

**Puddingstone meeting at St Albans on 7 August, 2010: draft notes on possible future research made by Bryan Lovell on 8 August 2010**

Jackie Skipper gives us a regional framework using sequence stratigraphy. She suggests that regional formation of HPS is plausibly linked to the 55 Ma warming event at the Paleocene-Eocene boundary. Proving that link is difficult enough to be really interesting and is well worth attempting. Are the Paleogene transgressions and regressions mapped by Jackie caused by pulses in the early Iceland plume? (OK, BL obsession...)

The distinction drawn by John Catt between the Puddingstone in place and that moved by natural and human agency is vital and can be taken further with the help of the records that already exist. Is John's post-2 Ma tilt of the Thames Valley, complete with its various puddingstones, a present-day example of a Pulse in the Planet? (JGS, July 2010) (another obsession-warning...).

Steve Perkins sets out multiple hypotheses for deposition and diagenesis of HPS. It is going to be hard to test his Dungeness model with the poor exposures we have, but Steve shows us graphically how petrographic observations can guide us.

Jenny Huggett suggests electron microscopy and isotopic analyses as potentially fruitful techniques, especially when coupled with analysis of microfossils. (And heavy minerals seen in the fine sand matrix, Jenny?)

Haydon Bailey suggests that we might find fossils in mudstones in the basal Paleogene on the south side of the Colliers End outlier. Haydon, Jenny, Jane and I will go there to collect specimens – soon I hope!

Studies of contemporary weathering, including classic work at Singapore by Elizabeth Alexander (QJGS, 1959), will guide us

as we continue to consider the modern ideas of John Catt and John Hepworth.

Di Clements makes an undisputed case that silicification of Bagshot sarsens must have come well after the 55 Ma warming event. So how many major Cenozoic silicification events were there? On present evidence I prefer (at least) two events to a single later, pervasive episode of silcrete formation. Di suggests that the outstandingly detailed records of John Cooper at NHM should be digitised to help guide us on this and other topics. (I have a bulky HPS file passed to me by Eric Robinson that could be added to that NHM reference material.)

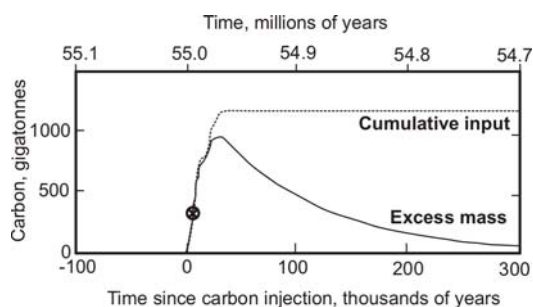
Jane Tubb describes the uncertainties concerning the stratigraphical position of HPS with respect to the underlying chalk, illustrated by Jack Doyle's evidence from the now-hidden A120 roadcut at the north end of the Colliers End outlier. She and I both commend the Bessie Parkins collection of puddingstone at Sutes Farm as a valuable source of evidence for research on specimens that were collected in original and well-controlled stratigraphical position.

It would be good to involve the archaeologists in any meeting we might plan to hold at the Geological Society, once we've made significant progress with some of our research.

I'm adding here a figure that I had originally planned to show on 7 August, but in the event did not because I thought it was time we got on to our closing discussion of HPS rather than dwell on global issues. The figure (not in the Proof in the Puddingstone booklet I handed out) shows the massive input of carbon at 55 Ma that led to significant global warming, rise in sea level, acidification of the oceans and extinctions that now mark the Paleocene-Eocene boundary. It also shows that we are well on the way to repeating that input of carbon. The division of time into thousands rather than millions of years that makes this conclusion possible is something we can only yearn for in our

own HPS-bearing rocks. But with a combined attack on various scales, from microns to hundreds of kilometres, I believe we can get much closer than we are now.

Here's the figure and caption:



*Figure 2.3 in Challenged by Carbon (CUP, 2009)*

Sketch after a section of an illustration used by Professor Gerald Dickens in his discussion of the work of Richard Norris and Ursula Rohl in *Nature* in 1999. This figure shows the rapid release 55 million years ago of carbon and its subsequent removal (see 'Excess mass') from the atmosphere and oceans over 100 000 years. We may use this 55 Ma event as a guide to the effect of our present-day release of carbon, should this remain unchecked. We have so far climbed at least 300 gigatonnes (a gigatonne is a thousand million tonnes) up the steep slope of 'Excess mass' that begins at zero (55 Ma), so we have already reached at least as far up the curve as the point marked X.