 1995. **INTER-INQUA colloquim: Working group on Milankovitch and Plio-Pleistocene vegetation succession from 2.6 to 0.9 Ma**, Ankara, Turkey. Contact: Dr Suzanne A.G. Leroy, Centre for Palaeoecology, School of Geosciences, Queen's University Belfast, Belfast BT7 1NN, N.Ireland. Phone: +44-1232-335 143 & 273 978, Fax: +44-1232-321 280, Email: s.leroy@qub.ac.uk

4-11 May 1997. **International symposium on soil, human and Environment Interactions**, Nanjing, Peoples Republic of China. This symposium will be organised by the Institute of Soil Science, Chinese Academy of Sciences and co-sponsored by the International Soil Science Society & Chinese Academy of Sciences. Fax: 0086-25-3353590, Email: zhaoqg@njnet.ihep.ac.cn.

22-24 May 1997. **CANQUA-97, Canadian Quaternary Association 8th Biennial Meeting**, Montreal, Quebec. Contact: Michel A. Bouchard, Chairman of the Organising Committee CANQUA-97, Phone 514 343 6821, Fax: 514 343 5782, Email: bouchami@ere.umontreal.ca

July 1997. **VIII Pacific Science Inter-Congress: Islands in the Pacific Century**, Suva, Fiji Islands. Contact: Secretariat, VIII Pacific Science Inter-Congress, c/- School of Pure and Applied Sciences, The University of the South Pacific, PO Box 1168, Suva, Fiji Islands. Phone: 679 313 900 ext 2691 or 2430; Fax: 679 302 548; Email: pas@usp.ac.fj.

July 1997. **Glaciers of the Southern Hemisphere**, Melbourne Australia. Sponsors: International Association of Hydrological Sciences & the International Association of meteorology and Atmospheric Sciences. Contact A.G. Fountain, U.S. Geological Survey, PO box 25046 MS-412, Denver CO 80225 USA; Phone: 303-236 5025; Fax: 303 236 5034; Email: andrew@usgs.gov

14-18 July 1997, **International Symposium on Antartica and Global Change**, Hobart Australia. Contact: Secretary general, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, United Kingdom; Phone: 44-1223 355974; Fax: 44-1223-336543; Email: 100751.1667@compuserve.com

28 August - 3 September 1997. **IV International Conference on Geomorphology**, Bologna, Italy. Contact: IV International Conference on Geomorphology, Planning Congressi s.r.l., Via Crociali 2, 1-40138 Bologna, Italy. Phone: 39-51-302980, Fax: 39-51-309477, Email:

MICHELE.GALATINO@PLANNING.INET.IT

2-4 September 1997. **Archaeological Sciences '97.** Durham, UK. Contact: Andrew Millard, Department of Archaeology, University of Durham, South Road, Durham, DH1 3LE. Phone: 0191 374 3625 Fax: 0191 374 3619. Email: A.R. Millard@Durham.ac.uk.

8-12 September 1997. **Fifth International Carbon Dioxide Conference**, Queensland Australia.
Sponsor: CSIRO Australia. Contact: Carbon Dioxide Conference Secretariat, CSIRO Division of Atmospheric research PMB #1, Apendale, 3195, Victoria, Australia. Phone: 61-39239-4661, Fax: 61-3-9239-4444; Email: pnh@dar.csiro.au

10-13 September 1997. **Metals in Antiquity**, Harvard University, Cambridge, USA. Contact: Suzanne Young, Archaeometry Laboratories, harvard University, Peabody Museum, 11 Divinity Avenue, Cambridge MA 02138, USA.
Email: SYOUNG@FAS.Harvard.Edu

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12-14 September 1997. **RECOVERIES '97, The final meeting of the UNESCO IGCP Project 335 "Biotic Recoveries from Mass Extinctions"**, Prague, Czech Republic. Contact: Petra Hovorkova, Recoveries '97, Eurocongress Centre, Budejovicka 15, CZ 140 00 Praha 4. Email: recovery@gli.cas.cz

22-27 September 1997. **6th International Conference on Fluvial Sedimentology**, University of Capetown, Capetown South Africa. Contact: The Conference Organiser, 6 ICFS, Postgraduate Conference Division, UCT Medical school, Observatory 7925, South Africa or Contact Mrs Sally Elliot, Phone: + 27 21 406 6911 /4066381, Fax: + 27 21 448 6263, Email: sally@medicine.uct.ac.za

April 27-May 1, 1998. **31st International Symposium on Archaeometry**, Budapest, Hungary. Contact: Katalin T. Biro, Hungarian National Museum, Dept. of Information, H-1450 Budapest, Pf. 124. Hungary. Fax: (36)-1-2101 338, Email: h5852tbi@ella.hu ,
WWW: http://origo.hnm.hu/ametry.

June 1999. **19th Pacific Science Congress**, Sydney.

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3-DAY MEETING
MONASH UNIVERSITY
MELBOURNE,VICTORIA
10-12 DECEMBER 1996

"The environmental and cultural history and dynamics of the Australian-Southeast Region"

At least 40 natural and social scientists from a range of institutions in Australia and overseas will meet to present and discuss their research on the nature and causes of climate change, geological and biogeographical connections and patterns and timing of arrival and migration of Homo erectus and Homo sapiens and their possible impact upon the landscape, within the Australian-Southeast Asian region. Cultural developments and more refined palaeoenvironmental studies will be examined from the time of the development of agriculture through to the historic period. The meeting will provide a background for understanding present day processes and environmental problems and for addressing questions of future environmental change and research directions.

TOPICS OF INTEREST INCLUDE:

*Tectonic history & physical geography of the Australian-Southeast Asian region
* Cultural diversity in the southeast Asian region
*Biogeography and biogeographical history
*Climatic, atmospheric and oceanic change in the Maratime Continent.
*Long vegetation and environmental records from the Maratime Continent.
*Late Quaternary vegetation and environmental records.
*Early people and environments in the Maratime Continent
*Late Quaternary archaeological records from the Maratime Continent
*Human arrival in Australia-low, middle or high?
*The development of agriculture
*Historic connections
*Into the future

Costs: $20.00 full fee
FREE FOR STUDENTS

For more details contact:

Professor A.P. Kershaw,
Department of Geography & Environmental Science,
Monash University,
Clayton, Victoria 3168
Ph:03 9905 2927
Fax: 03 9905 2948
Email:peter.kershaw@arts.monash.
edu.au

FORTHCOMING CONFERENCE: 6TH INTERNATIONAL CONFERENCE ON FLUVIAL SEDIMENTOLOGY

22-27TH SEPTEMBER 1997
UNIVERSITY OF CAPE TOWN,
CAPE TOWN, SOUTH AFRICA.

The Sixth International Conference on Fluvial Sedimentology will be held from 22-27 September, 1997 in Cape Town, South Africa. This Conference, held every 4 Years, aims to Stimulate the exchange of ideas between scientists and engineers with a common interest in understanding rivers and their deposits in modern environments and in the geological record. The scope of this meeting includes all aspects of geomorphology, facies models, sequence stratigraphy, alluvial basin analysis, sediment transportation and deposition, and river management.

Proposed Conference Themes:

1. Sediment transport & bedforms
2. Fluvial processses on alluvial fans
3.Fluvial channel systems-ancient and modern
4. Overbank systems-ancient and modern
5.Sequence stratigraphy
6. Energy resources and fluvial sequences
7.Fluvial placer deposits
8. Estuaries-ancient and modern
9. River management
10. Open theme

The conference venue will be the Breakwater Lodge, an hotel run by the University of Cape Town's Graduate School of Business, which is ideally situated in Cape Town;s Victorial and Alfred Waterfront. The technical sessions will run over 5 days, with one day in the middle of the week devoted to local field trips, workshops and recreational activities. Poster presentations are encouraged and will be formally presented by the authors. Programmes will be arranged for accompanying members.

A selection of pre- and post-conference field excursions will be offered, covering a wide variety of modern and ancient fluvial systems in South Africa, Namibia and Botswana. The include Namibian flash-flood rivers, Orange River alluvial diamonds, the unique meandering system in the Okavango "delta", the popular estuarine "Sedplett" field school, Palaeozoic to Mesozoic Cape and Karoo systems and underground exposures of Archaean placers.

A volume of Abstracts of all papers to be presented at the meeting will be published and distributed to all delegates. Please note that date for submission of abstracts is 15 March 1997. A referred "proceeding volume will be published within 12 months to allow authors to incorporate fresh peer response from the Conference. To this end, potential contributors should note that the deadline for submission of manuscripts is 30 November, 1997.

For more details contact:

Mrs Sally Elliot, 6ICFS, Postgraduate Conference Division, UCT Medical School, Observatory, 7925, South Africa
Phone: +27 21 406 6911/ 4066381 Fax: +27 21 448 6263 Email: sally @medicine.uct.ac.za

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IGCP PROJECT 335

Final meeting 12-14th September 1997, Prague, Cezch Republic

The final meeting of the UNESCO IGCP Project 335 "Biotic Recoveries from Mass Extinctions" will be held between the 12th & 14th of September 1997 in Prague.

In the history of the earth (including the recent) numerous events of ecosystem collapse occurred that were followed by recoveries and origination of new ecosystems. This significant transformation could be realised in numerous ways. This IGCP Project aims to be a platform for the study of survival and recovery of the biosphere, and restructuring of global events following mass extinctions.

