CAM QUA

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GODWIN INSTITUTE FOR QUATERNARY RESEARCH

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TIME AND CLIMATE IN STRATIGRAPHY: A QUATERNARY PERSPECTIVE

Geological Society Ordinary Meeting
Burlington House 28th March 2001

Despite an impending tube strike, several of our number went down to London for this event, which was an attempt to rejuvenate OGM discussion meetings at the Geological Society. The clientele were in part very similar to any QRA event, and it was good to see so many familiar faces. However, there were also a good number of non-Quaternarists.

There were three speakers - David Bowen, and our own Phil Gibbard and Nick Shackleton - each with their own very different slant on the topic.

David Bowen perhaps stands in the middle, with an interactive approach to terrestrial and oceanic stratigraphies. He started uncontroversially by affirming the importance of defining chronostratigraphy from local terrestrial sequences and correlating outwards only from that starting point. However, he also stated a firm belief in the importance of broader correlations with the ocean sequence, and claimed that this could only be done by means of geochronology, which has been slow to advance. He went on to describe recent data in support of this approach. Evidence from marine cores such as MD95-2006 from the Barra Fan show ice-rafted debris peaks which suggest the presence of a British ice-sheet during the whole of the Devensian rather than the traditional view restricting it to the Late Devensian. This has prompted a re-examination of terrestrial records. Using Cl-36 as a geochronological control on the exposure of striated rock surfaces, this research shows that four phases of ice advance, previously described as pre-Devensian, are now dated to ~35,000yBP, ~22,000yBP, ~same time as Heinrich 1, and ~12,000yBP. He pointed out that such broad-scale linking of the terrestrial and marine systems allowed for understanding of phase relationships within the climate system.

In contrast, Phil Gibbard argued for discipline in the use of stratigraphical classifications - that these should be kept separate in order to facilitate comparison. He stated that chronostratigraphy is defined in rock sequences, and not floating. Furthermore, the Quaternary suffers from problems of conflation of climatostratigraphy and chronostratigraphy. These are more serious than further down in the geological column, because of the small scale of our sequences. For example, boundaries defined on the basis of biological indicators, such as often used in climatostratigraphy, are diachronous, and therefore problematic as chronostratigraphic markers. Phil also discussed the difference between marine and terrestrial stage boundaries, pointing out that marine terminations are not as abrupt as they seem, and (using an example from Broecker) may in fact cover over 7000 y of sedimentation. He further pointed out that Marine Isotope Stage (MIS) boundaries are drawn at the mid-point of the transition, which is not where the equivalent terrestrial stage boundaries would be drawn. He illustrated this using unpublished data from Shackleton, Sanchez-Goni and others from a coupled pollen-isotope study on Iberian core MD95-2042. This shows that at this site MIS 5e started considerably before the terrestrial Eemian. This prompted Nick to ask whether Phil showing the figure (submitted to a special issue of Global Change for which he is a guest editor) meant that the paper had been accepted!

Nick Shackleton's view had been shaped by being involved in fixing global stratotypes or 'Golden Spikes' in Neogene marine sediments. He argued that such an approach was less useful in the Quaternary (e.g. applied to the Plio-Pleistocene boundary) because it provides a formalisation that is too vague to be useful on the scales on which Quaternarists work; mixing time within the ocean meaning that global signals are in fact diachronous.

Discussion was brief, and surprisingly polite, given the controversial nature of much of which had been discussed.

Perhaps that can be attributed to the presence of pre-Quaternarists, and the feeling it was not fair to bombard them with too much detail of the terrestrial Quaternary sequence.

All in all, a good afternoon out, and a thought-provoking session.

Becky Briant

Palaeoenvironmental Investigations conducted at Cavenham Mere, Suffolk

Rob Austin, McDonald Institute

Cavenham Mere is the most southerly of a series of meres in Central East Anglia whose Holocene lake sediments have been investigated to study changes in the vegetational pattern and the impacts of anthropogenic activity. The site is located close to the Cambridgeshire/Suffolk border, on the easterly fringes of Cavenham village. The basin is now infilled and forms a grassy 32ha depression.

