

Photo: Elvin Thurston 2007

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Edited by the General Secretary

Fossils at West Runton

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Lectures in 2007-8

7:30 -9:30 pm on Thursdays in the Friends Meeting House, Upper Goat Lane, Norwich.
Good car parking facilities are available in the multi-storey next door. Come early (from 7:00) to join informal discussions and meet your fellow members.

October 18th Prof Tony Stuart, “**Late Quaternary megafaunal extinctions in Northern Eurasia**”

We live today in a zoologically impoverished world from which most of the largest and most spectacular terrestrial vertebrates (megafauna) have disappeared in the recent geological past. Losses include mammoths (2 species), mastodons, sabretooths, ground sloths and many other species in North America, and woolly mammoth, woolly rhino, giant deer (‘Irish elk’), cave bear, cave lion, and spotted hyena in Northern Eurasia. South America and Australia were also severely affected. Did these Late Quaternary megafaunal extinctions result from climatic/vegetational changes, ‘overkill’ by human hunters, or a combination of both? Resolution of this crucial issue can only come from detailed research, especially constructing a firm chronology of extinctions in each region.

In our current NERC funded research project we are generating new AMS radiocarbon dates made directly on material of to establish a reliable chronology for the extinct megafauna of Northern Eurasia ca. 45 to 5 thousand years BP. A major aspect of our project is comparing the megafaunal record with the archaeological and vegetational evidence using GIS mapping and range charts with the aim of better understanding the cause or causes of these extinctions.

November 15th Dr Tim Lenton, UEA. “**Tipping points in the Earth system**”

The term “tipping point” usually refers to a critical threshold at which a tiny perturbation can qualitatively alter the state and development of a system. The term “tipping element” has been introduced to describe large-scale components of the Earth System that may pass a tipping point. Of particular interest are those elements in the climate system that may be tipped by human activities this century and undergo a qualitative change before the next millennium. We have critically reviewed these potential policy-relevant tipping elements, drawing on the fast-increasing pertinent literature and an

international workshop, in order to compile a master list and assess where their tipping points lie. For an important subset, their sensitivity to global warming and the uncertainties in this are ranked using the results from an expert elicitation exercise. The Greenland Ice Sheet emerges as the tipping element with the nearest threshold and the least uncertainty in this. The majority of causal connections identified between tipping elements are 'positive' – where tipping one element encourages tipping another. This raises the alarming possibility of human activities triggering "domino dynamics" in the climate system. The implications for human societies and climate policy are profound. In principle, early warning systems could be established to detect the proximity of some tipping points, but in practice the necessary long time-series of high resolution observations are lacking. Recognizing the nonlinearity in damage costs associated with passing a tipping point fundamentally alters the minimisation problem for the combined costs of mitigation and adaptation, shifting temperature targets accordingly. On the other hand, the accessibility of certain tipping points in the socio-economic system may even provide no-regret options for triggering the transition to a low carbon economy.

December 6th Dr R Belshaw, "Sedimentary and surface processes in the development of the East Anglian landscape".

Sedimentary Processes. River Processes-What flowing water can and cannot do; the importance of super-critical flow; why lowland rivers cannot incise and form terraces in warm periods; why they might incise in cold periods. Marine Processes-Sub-tidal channels; tidal barrier beaches; the effect of changes in sea-level

Landscape evolution in central and eastern England since the early Tertiary

January 10th 2008 Prof. Conway-Morris. "Does evolution have a direction, and if so where is it going?"

Is evolution a random, open-ended process without inherent predictability? "Re-run the tape of life", claimed Stephen J. Gould and the out-come will be entirely different: no humans, for example. Prof. Conway-Morris will argue the exact reverse. Evolution is far more predictable than generally thought, whether we are talking about molecules or societies. This means human-like intelligence is very probable, perhaps inevitable. So not only does this indicate a deep structure to evolution, but re-opens the question posed by Fermi: where are the extraterrestrials?