The Project outlines are:

(1) to study patterns of extinction/survivorship of organisms during the mass extinction events;
(2) to analyse the evolutionary and ecological strategies that allowed clades and communities to survive and initiate subsequent biotic recoveries;
(3) to study the structure of the deep-crisis ecosystem;
(4) to elucidate the recovery initiation mechanisms;
(5) to find the time, space and functional patterns of the recovery;
(6) o define the data and tools for this discipline;
(7) to develop general models by means of comparison of individual global crises in Earth's history;
(8) to apply these (predictive) models to better understanding the modern environmental and biodiversity crises.

This International Project is headed by Douglas H.Erwin, Smithsonian Institute, Washington D.C. & Erle, G. Kauffman, University of Colarado, Boulder. Over Sixty countries are involved in the Project.

The final meeting is designed to bring together palaeobiologists, palaeontologists, biologists, ecologists, systems theorists and other persons who are interested in the topic.
The final meeting will be held under the auspices of the Geological Institute, Academy of Sciences.

For more information contact:

Petra Hovorkova, Recoveries "97
Eurocongress Centre
Budejovicka 15
CZ 140 00 Praha 4

For Meeting updates and details of the programme please consult

http:www.gli.cas.cz/conf/recovery.recovery.htm

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INQUA PALAEOCLIMATE COMMISSION

INTER-INQUA Colloquium, 29 March- 1 April 1997, Ankara Turkey.

Dr Suzanne Leroy and Dr Cesare Ravazzi, leaders of the Commission on Paleoclimate "Working group on Milankovitch and Plio-Pleistocene vegetation succession from 2.6 to 0.9 Ma" will be holding a two-day meeting in Ankara, Turkey in 1997. The meeting will be preceded by a two-day fieldtrip

The aims of the colloquim are to inform the community about new possibilities for the interpretation of Plio-Pleistocene sections using cyclostratigraphy and to instigate detailed palaeoenvironmental-palaeoclimatic reconstructions. Preference will be given to papers giving new high resolution data, revising old interpretations and reviewing the recent progresses made in cyclostratigraphy. It is not limited to palynology provided that detailed palaeoenvironmental data from continous sections are presented.

For further details contact:

Dr. S.A.G. Leroy,
Centre for Paleoecology,School of Geosciences, Queens University Belfast, Belfast BT7 1NN, N. Ireland. Ph +44-1232-273 978; Fax: +44 1232-321 280; Email: s.leroy@qub.ac.uk

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INTERNATIONAL PALAEONTOLOGICAL ASSOCIATION

List of Endangered Fossil Sites.

Fossil sites of great importance are endangered around the world for numerous reasons. Some are being exploited by collectors/merchants , others are being used as waste dumps and still others are being obliterated by the enchroachment of man and his activities. Little can be done to mitigate the problem if the endangered fossil sites are not made known to the public at large. Knowledge is power and until palaeontologists have a full listing of those endangered sites they can take very little coordinated action to ameliorate the problem.

The International Palaeontological Association (IUGS) wishes to assemble a catalogue of worldwide endangered fossil sites, including specific information about their location, conditions, problems, their potential/actual loss to science and mankind and other pertinent information

For more details and the appropriate form to with which to register your endangered site contact:

Verda Kenworthy
Amoco Corporation,P. box 3092, Room 784W3, Houston TX 77253 USA.
Fax: 713-3667416
Email:verda_m_kenworthy@amoco.com

CONFERENCE REPORTS

NINTH INTERNATIONAL PALYNOLOGICAL CONGRESS, HOUSTON, JUNE 1996: AUSTRALASIAN CONTRIBUTIONS

W.E. Boyd

Centre for Coastal Management,
Southern Cross University
Lismore 2480, Australia

In 1682, Nehemiah Grew described pollen as being "... powders ... like those of Meal or Dust ...". In 1944, and in response to discussion regarding a suitable name for the scientific study of pollen, Hyde and Williams (1944, p. 6) made the following suggestion:

> "The question raised by Dr. Antevs: 'Is pollen analysis the proper name for the study of pollen and its applications?' and his suggestion to replace it by 'pollen science' interests us very much. We entirely agree that a new term is needed but in view of the fact that pollen analysts normally include in their counts the spores of such plants as ferns and mosses we think that some word carrying a wider connotation than pollen seems to be called for. We should therefore suggest palynology from Greek paluno (paluno), to strew or sprinkle; cf. pale (pale), fine meal; cognate with Latin pollen, flour, dust): the study of pollen and other spores and their dispersal, and applications thereof. We venture to hope that the sequence of consonants p-l-n (suggesting pollen, but with a difference) and the general euphony of the new word may commend it to our fellow workers in this field."

... and hence the term "palynology" came into being. The practice of palynology had, of course, been well underway by 1944, but since that time it has advanced to make major world wide contributions to the fields of biology, medicine, geology, climatology and many other environmental sciences.

The (approximately) four-yearly International Palynological Congresses provide a forum for all of these scientific interests to come together and hence provide a showpiece for palynological studies and the contribution to science that such studies may make. As we rocket towards the future, it was thus only appropriate that the organisers of the 9th IPC should welcome attendees to Houston with a logo of a miniature space shuttle flying round a giant Chen-Am pollen grain.

The Congress venue was the reasonably flash JW Marriott Hotel on Westheimer by the Galleria (local culture time: J.W. Marriott was a local self-made millionaire and a role model to all Texans, Westheimer is an avenue in the up-market end of town, and the Galleria is an enormous up-market boutique shopping plaza with any number of food places (cheap and hot Tex-Mex) and an indoor skating rink to contrast with the hot, humid, real outdoor world of Texas). Organisation was tight with the Congress, squeezed in between a Barbie Convention and a National Mothering Convention. More importantly (what, even more importantly than a Barbie Convention??), the quality of paper presentations was, thankfully, well up on that at most of the big conferences that I've been to recently.

The Congress itself comprised five days of three to five concurrent sessions, representing 30 symposia in all. Four of the symposia dealt with modern palynological topics, eleven dealt with what may be viewed as "ancient" geology, i.e. pre-Quaternary topics, and nine symposia dealt with Quaternary topics (including the aptly named "Quaternary palynology" symposium which inexplicably grouped papers which could have been presented in any of the other eight Quaternary related symposia). In addition there were six other symposia dealing with more general topics. Pre- and post-Congress field trips ranged from visits to local swamps (waist-high water and crocs) to fly-overs of the Grand

Canyon. Reports of the pre-Congress field trips were glowing. For committeephiles, at least seven committee meetings filled the gaps, while the rest of the mob filled the hotel bar.

In terms of scholarly contributions, the range was much as at previous Congresses, although the crowd was somewhat smaller than at the Aix-en-Provence Congress. The Australasian contingent was sufficiently small to be decent, but sufficiently vocal to be noticed. It seemed to receive more talk-time than our small populations might appear to warrant. A sign of the health of our disciplines? So what were there Australasians saying? Let's start with the "Quaternary" topics.

The **Intertropical Last Glacial-Holocene Climatic Change** symposium was an obvious forum for the antipodeans, and we were not disappointed, although much was, perhaps predictably, reasonably familiar: Geoff Hope's Last-Glacial transition in New Guinea, Simon Haberle's 30,000 years of vegetation change in montane New Guinea, and John Flenley's Easter Island, plus stuff from Hawaii. The theme was continued in the **Last Glacial-Interglacial Cycle Patterns and Causes of Change** symposium, which was in part chaired by the Australian Interglacial-Glacial-Cycle person himself, Peter Kershaw. Peter appeared in various guises during the symposium, generally as the chair, but later as a speaker, first with Patrick Moss revising north Queensland vegetation history, and later with Sander Van der Kaars putting holes in the Banda Sea into which pollen from both sides appear to be falling. To broaden the Australian perspective, Kate Harle presented beautifully-coloured computer diagrams of Lake Wangoom and Marine core E55-6, Merna McKenzie travelled to the Otway Region, Patrick Moss sorted out the 80,000 year old humans in ODP 820 (i.e. forget the 80,000 year human "event"!), and Eric Colhoun gave an overview of the western Tasmania Interglacial-Glacial Cycle. Beyond Australia, Geoff Hope delighted in the joys of working in impossible terrain in Sulawesi and New Caledonia, and Rewi Newnham and Brent Alloway gave a regional synthesis and account of new sites from the gently pleasant countryside of Taranaki and Wanganui.

Echoes of these symposia could also be heard in the **Long Continental and Marine Records of Paleoclimate** symposium, with Kate Harle and Peter Kershaw (dare I say, again?) doing the Lake Wangoom shuffle, Sander Van der Kaars *et al*. (looking remarkably like Peter Kershaw) delving deep onto and into the Lombok Ridge. All these sessions were day long marathons, made bearable by clear and generally entertaining presentations.

In contrast to these marathon sessions, the **Phytoliths and Pollen** symposium was a short and modest, if equally well presented, affair which showcased examples of the fruitful integration of pollen and phytolith (the up-and-coming palynomorph) research. Simon Haberle (again?, but now as an antipodean exile in Cambridge, co-presenting with Dolores Piperno), described a field area -- the Amazon Creek, headwater to the continental edge deep sea fan -- some several thousand kilometres long, and went on to win the prize for the longest cross section (scale in hundreds of kilometres). Monash's Dan Penny presented his work with Lisa Kealhofer on the Holocene vegetation of N.E. Thailand's Lake Khumphawapi.