The basin, which probably formed as a solution hollow, is surrounded on three sides by Devensian terrace gravels overlain in places by thin coversands. From the environmental standpoint the site is of interest because it is surrounded by three distinctive types of environment. To the west lies Cavenham Heath –the most southerly sector of the Breckland heathlands, while to the north lies the Lark River valley, an area of fens and marsh, and to the east and south lie extensive areas of chalky, clay rich soils. Each of these environments encourage different vegetational assemblages that, at different times, must have had a greater or lesser influence upon the vegetation found within the Cavenham Mere basin.

Archaeological interest in the site began following the discovery of flint scatters close to the palaeo-margin of the mere. In 1995, excavations revealed additional evidence of sustained early settlement beside the mere; this is hardly surprising, since the location of the mere places it at the cusp of a major historical cross-roads. The east-west transect is made up by the Lark and Gipping river valleys. The valleys would have acted as a migratory pathway for game, and also afforded an easy passage for transitory hunting parties penetrating into the interior of Britain. The north–south transect, may have been even more important, the open nature of the Breckland Heaths allowed unrestricted communication between Eastern England and all other areas to the South and West.

Using pollen/charcoal analysis, loss on ignition and magnetic susceptibility data, a reconstruction of the vegetational succession in the mere catchment area was developed. These results were then compared with those seen at other central East Anglian mere sites. Only a short summary follows, full details of the results and interpretation are held in the Department of Geography library, Cambridge.

The sequence was divided into nine zones which start with open tundra/steppe type grasslands attributable to the Devensian Late-Glacial. Differences between the vegetation seen at Cavenham and other sites remain small during the early phases. However, contrasts become more apparent in later phases, for instance in Zone CMR-5, birch pollen never reaches same percentage levels seen amongst the predominantly clay soil based meres in the east of the region. In CMR-6, hazel scrub is seen to replace birch, although grassy heathland still remains dominant, there is also evidence for outbreaks of fire. The most probable explanation for the fires is that the combination of warm summers and the extensive areas of heathland causing outbreaks of wildfire, although these may be equally attributable to human agency. The elm decline is hardly recorded in the pollen record at Cavenham, but there is strong evidence to believe that the landscape was being actively managed after this event since cereal pollens appear at this time and charcoal counts peak. The final phases show only minor shifts in woodland and grassland pollen counts before the record becomes undecipherable, this would seem to coincide with a desiccation of the mere and before the emplacement of a thick band of clays and silts.

The original survey of Cavenham mere left many questions unanswered. In particular, these revolve around the timing of the appearance of the clay deposits and whether more recent parts of the vegetation sequence existed in other areas of the mere. Pollen evidence indicated that clay started to infill the basin in post Iron Age times, as beech and hornbeam pollen were recorded in zones CMR-8 & 9 and both species are thought to have colonised East Anglia by about 1.9ka BP. Aerial photographs and subsequent coring suggested that the north-west sector of the mere contained one area where spring fed streams had produced a band of rich organic material that either continued to form during the building up of the clay band or eroded a channel through it. Presently, the pollen samples prepared from these deposits are being counted and three radiocarbon samples are awaiting processing. It is hoped that the full results of the combined surveys will be published toward the end of the year.

Round the world in eighty soils - a journal of past climatic changes

Inaugural Lecture: Professor Rob Kemp

A group of us made our way to Egham to hear Rob Kemp of Royal Holloway give his inaugural lecture on February 12th. There was a large audience with many 'names' from the Quaternary world, and the lecture was very entertaining – complete with sound effects from earthworms and cicadas!

Rob Kemp's work is on the macromorphology and in particular the micromorphology of soils; and by using modern analogues these properties have been used to interpret past climatic conditions. He described the process of making a thin section from a block of soil previously impregnated with silicon, and showed slides to demonstrate what could be seen - for example, clay coating on a soil particle representing the remains of a pore which he interpreted as being associated with a temperate climate, perhaps a deciduous forest.

The first part of the lecture described loess sequences in China which alternate between loess and palaeosols, showing slides of their micromorphology. He described the Chinese monsoonal climate, which alternates between the cold Northwest winds bringing dust from the Gobi Desert and the summer winds which are much warmer and much more humid. The soil evidence points towards past changes in this monsoonal system – in glacial cold stages the NW winds were dominant (loess deposited) and in the warm stages the wet oceanic winds were dominant (soils deposited). By using comparisons with modern soils past temperature and rainfall has been deduced and a loess stratigraphy built up. This has then been developed further, linking glacial cycles and monsoons, with a diagram of these against dust/loess accumulation. Professor Kemp made several points about this – that there is always some dust accumulation, the importance is the speed of the deposition of any soils:– the loess units may partly reflect any alteration that took place during or after deposition; and that sequences provide a semi-continuous record of accumulation.