February 21st, Dr Steven Pawley on the chronology of glaciations.

Steve will tell us of his research in North Norfolk and how he has unravelled the evidence of several glaciations to establish their chronology.

Recently Published Paper.....Summary and Remarks

Evidence for Middle Pleistocene temperate-climate high sea-level and lowland-scale glaciation, Chapel Hill, Norwich, UK. Adrian Read, Mike Godwin, C.A.Juby, Jon Lee, A.P.Palmer, I Candy, & Jim Rose, Proc. Geol. Assoc. (2007), 118, pp 143-156

In this review those remarks and comments entirely arising from extrapolations made by your editor are *italicised*. ***He offers them for your criticism and comments.***

This paper reports work done when the Norwich bypass was being built. *It illustrates just how important it can be to watch all excavations in our area and to publicise them!* The succession can be summarised as, from the chalk upwards, gravel that is part of the shallow marine How Hill member of the

Wroxham Crag, overlain by the glacial Happisburgh Formation, followed by shallow marine sands designated the Chapel Hill Sands. Finally the succession is completed by the clay-rich Lowestoft Till. The evidence supporting these interpretations is fully described

This paper is important for several reasons.

The first is that immediately above the Chalk (here at ca. 18m OD) is a layer of gravel

whose clast and mineral composition is the same as that of the shallow marine How Hill member of the Wroxham Crag; there was no indication of earlier Crags or derivation from them.

Of course this is not proof that earlier crags was not deposited and then destroyed by a later progression. This destruction is a potent process, as shown by the destruction of the thick glacial deposits west of Sheringham by the current marine progression, as illustrated on the front of the last Newsletter. However it remains possible that they were never deposited and that land level was at a minimum at the time of the How Hill member, allowing a transgression greater than before. I understand that the How Hill member also overlaps the earlier Crags elsewhere.

The second is that it reports strong evidence of a warm period between a glaciation before the Anglian, which appears to be coincident with the Happisburgh Glaciation, and the deposition of the Lowestoft formation during the Anglian Glaciation (MIS 12). The relevant marine Chapel Hill Sands consist of a lower bed containing a temperate foraminiferal assemblage and an upper bed with a cold foraminiferal assemblage, as well as marine shells. Thus previous proposals made about the Happisburgh Glaciation as being separated from the Anglian by an interglacial are supported.

The third is that, since there appears to be an unconformity at 28.5 m OD at the top of these sands beneath the Lowestoft formation, there is a strong indication that the land level has since risen more than 28.5 m. It is suggested that "in excess of 30 m of uplift must have occurred in the region of Norwich".

The proposal made in an earlier edition of this Newsletter (ref.1) that Bramerton and Norton Subcourse have been uplifted by isostatic processes is apparently supported. Indeed, since the sum uplift seems to be close to zero at Pakefield, if the uplift at Chapel Hill that is ca. 32km from Pakefield was ca. 30m, then, taking into account the rigidity of the crust, 9 m at Norton Subcourse at ca. 17km distance seems readily acceptable. Thus previous deductions made in GSN newsletters about

the relative ages of the Cromerian deposits at Norton Subcourse and Pakefield based on height above OD were unjustified.

Considering that it is situated in the middle of "flat" Norfolk, anyone who has driven or walked in Norwich will probably agree that it is remarkable for its hills. Is this consistent with the Wensum near Norwich, and the Yare below Norwich, being comparatively deeply incised? Indeed at one point land level rises 30m from the bank of the Wensum within only 250m! This is just what one would expect for a local rise in land level (analogy with the Grand Canyon!). It is interesting that while the whole of north-west Norfolk is a region of relatively low gravity; there is currently a local gravity minimum centered on the area to the west of Aylsham of -8 mGal (ref. 2.), attributed to Palaeozoic granitic intrusions (ref. 3). This compares with +2 mGal at Pakefield. Such low gravity anomalies occur as far as the western fens. Presumably north-western Norfolk is still rising slightly relative to south Norfolk and north Suffolk. Of course evidence for current isostasy does not prove that the situation was the same during the Cromerian. Indeed the evidence of Bytham river terraces supports the proposal that, until the Anglian glaciation, the Bytham valley was rising as well, at least in western Suffolk. But as shown by Keith Clayton (ref. 4), there is strong evidence for removal of a considerable depth of chalk and Jurassic clays in north-west Norfolk and western Suffolk during the Anglian Glaciation that would have deloaded the crust to some extent. Did that glaciation initiate or encourage an isostatic rise in central and north Norfolk and western Suffolk in the last 400ka?