The **Archaeological Palynology** symposium was notable for its absent presenters, with five out of the first eight not appearing; things got better as people found their way into the correct rooms. However, no-one talked about matters Australasian, so several willing volunteers offered impromptu talks to replace gaps, with yours truly giving a photo travelogue of landscape archaeology and phytoliths in West New Britain, P.N.G., and John Flenley talked about archaeological and palaeoecological matters on Easter Island.

The **Paleoclimate and Paleoenvironmental Studies** symposia yielded a curious mix from Chinese Miocene through Late Pleistocene/early Holocene Iceland to the sampling of small streams. The antipodean rescue

came towards the end with Simon Haberle's Late Holocene work from southern Chile and Lynne McCarthy's Sticknest Rat Middens, a nice curiosity to finish the day.

Other Australasian contributions to the Congress included Dallas Mildenhall's co-convenership of the **Forensic Palynology** Symposium. In addition four of the nine papers in this symposium were Australasian contributions. Dallas co-authored two papers overviewing this emerging application of palynology whilst Mark Horrocks with a Kiwi perspective, and Rosie Bruce's co-authored applications of palynology and stable isotopes in Australian forensic science. Another potential application of palynology was described by Rewi Newnham in the **Aeropalynology** symposium, with his interesting suggestion that aeropalynology may provide a tool for monitoring climatic change; monitoring of pollen seasons should provide a sensitive indicator of climatic change.

Lynne Milne presented her morphological study of *Petrophile* in the **Pollen Morphology, Systematics, Structure and Evolution** symposium, and was followed by Diana Bass describing the attempts of her research group to develop new identification methods for pollen using confocal imaging of surface and sub-surface exine. Diana also presented, in the **Aerobiology** symposium, her discovery of a most unusual aeroallergen, the pollen of spinach (*Spinacea oleracea*) ... watch out Sydneyside spinach growers! Another warning came in the **Entomopalynology** symposium, the form of Peter Gregg's discovery that certain moths can transport pollen hundreds, if not thousands of kilometres, in this case from west to east Queensland. Now what does that imply about those North Queensland long pollen sequences ...? Returning to matters more directly Quaternary, we met Geoff Hope again in the **Global Pollen Databases** symposium, extolling the virtues of the Indo-Pacific Pollen Database.

Last, but certainly not least, was what was undoubtedly the most significant Australasian contribution to the Congress: my convenership of the **New Frontiers and Applications in Palynology** symposium. Remarkably for a symposium on the last day and on the morning after the Congress Banquet, this symposium drew a standing-room-only crowd; this may have been something to do with the Congress organisers not supplying free booze at the Banquet! My own contribution comprised an attempt to overview "new frontiers and applications in palynology", using the rather obvious metaphor and images of the western film "frontier" It gave the late comers some time to settle before the serious business began. Amongst computer dinoflagellate identification keys, biochemistry, and the use of Chernobyl as a chronomarker in modern pollen studies, the Australasian contributions to this varied session included my own description of several attempts to use palynomorphs as sources for AMS radiocarbon dating (fortunately some of my co- authors, Paul Bishop and Dan Penny, actually have dates from their effort; mine are still somewhere in the machine at ANSTO!), and Lynne Milne's entertaining talk and subsequent workshop on preparation techniques for SEM and TEM microscopy. Lynne's contribution was probably the only profit-making talk at the Congress, with the crowds flocking round to buy her sample preparation kits.

All in all a rather mixed bag, with lots of little bits and pieces and one or two major bits and pieces. In relation to palynology world-wide, the general feeling from the Congress is that Australasian palynology, certainly at the Quaternary level, is alive and well (although who is that fellow Kershaw?). Regarding emerging issues, what will we have to look out for? More long sequences and Interglacial-Glacial Cycles? Climate is certainly in; palaeoecology *per se* and people appear to be less popular.

One of the curiosities about a Palynological Congress is that much, if not most of the discussion at such a Congress was about the issues to which palynology can contribute -- climate, environment, human impact, etc. -- and very little is actually about the palynology itself. At times more

discussion of the palynological material -- the raw data from which all else flows -- might have been useful. A case in point is Peter Kershaw's revision of Lynches Crater: old data, new ideas. The new interpretation seems to come largely from Kershaw's review (literally) of the existing data, and promises to keep the Lynches Crater pot boiling for while. Such revision should remind us that counting the pollen is not all; the way we interpret it is most important.

Finally where will all these presentations get published? There are plans to publish a limited proceedings volume, and many of the Symposia are planned to be published as special issues of relevant journals. The "Archaeological Palynology" symposium, for example will appear as a special issue of *Vegetation history & Archaeobotany*. Similarly papers from the "New Frontiers and Applications in Palynology", "Phytoliths and Pollen", "Forensic Palynology", and "Tephra-linked Pollen Studies" symposia will appear in a special issue of *Review of Palaeobotany & Palynology*. Likewise Peter Kershaw has informed me that the symposium he co-convened with Cathy Whitlock on the "The Last Glacial-Interglacial Cycle: Patterns and Causes of Change" will be published in a special issue of an Elsevier Journal, probably Palaeo3. Doubtless other symposia such as the "Long Continental and Marine Records of Paleoclimate" will appear in one of the international Quaternary journals.

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CONFERENCE REPORTS

2ND NATIONAL CONFERENCE ON ACID SULFATE SOILS, COFFS HARBOUR, 5-6 SEPTEMBER 1996.

Angus Ferguson

Centre for Coastal Management
Southern Cross University
Lismore, NSW Australia

The 2nd National Conference on Acid Sulfate Soils (ASS) held at Coffs Harbour on the 5-6 September, 1996 attracted over 300 delegates who listened to 30 oral papers, and inspected some 40 posters. The proceedings were divided into eight thematic sessions including: field identification; laboratory tests; drainage and hydrology; ecological impacts on fish, fauna and flora; farmland management and wetland rehabilitation; soil treatment; economic impacts; and policy, regulation and education. The conference allowed opportunities for extensive discussion on ASS issues, and also networking between experts and interested parties.

Probably one of the most positive developments of the last few years has been the widespread recognition and acceptance of the ASS problem by governments, scientists, farmers and fishers. Although this has led to some conflict amongst various interest groups, there has generally been an improvement in knowledge about ASS, and a willingness to tackle the management of ASS issues. The 2nd National ASS Conference reinforced this current state of affairs, and while identifying deficiencies in some areas, the proceedings highlighted some definite directions for the future.

A relatively brief session on the ecological impacts on fish, fauna and flora highlighted both the acute and chronic effects of ASS on floodplain and estuarine environments. Significant

impacts identified included fish kills, fish diseases (e.g. Epizootic Ulcerative Disease or 'Red Spot'), aquatic habitat modification, and shifts in both aquatic and terrestrial vegetation communities towards a simpler suite of acid-tolerant species. Although these problems are now recognised, there has been little work done to show the magnitude of the impacts.

A large amount of time was devoted during the conference to the technical, political and social aspects of ASS management. Some examples were given of the successful rehabilitation of ASS areas, however it became obvious that little was known about the effective management techniques for broadacre agriculture. While future floodplain developments can strive to avoid disturbing ASS through proper assessment and appropriate regulation and planning measures, huge problems already exist as a legacy of an age when ASS risks were not recognised.

Management of floodplain watertables (which control both the oxidation of ASS and the transport of acid products to streams) remains a big problem due to the extent of drainage and tidal structures along Australia's east coast, and to the dependence of existing agricultural practices upon these structures. Little doubt remains that floodplain hydrology must be improved in ASS environments, however a lack of technical knowhow combined with some resistance by landowners to change impedes progress in this area.

The session on laboratory testing provided spirited debate over the testing procedures used by consultants and government agencies to identify and quantify ASS risks. One method currently popular in the assessment of ASS, Total Sulfide Acidity (TSA)*, was criticised for overestimating ASS soil risks in some cases, or even identifying ASS where none existed.

Problems with the TSA method arise due to the inclusion of other sources of acidity (e.g. acidity produced by the oxidation of ferrous iron species and organic matter by the harsh hydrogen peroxide digestion procedure) As part of the total sulfide acidity. The problem has been addressed by modification of the method to remove the organic matter fraction in a preliminary step, however this appears to be only partially successful and greatly adds to the time taken and to the cost of the method.

It was suggested that a less ambiguous method of ASS assessment was the direct measurement of total sulfur and sulfate, with the sulfide content being equal to the difference between the two. However, little agreement was reached by the experts, and this important problem which is central to the management of ASS remains to be resolved.

The overall feeling at the conclusion of the Conference was that the processes occurring within ASS environments are now fairly well understood, and that we are entering a practical implementation phase. A senior researcher on ASS, Ian White, commented in a closing speach that it was time to "get off the parade ground" and start to implement effective management of ASS problem areas.

First steps in the practical phase include widespread trials of different floodplain, tide gate and drainage management strategies. In some areas it will be necessary to develop wetland agricultural practices better suited to higher water table regimes, such as flooded pastures. In all cases, a vital element to effective management will be community consultation to ensure that strategies work on the ground.

*Total Sulfide Acidity (TSA) is the current National Association of Testing Authorities, Australia (NATA) standard for the determination of acid sulphate soil hazards. It is defined by the relationship: TSA= TPA (Total Potential Acidity)-TAA (Total Actual Acidity). The procedure for determining TAA is NATA registered as Test Method T1030 whilst the procedure for determining TPA is registered as Test Method T1031.

PALYNOLOGICAL AND PALAEOBOTANICAL ASSOCIATION OF AUSTRALASIA (PPAA)

PPAA has been in existence for almost twenty years. Meetings have been infrequent because of the small memebership which is spread across Australia and new Zealand, with a few members even further afield. The aim of the Association is to promote interaction between palynologists and palaeobotanists, irrespective of their specialist interests.