There were more slides showing features used in interpretation – examples were; gypsum particles (showing a dry period) , some freeze-thaw structures, and pieces of carbonate leached from above (interpreted as showing the presence of moisture). The amount of detail that came out of the thin sections of soils was staggering – Professor Kemp talked through a loess sequence in Langzhou, China which shows variation in climate where all other records indicate no change. A major point made was that there is a remarkable match between the loess/soil peaks and the marine oxygen isotope curves, so global climate signals could be seen in the loess sequences.

As the title suggests, there were soils from all around the world - and the rest of the talk concentrated on the Americas. Sequences in North America, formed as a result of catastrophic bursts of massive ice-dammed lakes, and interspersed with dust deposits are particularly impressive. These sequences also have tephra layers from the Cascades (e.g. Mount St Helens) in them – a boon for dating, as these are quite thick and traceable. The earthworm sound effects came in here! The tephra has been bioturbated into the loess in places, (damper conditions) and the cicada noise marked parts of the sequence that are drier - contemporary cicadas like it dry! This was a good bit of light relief with alternating strange noises to indicate the changing dominance of these two climate conditions.

The talk ended with a description of the sequences in Argentina and the huge potential there to increase the knowledge of the southern hemisphere. They plan to work on the ages with luminescence dates, and then to obtain multi-proxy climatic data – so something to watch for!

This was a good introduction to soils and their use in Quaternary climate analysis, and an excellent opportunity to hear one of the experts. Afterwards we also had a chance to see the Royal Holloway picture gallery, with its amazing collection of High Victorian paintings- not to everyone's taste, but a fantastic collection all the same!

Jenny Bennett

Foot & Mouth hits Fieldwork

The foot and mouth outbreak in Britain's countryside has disrupted most field activities this spring. Both the QRA annual field meeting in West Wales and the short field meeting in Southwest Ireland have been cancelled due to foot and mouth restrictions. In Cambridge, fieldwork of students such the Quaternary M.Phils has been abandoned resulting in the reliance upon cores/sediments in storage already. With little sign of any lifting of the restrictions, especially in the uplands of southern Scotland, Cumbria, Wales and Devon, it looks like fieldwork will be restricted to those lucky enough to work in foreign parts.

Did Man's germs wipe out the Mammoths?

They were some of the most remarkable creatures to roam the Earth. Mammoths, mastodons, giant armadillos, dog-sized rodents, sloths as big as giraffes and sabre-toothed tigers wandered the plains and forests of North and South America. Then, c.11,000 years ago they vanished. The reason why has provoked fierce debate. Dr. Ross MacPhee, of the American Museum of Natural History in New York, believes he has found the cause of the extinctions: these great animals died because they caught the coughs and colds from humans. Dr MacPhee believes that the extinction of more than 130 species within a period of half a millennium or less could only be brought about by disease.

This is contrary to the 'over-kill' hypothesis of Dr Paul Martin, Arizona University. However, the idea that early American hunters were the eradicators of the continents mastodons and mammoths suffers from one major setback: the lack of evidence to support it. Despite a plethora of fossil remains, only six mammoths have been found with spear-points in them. As for the other 130 species wiped out, not one has been found near an arrow or with a sign of having been butchered.

MacPhee argues that whilst humans were no doubt hunting, considering their numbers they could not have done so on a scale that could have made any difference to the survival of the species. Instead, he believes America's great creatures were victims not of human aggression, but of diseases introduced by us, or possibly by animals such as dogs or rats travelling with us. MacPhee points to recent epidemics introduced by humans that have wiped out species of toads and frogs in North America, and populations of birds such as the Hawaiian honeycreeper.