It is also interesting that the course of the Bytham River across north Suffolk (and the current Waveney-Ouse valley) currently coincides with a region of approximately normal gravity whereas most of East Anglia is currently experiencing slightly lower gravity; if a similar situation also pertained before the Anglian Glaciation did it control the course of a low energy river like the Bytham?

Meanwhile, if western Suffolk has also risen since the Anglian because of crustal deloading (ref. 4), shouldn't this be taken into account when considering correlations between exposures of the Bytham terraces?

Norfolk, January 2007

- 2) *Gravity Anomaly Map of Britain, Ireland, and Adjacent Areas*. BGS 1997
- 3) N. Chroston, various papers
- 4) K M Clayton, *Quaternary Science Reviews* 19 (2000) pp. 811-822

References:-

- 1) Newsletter of the Geological Society of

Battle of Happisburgh!

Lithostratigraphers and biostratigraphers fight it out beneath the cliffs!

The recent meeting of the Quaternary Research Association in North Norfolk (9th-12th September) demonstrated that the fossil experts and the rock experts still strongly disagree about middle Pleistocene chronology. Your correspondent now finds both proposals completely convincing while being virtually completely incompatible! Jim Rose (Royal Holloway Univ London, and Richard Preece (Univ. Camb) made their proposals clearly beneath the Happisburgh cliffs on the third day. Neither made any significant concessions but made their points with humor in a calm, reasoned, and completely polite way. Rene Barendregt (Univ. of Lethbridge, Canada) complimented the participants, commenting that in North America such disagreement might have preceded fisticuffs!

We all await the outcome of current research using techniques such as thermal transfer OSL and the application of an improved amino acid racemisation technique currently being used by Kirsty Penkman (Univ. York). The whole issue of Pleistocene chronology needs such injection of new data.

The rest of the meeting consisted of active discussions and demonstrations at Bramerton, Leet Hill, Earsham, Pakefield, Happisburgh, West Runton, Weybourne, Weybourne Town Pit, and the Blakeney Esker.

Thanks are due to the organisers, and participants such as Prof Rose and others, who made this meeting so interesting and worthwhile.

E.T.



Our Field Secretary, Peter Riches, bringing the meeting up to date about Bramerton from an early Pleistocene podium.

Brian Moorlock (BGS), Peter Norton (GSN), and Rene Berendregt , at Bramerton.



Flint flake, a probable human artefact, found during the meeting at Earsham



Ian Candy demonstrates calcrete at Leet Hill



Jon Lee, a principal organiser of the Meeting, explains the research at Leet Hill

One of the original flint flakes found at Pakefield brought by Simon Parfitt for our inspection.



At Happisburgh Richard Preece confidently makes the case for the biostratigraphical approach while Rob Westaway (behind) and Jim Rose listen thoughtfully.





Jim Rose, energetic as ever, clears a section for the group at West Runton

Sometimes the discussions were quite laid back – like this one at Weybourne!



Note that members who have notified us of a broadband connection get this newsletter in glorious color, at minimal (no postage!) cost to the Society. This is one of the measures taken by your Officers to maintain the bargain price for your subscription!

Announcement

We do not currently intend to issue a newsletter in January unless there are contribution(s) from members.

Otherwise the next GSN newsletter is planned for April 2008.