In the past, formal meetings were attached to large conferences suchas IOP and IPC, but numbers and more tightly focused common concerns now warrant "stand-alone" venues. For example in November 1995, PPAA organised a mini-conference at Monash University, Melbourne on the theme of "refining estimates of Australian palaeoclimates from palaeobotanical evidence". The period covered extended from the late Cretaceous up to the near present and including discussion of intrinsic constraints; e.g., difficulties in using the climate ranges of the nearest living relatives (NLR) to reconstruct pre-Late Quaternary climates: the NLR's of fossil genera and species in one early Pleistocene assemblage range from alpine obligates to warm temperate-subtropical rainforest.

Interest was extremely high, with some 70 persons attending. The conference proceedings will be published as a special edition of the Australian Journal of Botany. Similar meetings are planned to be held every 2-3 years, at times that will avoid clashing with international confernces. These meetings will be used to formulate PPAA policy and elect-office-bearers.

At present the Association has 60 financial members (annual subscription ($Aust. 8.00) and a newsletter titled the PALAEOAUSTRAL is published approximately every two years. For other information and details of membership please contact:

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Queens Domain,
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Tasmania, 7001, Autralia
Fax +61+02+34-7719
email: L.J.Scriven@plant.utas.edu.au

Editor's note: Leonie has informed me that the running of the association is currently in transition from Hobart to Adelaide hence there may be some difficulties in contact. Further details will be included in the next edition of QA.

PUBLICATION NOTICE

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Allan, R., Lindesay, J. & Parker, D.

***

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PUBLICATION NOTICE

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Bouma,W.J., Pearman, G.I. & Manning, M.R.

***

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* October 1996, Hardback, 650pp, Colour illustrations, ISBN 0643 05688 2

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PUBLICATION NOTICE

Australian Archaeology '95

Proceedings of the 1995 Australian Archaeological Association Annual Conference

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Ulm,S., Lilley, I. & Ross, A.

This volume (published as Volume 6 in the Tempus series) includes 26 articles based on papers given at the 1995 Australian Archaeological Association Conference held at Gatton College (University of Queensland). The volume will be available from the address below from December 1995 for around $30.00 (plus postage).

The volume has six sections covering issues of change in Australian prehistory:
- new directions in cultural heritage management;
-stone artefact, use-wear and residue studies;
-recent research in Queensland;
-recent regional research;
-and repatriation issues in Australian archaeology.

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Brisbane QLD 4072
Australia

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PUBLICATION NOTICE

Proceedings of the 2nd Acid Sulphate Soil Conference

Coffs Harbour NSW,
5-6 September 1996

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Smith., R.J. & Smith, R.W.

This volume includes some 30 papers and the abstracts of almost 40 posters presented at the 2nd National Conference on Acid Sulfate Soils.

Topics covered in the volume include:
-Field identification
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-Drainage & hydrology
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-Policy, reglation and education

Any Quaternarist wishing to Purchase the Proceedings of this Conference can do so by contacting:

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QUATERNARY E-MAIL LISTS, INTERNET PAGES & ELECTRONIC JOURNALS

This being the third issue of QA which has included information on Quaternary e-mail lists, WWW pages and electronic journals it seems that it is likely to become a regular feature of the Newsletter. With this in mind don't forget that if you have information readily accessible via e-mail or a pet WWW site which you want all Quaternarists to know about please inform the editor so that it can be announced in these pages.

INQUA COMMISSION ON GLACIATION

The GAGE work group of the INQUA Commision on Glaciation is preparing a proposal for the Landsat 7 archive program. A preliminary proposal is now available on the WWW at:

http://www.emporia.edu/S/wwwearthsci/gage/glacier7.htm

All quaternary scientists are invited to comment and suggest additional glaciers to include with the proposal. The complete proposal will be delivered to NASA in January 1997.

For more information contact:

James S. Aber
Email: aberjame@esumail.emporia.edu

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JOURNAL OF FORAMINIFERAL RESEARCH WWW HOMEPAGE

The Cushman Foundation is pleased to announce the establishment of a Journal of Foraminiferal research Homepage at:

http://superior.carleton.ca/~tpatters/cushman/cushman.html

This site contains information on the journal, including instructions for contributors, lists of publications, subscription information, e-mail links to foundation officers and links to other paleontological sites. A complete index of all published volumes (with abstracts) will be available at this site in the near future.

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INTERNATIONAL ARCHAEOMETRY CONFERENCE WWW HOMEPAGE

The next International Archaeometry Conference to be held in Budapest Hungary in 1998 is establishing a Homepage which can be perused at:

http://www.origo.hnm.hu/ametry68/homep1.html

SOCIETY FOR ARCHAEOLOGICAL SCIENCES WWW PAGES

In the last edition of QA you were informed of the SASnet mailing list. The society has also established WWW pages which can be found at:

http://www.wisc.edu:/anthropology/sas/sas.htm

This WWW site provides details of forthcoming conferences as well as links to various other sites of interest to the archaeological fraternity. In adddition the SAS WWW site provides access to extended abstracts of journal articles & recent Conferences.

Note for example that an extended Abstract of Part 1 of a two part series on ancient DNA published in the Archaeology Magazine can be found at the SAS WWW site or directly at:

http://www/he.net~archaeol/9609/abstracts/dna.html

Likewise the abstracts of the 1996 International symposium on Archaeometry held at the Univeristy of Illinois/Urbana-Campaign can be accessed via the SAS WWW site or directly at:

http://www.wisc.edu/anthropology/sas/ARK96.htm

So too abstracts of the Workshop on tthe Practical Impact of Science on Field Archaeology held in Israel on the 28-29th October 1996 can be found ar:

http://www.wisc.edu:2874/anthropology/sas/isrwrk.htm

PROVINCIAL MUSEUM OF ALBERTA WWW PRESENTATION

Sponsored by the Friends of the Provincial Museum of Alberta Society, the Provincial Museum of Alberta WWW presentation is now "on air" and can be accessed at:

http://www.pma.edmonton.ab.ca

This site contains over 325 pages of information about the Musuem, including an introduction to the twelve curatorial areas and the educational programs, information on galleries and exhibits, and a visit to the Museum Shop. It also contains general visitor information and aclaendar of events. Quaternarists may find sections on Archaeology, Ethnology, Postglacial Palaeoenvironments of Alberta, and Quaternary Vertebrate Paleontology of particular interest.

Emporia State University
WWW Course: Ice Age Environments/Quaternary Geology

A webcourse on glaciation and glacial environments will be offered by Emporia State University in the spring semester of 1997. This course is well suited for geology, geography, and environmental science students. It is also appropriate for teachers in biology or earth science who wish to know more about the Ice Ages. Topics include glaciation and glacial landscapes, climate and climate chnage, vegetation and wildlife, as well as human influences on the environment. Web sites around the world are included for a global overview of the Ice Ages. The course will be available for either undergraduate or graduate credit

For more information, consult the course webpage:
http://www.emporia.edu/S/www/earthsci/ice/icehome.htm

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Plate 1. The Mackareth Corer in Action. (Photograph Courtesy of Charlie Barton)

QUATERNARY AUSTRALASIA PAPERS

Paper: Quaternary Australasia 14/2 (1996)

THE NATURE OF QUATERNARY SEDIMENTS AT WYNNUM, BRISBANE.

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Abstract

Recent sedimentary data for the Wynnum (Brisbane) area are presented. Radiocarbon dates suggest that active sedimentation started at least 2660±70 yrs Bp at a slow rate that increased as water depth shallowed. These marginal marine sediments are part of the Brisbane Rivers bird-foot delta and contain many overlapping channel deposits, erosional surfaces, and an upwards-fining sedimentary sequence. These deltaic sediments unconformably overlie extensively weathered tertiary basalt. Weathering of this basalt has most likely occurred sub-aerially under climatic conditions similar to those found presently, prior to inundation by the last sea level high some 6500 yrs before present.

Introduction

The Wynnum site (latitude 27^{o} 27' longitude 153^{o} 10') is on the western edge of Moreton Bay, southeast Queensland, about 3 km south of the Brisbane River mouth (Figures 1&2). To the east, north and northwest the tip is surrounded by salt marsh.

The study site is roughly 15 km east of the Brisbane City centre (state capital of Queensland) and 3 km southeast of Brisbane airport. To the southwest of the tip the land surface rises sharply to form low hills and to the west and north the land is low lying and generally of low gradient; the flat land including the tip, is part of the progradational deltaic surface for the Brisbane River. About 1.5 km north of the Wynnum site is a major distributary channel of the Brisbane River the Boat Passage, which separates Fishermans Island from the mainland (Figure 2).

The climate of Moreton Bay is classified as Cfa on the Koppen-Geiger system (Koeppe & Long 1958; Lineacre & Hobbs 1977; Saenger *et al*.,1977) or a humid subtropical climatic region (Gentilli 1971; Koeppe & Long 1958). This climate is characterised by high rainfall and humidity during the warmer summer months and drier conditions, with a wide temperature range the winter months.

The western part of Moreton Bay is composed of Quaternary shale, silt, clay and coral resting on a basement of Triassic-Jurassic sandstones and shales with some Tertiary volcanics and Paleozoic metamorphics (Heckel *et al.*, 1978; Stevens & Rogers, 1979). Five of the 12 cores collected from the Wynnum site reached a massive low permeability green grey clay that contained abundant strongly weathered basalt clasts; these clasts suggests that the underlying basement at the Wynnum site is a weathered basalt.