However, evidence of a theory of mass extinction due to human-borne spread of disease is lacking at present, although MacPhee is hoping to extract the DNA of bacteria, viruses or protozoa and provide the evidence needed. Also, MacPhee does not consider the effects of rapid climatic change during the period of mass extinctions. Is it not likely, that species were eradicated due to their inability to adapt to rapidly changing habitats at the close of the last glacial period? The idea that mass extinctions were caused by the spread of human-borne disease could in fact be viewed as an indirect result of climate change with the spread of man through the Americas, facilitated by ameliorating climate, bringing with it the spread of disease.

Adapted by Phil Hughes from an article by Robin McKie in the Observer newspaper, January 28th 2001.

DIARY

CAMBRIDGE QUATERNARY DISCUSSION GROUP

There will be no Quaternary Discussion Group meetings this term. Keep an eye out for the next issue of CAMQUA for the Autumn timetable!

'Progressive Palaeontology'

16-17th May 2001

A Palaeontological Association postgraduate conference is being held at Liverpool John Moores University. Details of the meeting can be found at:

http://cwis.livjm.ac.uk/bes/admiss/ProgPaleo/ppc.htm

Alternatively, please feel free to contact Hannah
<BESHORE@livjm.ac.uk>
or Sally
<BESSREYN@livjm.ac.uk>
for further details

DIARY.... continued

As mentioned on page 3, several field meetings have been cancelled - see **http://www.qra.org.uk/** for details. We are, however, including those field meetings which have not as yet been affected:

QRA Short Field Meeting
North Lincolnshire and East Yorkshire
September 2001

Organisers: Mark Bateman, Paul Buckland, Mark Dinnin & Nicki Whitehouse

Contact: Mark Bateman, Department of Geography, University of Sheffield, Winter Street, Sheffield.

e-mail: ***m.d.bateman@sheffield.ac.uk***

QRA Postgraduate Symposium
University of St. Andrews
10-12th September 2001

Contact: Lindsay Wilson, School of Geography and Geosciences, Irvine Building, University of St. Andrews, St. Andrews, Fife, KY16 9AL
Tel: 01334 463 930
Fax: 01334 463 949

e-mail: ***ljw4@st-andrews.ac.uk***
http://www.st-andrews.ac.uk/~ljw4/qra2001.htm

Changing Wetlands: New Developments in Wetland Science

University of Sheffield
11-13th September 2001

See the website at:

http://www.shef.ac.uk/~g/wetlands

for updates on the conference

URGENT APPEAL!

You might have noticed that the diary pages for this issue are looking a bit slim! Please send in details of any talks/ seminar series etc you feel would be of interest to CAMQUA readers - address on the right ---------->

"I see you in the process of conducting a pollen preparation and –wait, you're not adding the proper amount of solvent and the pH of the solution is not right. Now I see your supervisor turning around and slowly begin to approach..."

The Editors apologise for the poor quality 'humour' on this page.... So give us some material!!

It's your CAMQUA!

Camqua wouldn't exist without your contributions. In order to carry on we need more involvement from all relevant departments (Zoology, Earth Sciences etc). Always of use are reports on meetings or conferences. Don't presume someone else is already doing one, get in touch with your editors and volunteer! Invariably, we will gladly accept!

Deadlines

Copy for the next issue of ***Camqua*** should be submitted by **1st October 2001** to the editors at the Geography Department.

Credits

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Camqua would like to thank the Department of Geography for generously supporting the production of this issue.

Earth Link Seminar Series

A forum for high-profile science across the Earth Science community in Cambridge

Summer 2001 Programme

9th May 1.05pm
Harker Room, Earth Sciences

Tim Jupp (BPI)
A Thermodynamic Explanation for Black Smoker Temperatures

Carol Pudsey (BAS)
First Survey of Antarctic sub-ice shelf sediments: clast provenance as a clue to palaeoclimate

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16th May 1.10pm
BPI/Bullard

Emily Rayfield (Earth Sciences)
Cranial Design and Function in a Large Therapod Dinosaur

Matthew Dawber (Earth Sciences)
Ferroelectric Thin Film Memories

22nd May 6.00pm
St. John's Dirac Room

Changes in Surface and Deep Water Conditions at Millenial Time-Scale (the last 50 000 years in the Western Mediterranean Sea)

Speakers on this subject include: Isabel Cacho Lascorz, Isabel Sanchez-Almazo, Andy Woods, Rachel Flecker and Stephanie de Villiers

Helen Pfuhl
Isotopic Record and its Potential Implications for the Messinian Salinity Crisis