A POSSIBLE ENGRAVING OF A MAMMOTH IN GOUGH'S CAVE, CHEDDAR, SOMERSET

by

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ABSTRACT

In 2003, during an examination of Gough's Cave for Palaeolithic art, a figure was noted on the wall of an alcove, in an area of the cave not affected by blasting. The figure resembles a mammoth. Close inspection suggests that engraved lines may complement natural features of the rock surface suggestive of the trunk and possibly also the tusks. The geomorphic history of the cave gives a context in which an engraved line may have become obscured by erosion processes during repeated flood episodes. An analysis of the archaeological and palaeontological context suggests that an ancient engraving of this nature would not be out of place in this cave It is concluded that this figure might have been engraved during the Late Upper Palaeolithic occupation of the cave.

INTRODUCTION

Gough's Cave, at the foot of Cheddar Gorge (Figure 1.) is well-known for its extensive deposits of both Late Upper Palaeolithic and Mesolithic archaeology, which demonstrate that the outermost parts of the cave were used from the very beginning of the Late Upper Palaeolithic through to the middle of the Late Glacial Interstadial (Jacobi, 2004) and that the site was reused after the close of the last Ice Age, during the Early Mesolithic (Burleigh, 1986) and later. For this reason, Gough's Cave was an obvious candidate for study in the light of the discovery of Palaeolithic parietal cave art in Britain, at Creswell Crags, in 2003 (Bahn *et al*, 2003).

Much of the rock surface in this cave has been modified since it was opened to the public by Richard Gough in the 1890s however during a careful search of the remaining original surfaces in 2003 by G.J. Mullan and L.J. Wilson the image shown in Figure 2 was noted on 22 June. It is located in a small alcove on the south side of the show cave between the Fonts and the blasted section that indicates the end of the cave as known in prehistoric times (see Figures 3 and 6). This somewhat enigmatic feature has subsequently been the subject of a number of studies in an attempt to assess whether it is, or could be, a Palaeolithic engraving of a mammoth.

The first thing which needed to be determined was whether the figure was in fact natural in origin or whether it, or any part of it, had been humanly made or modified. In order to address this problem, the feature was recorded as fully as possible using a variety of techniques. In addition, the archaeological and palaeontological context of the engraving was investigated and a detailed morphological examination of the passage walls was undertaken to determine the extent of the sediment fill before the cave was excavated in the 1890s, and to assess how the rock surface might have altered over time.

CLOSE EXAMINATION OF THE CAVE WALL

The figure can be divided into four parts (Figure 5); these are i) the line of the dome of the head and the back, ii) the face and trunk, iii) the eye and iv) the tusks.



Figure 1. Location Map.

The most significant part of the feature is the line of the dome of the head and the back. This is a single line. It is relatively shallow but a cross-section and internal striation can be seen which are consistent with it being engraved with a relatively fine stone tool. This can be seen most clearly on the back of the head and in the middle of the line of the back. The remainder of the line of the back and the dome of the head, although clearly a single feature, is faint and partially infilled with sediment which obscures its character. However as discussed below the cave, including the area in which the figure is located, has been subject to repeated flooding which will have had a direct effect on the preservation of the rock surface. A line of this shape and type is not replicated elsewhere on the rock wall, either in direction or in texture. It does not follow the grain of the rock and has a distinctive appearance from the obvious natural lines on the alcove wall. Certainly there is no line which either takes the same direction or shows similar changes of direction to this one.

What may be engraved lines appear to complement natural features in the rock surface which insinuate the trunk and possibly also the tusks of the mammoth. The latter parts have a higher relief than the rest of the figure and seem to be in keeping with the texture of the remainder of the rock surface in this alcove. Similarly the "eye" appears to be a natural feature. The incorporation of natural features in an engraving to create animal depictions is a well attested phenomenon in Palaeolithic art.

RECORDING

Several techniques were employed to obtain an accurate representation of the figure.

Photography: The image in Figure 2 was obtained by the use of conventional digital photography. The major difficulty with photographic techniques is obtaining even lighting across curved rock surfaces using the oblique lighting that is required to make engraved lines and other grooves in the rock stand out. In general, front-lighting does not cast shadows and does not allow these features to be seen.



Figure 2. Photograph of the possible engraved mammoth in Gough's Cave. Photo: Andrew Atkinson

Laser Scanning: Laser scanning provides a non-contact method of recording surface topography. The laser scanner used, a Minolta VI-910, works on the principle of optical triangulation. A plane of light is emitted from the scanner and is swept across a surface. When it makes contact with the surface it is dispersed in various directions. The scattered light is recorded by means of a camera inside the laser scanner, and the accurate distance from the scanner to the surface is calculated at a rate of around 300,000 points in less than 3 seconds, thus providing a three-dimensional cloud of points, a digital, virtual version of the scanned surface. In addition to the three-dimensional information, colour information can be captured, with a colour value obtained for every point recorded.

Once the information has been obtained it is then processed. Multiple scans are aligned and stitched together, and a wireframe mesh representing the surface is created from the cloud of points. This mesh can then be imported into an appropriate software package for further analysis. Maya, a 3D modelling package, was used together with Surfer, a 3D contouring and surface plotting package, to obtain the final image (Figure 4).

Drawing: The final image, Figure 5, was obtained by tracing the line from photographs and scans, using Adobe *Photoshop* and a graphics pad attached to a PC. This was then taken back into the cave and compared visually with the original to check accuracy.