Methodology

Two types of sediment samples were taken from the Wynnum site, these were 50 mm cores and bulk grab samples. Twelve Core samples were collected from transects across the site (Figure 3). Cores were extracted by driving a 3 m length of 50 mm P.V.C. into the sediment until about 500 mm of pipe remained above ground. The pipe remaining above ground was filled with seawater and a plumber's dummy was inserted, tightened then topped up with water and sealed. Cores were then extracted, the excess pipe cut off and the ends sealed with plastic bags.

To compensate for the expected sediment compaction during core driving compaction factors were calculated by measuring the internal depth to the sediment (Di), the external depth to the sediment (De), and the total length of the pipe (L); the compaction factor is given by:

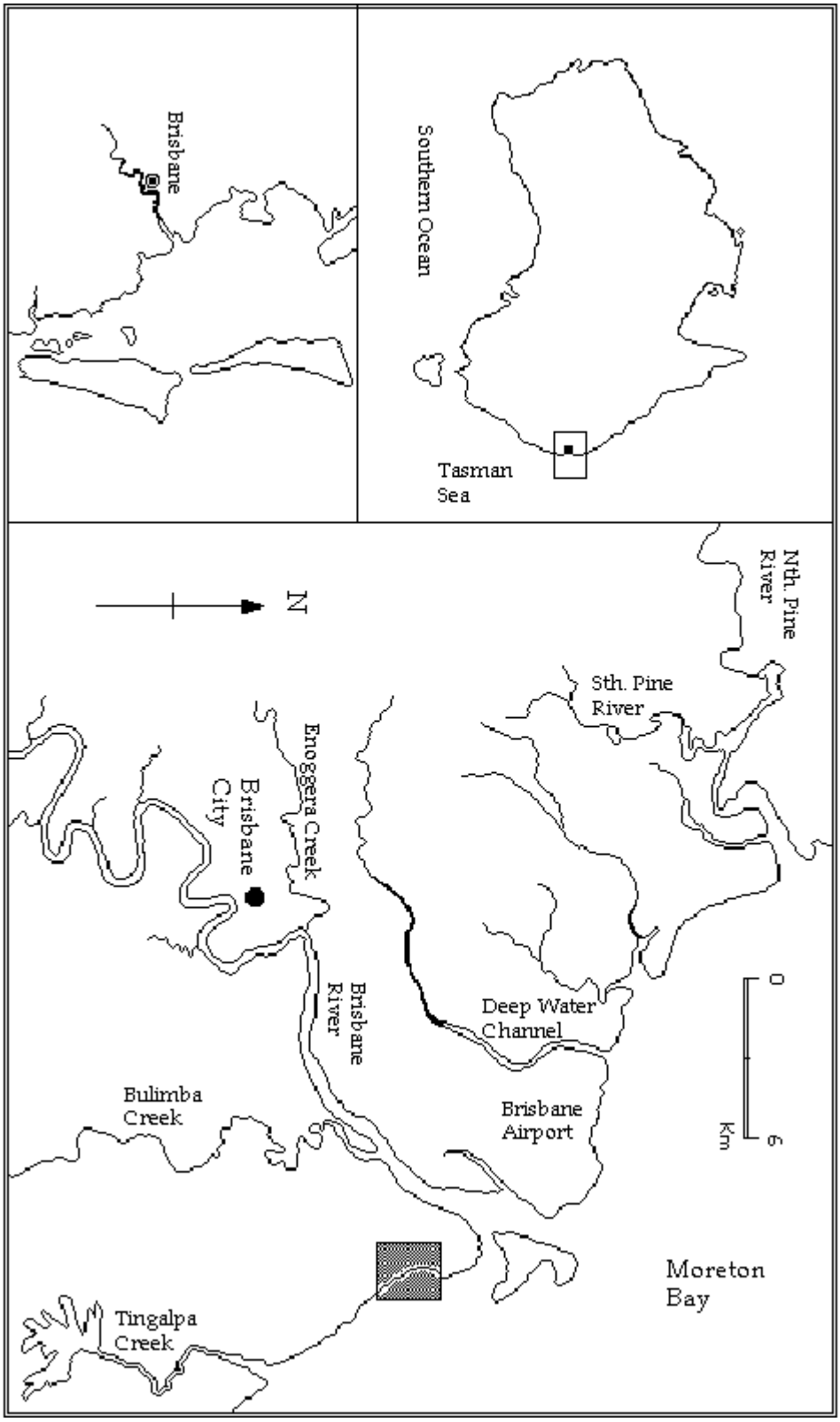

Figure 1: Map showing the location of the Wynnum tip study site (shaded area). The Wynnum sewage outfall is near the northern edge of the shaded area.

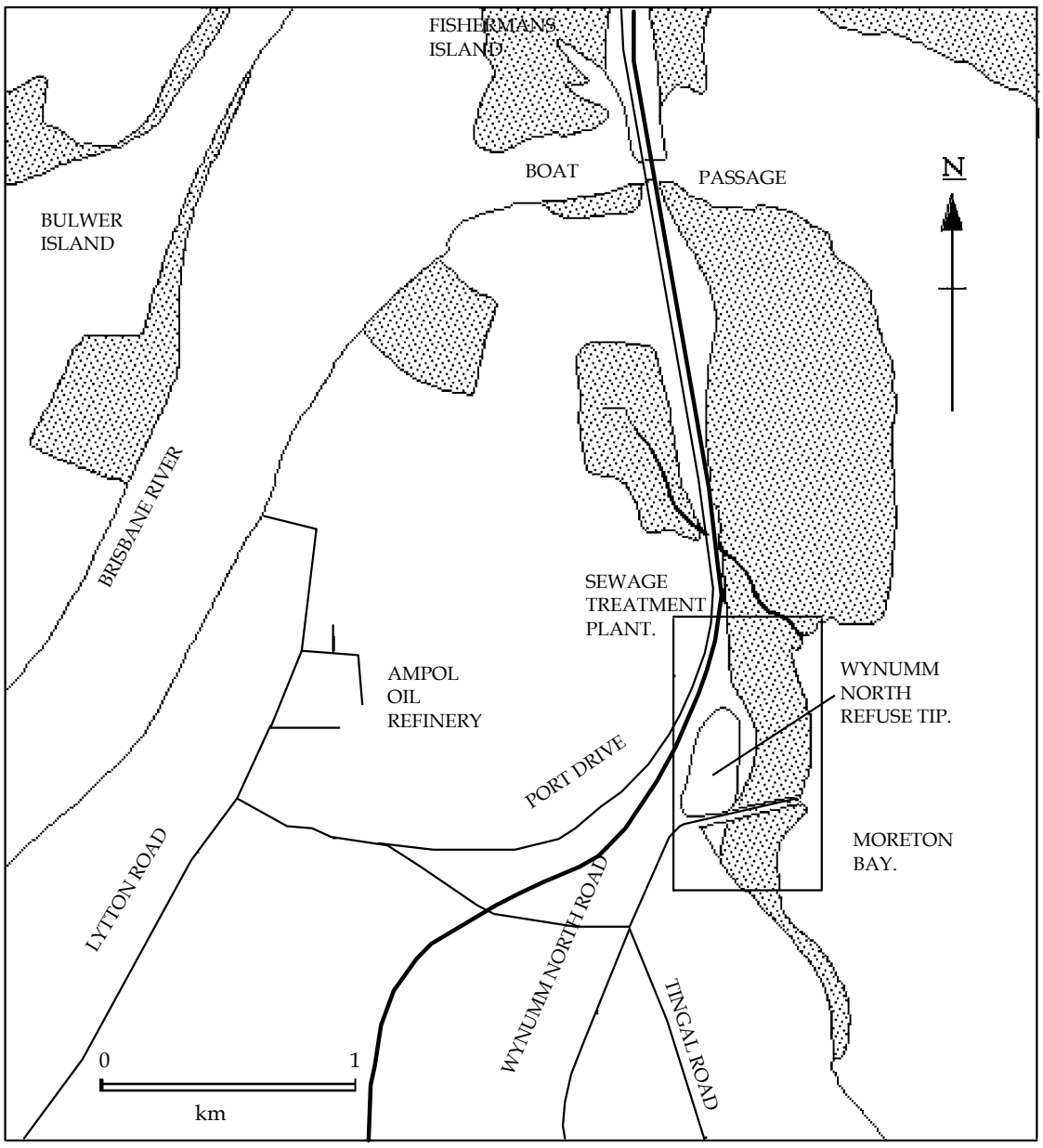

Figure 2: Map showing detail of the Lytton and Wynnum area of Brisbane and the location of the Wynnum North refuse tip. The boxed area is the extent of the study area. Shaded area represents areas of Mangrove.

