on a lizard raceway[6]) was also influenced by the interaction between incubation temperature and sex ($F_{1,72}$ = 7.42, $P <$ 0.009). Sons that hatched from cool-incubated eggs ran faster than daughters; but if the eggs had developed at higher temperatures, daughters ran faster than sons (see figure). These patterns were the same at 14 weeks of age. Although the young lizards more than doubled in mass over this period, the interaction effect between sex and incubation treatment remained significant both for body size (mass, $F_{1,39}$ = 5.35, $P < 0.027$; snout–vent length, $F_{1,39}$ = 10.47, $P < 0.003$) and running speed ($F_{1,37}$ = 4.71, $P < 0.037$). These were independent effects, because incubation-induced differences in running speed remained significant ($P <$ 0.05) when size effects were removed from the analysis using analysis of covariance.

Because body sizes and running speeds are likely to affect the survival and eventual reproductive success of the animal[7–9], our results suggest that the optimal incubation temperature differs between males and females. This effect provides a plausible selective advantage for the evolution of temperature-dependent sex determination in reptiles: TSD may enable the embryo to develop as the sex best suited to the incubation regime it encounters[1]. It is, however, puzzling to see such strong effects in a GSD species, when theoretical models predict it only in TSD forms.

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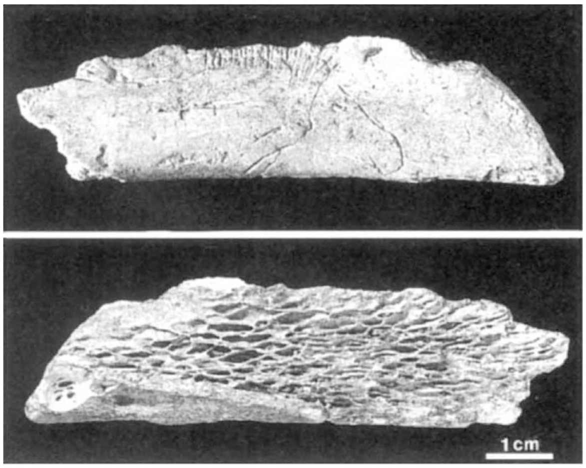
Solution for the Sherborne problem

SIR — Since its discovery in quarry debris near Sherborne, Dorset[1], the "Sherborne bone" has been the subject of debate, much of it in this journal (for example, refs 2, 3). We have re-studied this artefact, using optical microscopic analyses with image processing and a chemical and mineral textural study, followed by sampling for radiocarbon accelerator dating, to attempt to settle its authenticity once and for all.

This bone, a fragment of mammalian rib, had been engraved with the head and forequarters of a horse, and its resemblance to a Palaeolithic depiction from Creswell Crags, illustrated by Boyd Dawkins[4], was used as evidence both for and against its authenticity. More recent exchanges (for example, refs 5, 6) have supported or opposed the authenticity of the engraving as Palaeolithic, while Oakley, in Farrar[5], reported relative dating analyses which indicated that the bone itself was fossilized.

Our analysis of the obverse of the fragment revealed that the spongy bone is still filled with sediment. Micro-roots present in the sediment are trapped in the trabeculae of the spongy bone. The sediment and roots are the residue of the original filling adhering to the bone when it was buried and are not the result of fraudulent additions to age a fresh bone artificially. Microanalysis by energy-dispersive X-ray spectrometry, and elemental mapping of the sediment filling the spongy bone and of that still adhering to the engraved side, showed them to be of similar composition, suggesting that the engraved side was also not artificially patinated. The patina covering the bone is therefore the result of the burial environment of the bone fragment.



Engraved surface and obverse (showing dating sample location) of the Sherborne bone. Photographs by F. d'Errico.

Analysis of the engraving, however, revealed that almost all the engraved lines are sediment-free and do not show the same patina as the remaining surface of the bone. This is confirmed by optical analysis indicating that engraved lines have gray-value histograms that are different from those obtained from unengraved areas, but similar to those of recently damaged surfaces. Sediment residue also covers eroded areas, suggesting that alteration of the bone surface took place before its engraving.

The engraved lines reveal none of the features that are generally visible on experimental lines produced by lithic tools on fresh bone[7], such as sharp edges and multiple parallel striae. In contrast, the engraved surface of the Sherborne bone displays a granular, rough texture, and fractures perpendicular to the groove direction. The edges of the main grooves are frayed by continuous microflaking of the surface lamellae, clearly showing that the engraving took place on an already weathered bone.

Samples for radiocarbon dating were taken from the uncleaned and non-engraved obverse of the rib. The surface was mechanically cleaned and a small quantity (250 mg) of bone removed by drilling. After chemical pretreatment[8] and combustion[9], the sample yielded an accelerator age (OxA 5239) of 610 ± 45 years, indicating (after calibration[10]) that the rib had come from an animal that had died some time between the end of the 13th and the start of the 15th centuries AD. It is not possible to say when, after this date, the engraving was carried out, but it now seems inescapable that the Sherborne engraving is a recent fake. It is even possible that the horse head was traced by a metal tool, as no proof of the use of a flint point, such as the presence of minute striations accompanying the main groove[7], was found. Oakley's determination that the rib was "fossilized"[5] can be attributed to the known limitations of relative dating techniques[11].

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