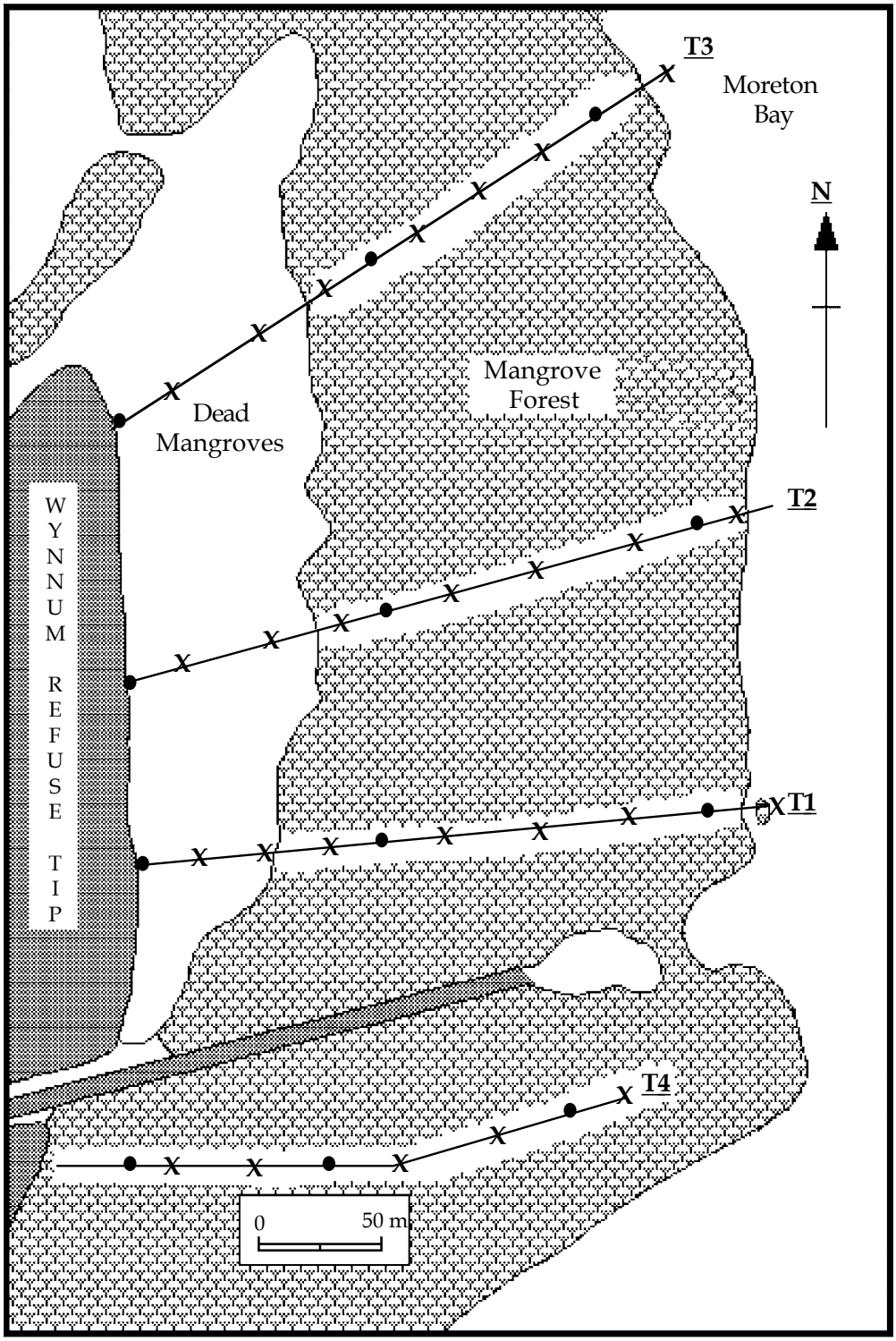

Figure 3. Map of the Wynnum Tip site showing sample locations; filled circles indicate cores and Xs indicate where grab samples were taken.

$$\text{Compaction factor} = \left(100 * \frac{(Di-De)}{(L-De)}\right)$$

The compaction factors of the 12 cores sampled is summarised in Table 1.

Table 1. Calculated % Compaction for sediment cores obtained from Wynnum Brisbane.

Core	%
Mcc1	39.0
Mcc2	56.5
Mcc3	51.9
Mcc4	53.6
Mcc5	54.6
Mcc6	49.6
Mcc7	59.1
Mcc8	47.4
Mcc9	54.6
Mcc10	48.0
Mcc11	47.3
Mcc12	25.5

In the laboratory cores were split by routing opposing sides of the P.V.C. pipe to within a few 10 ths of a mm from complete. The thin plastic membrane left was then penetrated with a sharp scalpel and a thin nylon cord then dragged through the sediment to split the core. Subsamples were taken along the length of the core at depths of 0, 10, 20, 30, 40, 50, 75, 100, and if required, at 125 cm intervals for metal analysis (see Clark, 1992; Clark *et al.*, 1996a; 1996b). During sub sampling the cores were logged for reconstruction of sedimentary environments.

In addition grab samples were taken from 2 depths at each sampling site; a surface sample spanning the depth from 0-5 cm and a sample covering the depth range from 30-35 cm Samples were placed in plastic bags and as much air as possible was excluded from the bag before sealing and labeling. In the laboratory grab samples were treated in a similar way to core samples; in that sediment in contact with the plastic was not taken as part of the subsample. The sediment was split in half and the central part of the sediment taken. Approximately one quarter of the sample was taken as a subsample.

All samples were prepared for grain size analysis. Significantly, a number of studies (Bouyocos, 1932; Olmstead, 1931; and Nelsen, 1983) have shown that grainsize distribution is not only dependent on the duration of sample treatment but also on the method employed and indicate that sample suites need to be treated in a uniformly consistent way. As a consequence all dried and weighed sediment samples were soaked in 100 ml of 50 vol. peroxide to destroy organic matter and to aid in the dispersion of clays. Due to the high salt content of many samples, each sample was washed with distilled water several times until the conductivity of the water was at about 0.5 µS, or until deflocculation had occured. To each sample was added 50 ml of 0.6 gl^{-1} calgon solution (Lewis, 1984) and for stubborn samples 2 ml of 40 % NaOH. Samples were then washed with deionised water and mechanically stirred with a handheld homogeniser for 5 minutes.

Samples were then wet sieved at -2, 0, 2, & 4ø on a shaker for 10 minutes at 70 % power. The sand fractions were then placed in preweighed plastic punnets and dried at 65°C for 24 hours before weighing. The silt and clay fractions (4, 6, 8, & 10ø) were analysed by pipette analysis (Lewis, 1984).

Results

Logged sedimentary cores were plotted using Macsection 2® to give Figure 4. A series of shelly deposits were found throughout the study area and there was a generally fining upwards sequence. It is believed that the shelly deposits are the remnants of tidal distributary channels associated with a prograding delta.

Radiocarbon dating of two shelly lag deposits yielded dates of 2660±70 years BP and 1440±70 years BP. These data give a sediment accumulation rates of 0.33 mm/yr for the lower sandier part of the core, and 0.48 mm/yr for the upper muddier part of the core. These data indicate that sediment accumulation rates have increased as water depth has shallowed and mangrove colonisation occurred.

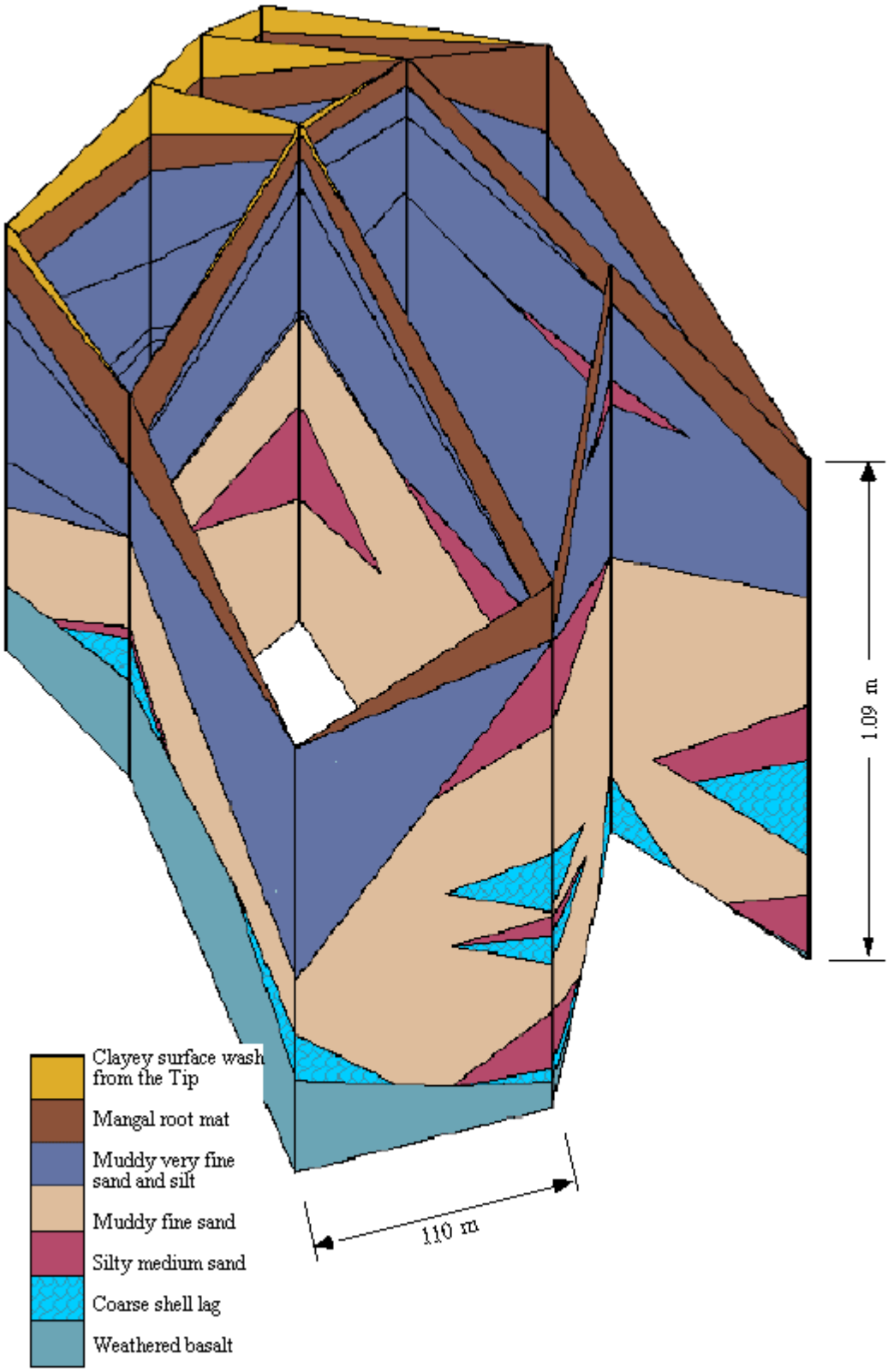

Figure 4. Fence diagram of the sediments at Wynnum generated from the core data. Diagram shows a series of overlapping channel lag deposits grading into channel fill and then to the mud flat sediments. The mangroves are the last phase to develop and traps the finest sediments

XRD analysis of the weathered material found in the lower most portions of 5 of the 12 cores indicates that the basement is dominated by kaolinite clay with some minor smectite clays and quartz (Figure 5). A small clast of parent material found in one core indicates that the weathered material has come from a basalt flow.

Data for the grainsize analysis shows that the mudflats have the coarsest detrital population and the mangrove sediments have the highest clay content. The change in distribution is very evident between the mangrove sediments and the mudflats. The data show that the sediments of the Wynnum area are slightly coarser at depth than they are at the surface (Figure 6). This fining upwards trend in the sediment reflects the changing conditions as mangroves colonise the area and moderate wave action resulting in the accumulation of increasingly finer sediment. The ternary diagram (Figure 6) shows that there are three distinct sedimentary zones; the mudflats, the fringing trees where some coarse sediment is present, and the remaining mangrove and salt marsh sediment.

Discussion

XRD data for the weathered basalt (Figure 5) shows that the basalt has been extensively altered to kaolinite and quartz; some plots reveal the presence of minor smectite in the weathered basalt (e.g. mcc12-07 and mcc10-07).

The kaolinite in the altered basalt shows very broard peaks and although resolution of the 4.464Å peak is too poor to allow determination of the Hinckley measure of disorder (Hinckley 1963), comparison with crystallinity plots from Murray and Lyons (1956) suggests that the mineral is very disordered. With the exception of illite which is produced from acidic parent materials (Barshard 1966), the weathering of either acid or basic parent material can produce a similar distribution of physils.

The Wynnum basalt samples have a dominance of kaolinite over smectite which suggests a mean annual rainfall during weathering of 20 - 40 inches (500-1000 mm; Barshard, 1966; see also Sherman, 1952). Under these rainfall conditions it is suggested that the smectite forms as a first weathering product and that the kaolinite is a secondary weathering phase. Kantor and Schwertman (1974) found that kaolinite/smectite assemblages were common where there was a strong seasonal rainfall of about 1000 mm per annum and a 3-4 month dry period. Weaver (1989) suggests that generally kaolinite dominates where annual rainfall is >2000 mm, that mixed smectite/kaolinite assemblages occur where annual rainfall is <1000 mm, and that kaolinite/halloysite assemblages occupy the mid range of annual rainfall. However, while rainfall and climate are primary controls in clay formation, soil drainage is also important, and a dominance of kaolinite in humid subtropical climates suggests moderate to good drainage (Weaver, 1989). Furthermore, the environment of formation is also important, and kaolinite is almost never formed during subaqueous marine weathering. Hence, weathering of the Wynnum basalt almost certainly occurred though sub-aerial processes.

Overall the analysis of the clay mineral assemblage would indicate that weathering occurred sub-aerially under similar (though probably slightly dryer) climatic conditions than presently exist today. Estimations of kaolin formation rates in sub-tropical regions are variable, however for basalts (Lelong, 1969; Mohr & Van Baren, 1954), and the deep weathering of ash materials (Aomine & Miyundi, 1963) suggest weathering times as fast as 10,000 years are possible.

During the last glaciation (18-12000 bp) sea level was considerably lower than present; some 150 m lower (Flood, 1983). Markgraf *et al.* (1992) suggest that the vegetation around Moreton Bay was not too dissimilar to the vegetation found to day. Peters (1992) suggests that by about 15,000 BP the climate in the region was becoming wetter and warmer; the question remains how much wetter and warmer. Other authors (e.g. Butler, 1994) suggest that during this period Moreton Bay would have had a climate 1 to 2°C cooler than present and that it would have been considerably drier; more Mediterranean like. Given these data it is unlikely that there was sufficient time for basalt weathering to have occurred in the cooler dryer climate that would have

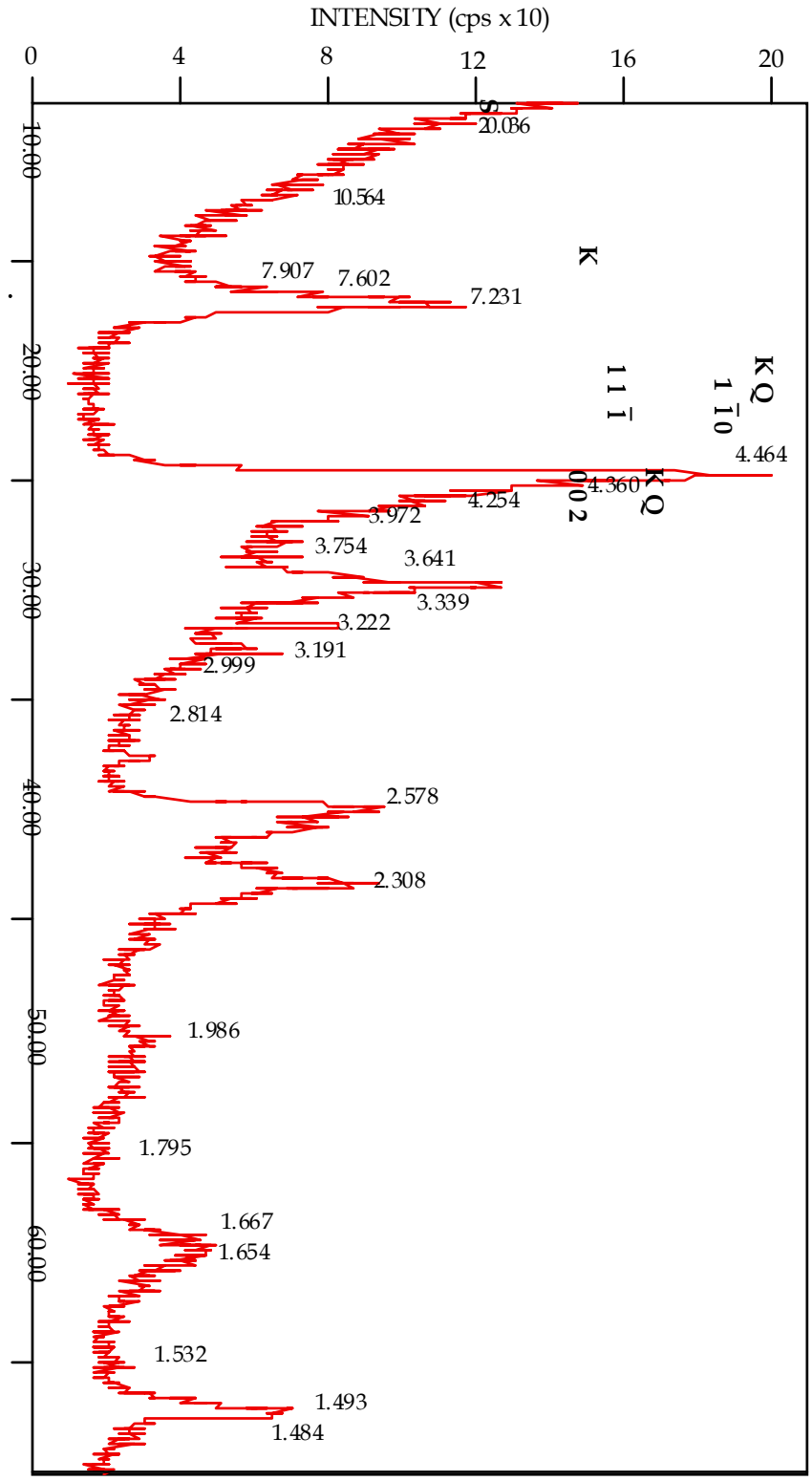

Figure 5. XRD plot of the weathered basalt underlying the Wynnum sediments. Values above peaks are the d-spacings in Angstroms and three digit numbers in bold are the Miller Indices for the peak; S indicates smectite, K indicates kaolinite, and Q indicates quartz peaks.

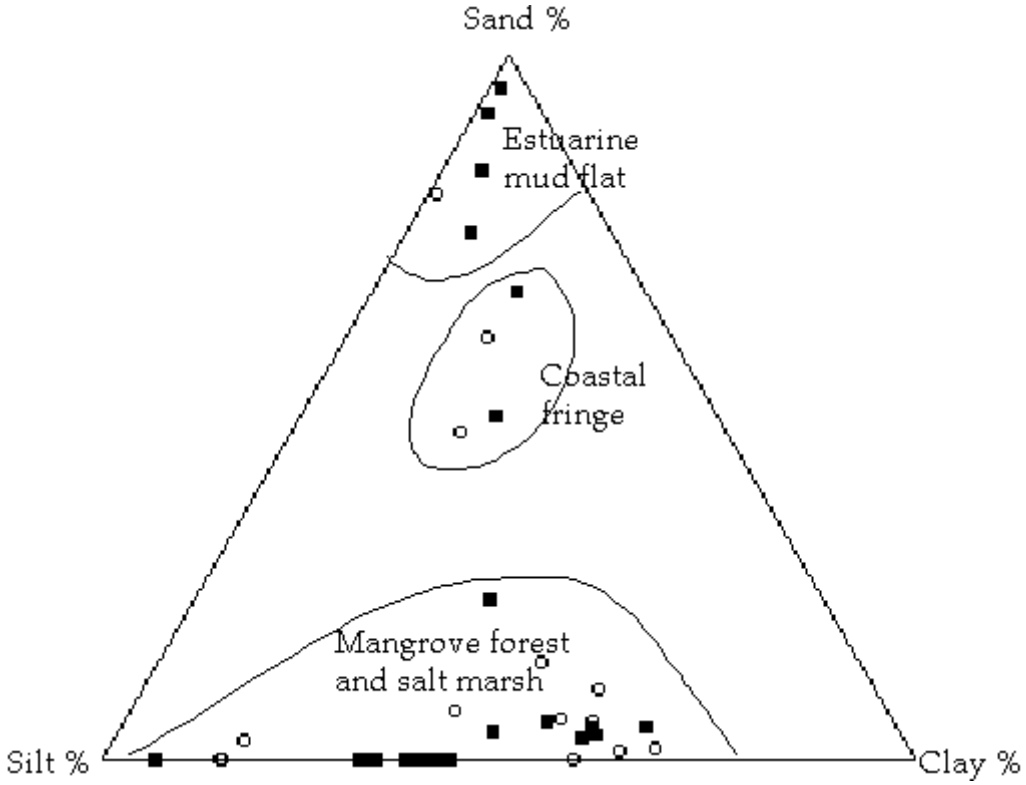

Figure 6. Ternary plot of grain size analysis of Wynnum sediments. The filled squares are surficial sediments whereas the open circles are from a depth of 25 cm. Generally the surficial sediments are finer grained than sediments from deeper in the profile.

prevailed during the waning of last glaciation and that sealevel rise would have brought a cessation of sub-aerial weathering about 7000 years before present.

However, a number of other authors (e.g. Chappell, 1983; Butler, 1994) suggest that between 120-20,000 years bp climates around Moreton Bay were wetter and warmer than the last glaciation and that it was wettest and warmest from 110-80,000 bp, and coldest and driest 15-11,000 bp. During this period sealevel also remained relatively constant at 10-20 m below present and it is more likely that basalt weathering occurred during this period.

Overall it appears likely that the weathering of the basalt basement at Wynnum took place under similar climatic and hydrological conditions as exist today (i.e. a humid sub-tropical climate with rainfall of about 1000 mm) and that this weathering occurred between 120-7,000 bp, with a majority of the weathering having occurred prior to 18,000 bp. This weathered basalt (the massive low permeability clay at a depth of 1.5 - 2 m) in the Wynnum area is believed to have a major control on the movement of leachates from the tip. Leachate moving down through the sediments from the tip encounters the impervious clay and is forced to move laterally across it down the hydraulic gradient (Clark, submitted).

Sedimentation Over the Last 6000 years.

The marginal marine sediments at Wynnum rest unconformably on a weathered basalt. The sediment cover is about 1.5 m thick in the southern part of the site, and thickens northward as a result of the gradual northerly dip on the unconformity.

Overlying the basalt is a shelly deposit with many shells embedded in the top of the weathered basalt. A radiocarbon age determination (by Beta Analytical, Florida)made on shell material from core sample MCC 003 returned an age of 2660±70 years B.P.. This date gives a minimum age for the erosional surface on the weathered basalt. Another sample from 690 mm down core MCC 003 returned an age of 1440±70 years.B.P.. These two dates indicate average sedimentation rates for the area of 0.33 mm/yr for the lower portion of the core and a rate of 0.48 mm/yr for the upper part of the core. The greater sedimentation rate for the upper portion of the core reflects accelerated accretion following colonisation of the sediments by mangroves which trap and bind fine grained sediments. The dated shell species were either *Anadara Trapezia* (Sydney Cockle) or *Batilleria Australis* (mudwelk); both of these molluscs are found in estuarine environments; with sandy to muddy sediments (Shepard & Thomas, 1989).

Stratigraphic data from the 12 cores taken from the site are presented in a fence diagram (Figure 4) which shows the spatial distribution of sediments. The logged cores showed no primary sedimentary structures other than a few sharp contacts which probably correspond to erosional surfaces and/or periods of non deposition; however subtle structures may be revealed by techniques such as x-ray radiography (e.g. Hamblin, 1962). All cores show a fining upwards trend in mean grainsize with a typical sequence grading upward from a coarse shelly lag deposit through a muddy medium to medium fine sand then a muddy fine sand and finally a silty or clayey mud.

Higher velocity tidal flows in channels have locally winnowed fine sediments to leave a coarse lag deposit; shells are abundant in these channel deposits. Lateral migration of modern tidal channels has produced discontinuous units characterised by longitudinal crossbedding (e.g., see Reineck and Singh, 1975), but none of these units were intersected in the test cores.

Heckel *et al.* (1978) interpret the area as tidal flats associated with the development of the Brisbane River bird foot delta and Figure 4 shows a series of overlapping shelly deposits that are interpreted as lag deposits of distributary tidal channels; the fining upward sequence reflects the infilling followed by tidal flat development and finally by muddy deposits associated with mangrove colonisation of the intertidal zone. Tidal flats (e.g. Jade Bay, Germany) show a similar tendency for muds occupy the zone closest to the shore while sand becomes progressively coarser off shore (Figure 6; Gadow, 1970 in Reineck & Singh, 1975).

The tidal mud flat and mangal forest sediments are heavily bioturbated by polychaetes, amphiopods, crustaceans, and gastropods (Frey *et al.*, 1989). Infauna population densities of up to 20,000 individuals per m^2 have been recorded for similar sites (Gerdes *et al.*, 1985) and it is likely that any primary sedimentary structures which may have been present were rapidly destroyed during bioturbation. All available evidence suggests that it is unlikely that the environment for sediment accumulation at the Wynnum site has changed radically over the last 3,000 years since mangrove colonisation.

Conclusions

Sedimentary data collected from the Wynnum area in Brisbane show a number of overlapping shell channel lag deposits, infilling silty medium sands and flat deposits that is consistent with being part of the distributary channels of the Brisbane Rivers bird foot delta. These sediments lie unconformably on a weathered tertiary basalt, which forms the basement for the study area.

Weathering of the basalt has most likely occurred under similar, but slightly drier climatic conditions as presently exist. Because the height of the last glaciation was probably too cold and dry for basalt weathering, and that the subsequent rises in temperature, rainfall and sealevel were to fast to allow adequate weathering to occur then it is more likely that weathering occurred between 120 and 20,000 yrs bp. While the rising seas inundated the site some ~7000 years BP, active sedimentation on the basalt did not occur until about 2660 years BP.

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QUATERNARY AUSTRALASIA ABSTRACTS

Paper: Quaternary Australasia 14/2 (1996)

BIOAVAILABLE PHOSPHOROUS IN THE SEDIMENTS OF THE BELLINGER RIVER ESTUARY

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Abstract of B.App.Sci. Hons. Thesis.

The Bellinger catchment, located approximately 500 km north of Sydney, is dominated by bushland (91.8%). This study was undertaken to assess the spatial and temporal trends in sediment-associated phosphorous in the Bellinger River estuary. The results are derived from cores taken at 5 sites, following the flood event of May, 1996, from the river mouth to 15 km upstream. Bioavailable phosphorous ranged from 0.51 mg kg $^{-1}$ at the river mouth, 25 cm depth, to 14.35 mg kg^{-1} 5 km upstream at the town of Mylestom, <1 cm depth; whereas total acid extractable phosphorous ranged from 51.00 mg kg^{-1} 1 km from the river mouth, 25 cm depth, to 540.50 mg kg^{-1} 12km upstream, 25 cm depth. Trends in bioavailable and total acid extractable phosphorous indicate that the average high flow salt/fresh water interface is located 4 km upstream of the river mouth. Downstream, saltwater mixing effects, and possible dilution with marine sediments under storm surge conditions, reduced phosphorous concentrations. This study represents a base-line data set for current and long term comparisons to systems dominated by urban and rural landuses with similar flow regimes, catchment sizes and geology.

COVER ILLUSTRATION

A scanning electron photomicrograph of two spheroidal clusters of Pyrite (FeS_2) crystals. These crystal clusters are common in unoxidised, estuarine, Holocene sediments. Pyrite crystals can be easily mis-identified as charcoal when conducting palynological analyses because of their blackish appearance in transmitted light. However, in incident (i.e. reflected) light pyrite is easily identified by its distinct brassy lustre. This photomicrograph was provided by Richard Bush, a post-graduate student from the School of Geography, University of New South Wales. Richard has undertaken much of his research at Southern Cross University using their scanning microscopy and other facilities to study the mineralogy, distribution and micromorphology of sulfides in estuarine sediments from the east coast of Australia.