ARCHAEOLOGICAL AND PALAEONTOLOGICAL CONTEXT

Gough's Cave has yielded much archaeological material over the past century. Jacobi (2004) gives a comprehensive account of the Late Upper Palaeolithic lithic finds and Burleigh (1986) lists relevant radiocarbon dates for both the Pleistocene and the early Holocene. In



Figure 3. *Plan survey of the entrance area of Gough's cave showing the location of the alcove in which the figure is located.*

summary it can be said that the site was used by Late Upper Palaeolithic hunters from the beginning of human recolonisation of the British Isles at about the start of the Last Glacial Interstadial for more than a millennium through to the latter part of that Interstadial, when it was deserted. After the cold event known as the Younger Dryas, the site was reused in the Early Mesolithic, at which time the skeleton known as Cheddar Man was interred. Both of these periods have produced parietal art, but the former is the period most likely to have produced representational art such as a mammoth.

The last mammoths in England disappeared around 12,000 years BP. Whether there were any in southern England at any point during the Last Glacial Interstadial is unknown, but there are well dated mammoths from as close as Shropshire at this time (Coope and Lister, 1987). It is also the case that artefacts of mammoth ivory have been found at Cheddar (Currant, et al. 1989) as well as at other cave sites, Kent's Cavern, King Arthur's Cave, and Pin Hole, from which lithics of similar, Creswellian, types are known (Jacobi, 2004). A double-bevelled ivory rod from Gough's Cave has been directly dated This is:

OxA-1890 Mammoth ivory sagaie 12,170±130 (BP) (Hedges et al. 1990).

It is therefore clear that the LUP inhabitants of Cheddar would have been familiar with mammoths.

It is also the case that the alcove in the cave was available to LUP people, an obvious prerequisite if such a date is to be accepted for this image. Although much sediment has been excavated from this cave, sufficient indications of its previous extent remain visible on the walls. Tracing this, it can be shown that this alcove was partially sediment filled, but was open.

Significant numbers of portable decorated pieces, mainly engraved bone, have also been found at this site (Hawkes, *et al.* 1970; Tratman, 1976; Charles, 1989).



Figure 4. Laser scan of the possible engraved mammoth from Gough's Cave.

ARTISTIC PARALLELS

Paintings and engravings of mammoths are known from numerous sites in France. Probably the best known collection, and certainly the most comprehensive, is that from the Grotte de Rouffignac, where 154 of the approximately 300 known Palaeolithic images of mammoths can be found (Plassard, 1999). The artwork in this cave was recorded and comprehensively studied by Barrière (1982). He gives (page 175) a table showing the various different styles of tusk to be found there together with sufficient illustrations to show that, in stylistic terms, Palaeolithic depictions of mammoths can vary from the highly detailed to extremely



Figure 5. Line drawing of the possible mammoth figure, indicating natural and engraved parts. *i)* the line of the dome of the head and the back, *ii)* the face and trunk, *iii)* the eye and *iv)* the tusks. Sections indicated by the arrowed lines A and B are the parts which most clearly show human workmanship.

simple, almost caricature, twin-humped lines. These latter are, however, easily recognisable with very little experience. Whilst it is the case that many examples of Palaeolithic art are highly detailed and true to life, many are deliberate caricatures. The apparent mammoth depiction in Gough's Cave would fit comfortably within the corpus of work known from Rouffignac and from the Palaeolithic as a whole.

CAVE GEOMORPHOLOGY AND THE EFFECTS OF FLOODING

Gough's Cave (survey, Figure 7.) is a fine example of a relict resurgence cave (Stanton, 1985; Farrant, 1991; Waltham *et al.*, 1997), and is the youngest of several former outlets of the River Yeo. Several other relict caves associated with the resurgence, including Long Hole and Great Oones Hole, occur in the cliffs above the cave. The present resurgence for the River Yeo lies about 40 m south-west of Gough's Cave, at an elevation of 26 m OD. The resurgence comprises several springs, the highest of which fails in dry summers (Barrington and Stanton, 1977).

Gough's Cave is a phreatic tube, approximately 3-4 m high and 5-10 m wide, graded to a former water-table at around 45 m OD. Just inside the entrance on the left is the Skeleton Pit, a natural flooded shaft 20 m deep which connects with the underground River Yeo, which passes almost directly beneath. From Skeleton Pit, the main passage slopes gently down to a



Figure 6. The entrance of the alcove containing the figure, during the laser scanning, April 2005.

low point only a few metres above the present river level, passing beneath two joint controlled phreatic avens. At the lowest point, a steeply ascending passage, known as The Fonts, with some superb gour pools, ascends to the right. At this point, the natural passage continues to dip down, but here it is still completely sediment filled. A route was blasted over the top of the sediment filled phreatic down-loop in 1890, breaking out into open passage and the rest of the system a short distance beyond.

The mammoth figure is located in an alcove at the lowest point in the show cave, 1.3 m above the present passage floor, and only about 2-3 m above the present river level. In flood conditions, water enters the show-cave from a nearby alcove and from Skeleton Pit, flooding the show-cave. In severe floods, the water rises over 6 m and water resurges out through the turnstiles at the entrance. The cave typically floods once or twice a year, although floods severe enough for water to resurge out of the cave entrance typically only occur every 5-10 years. Most floods subside within about 12-24 hours, although the cave has been known to flood for up to three days.

The mammoth figure is well within the flood zone and is liable to be submerged at least every couple of years for periods up to three days. Thus it is still prone to dissolution. If the figure was inscribed in the Late Upper Palaeolithic, then there has been the potential for a significant amount of dissolution under flood conditions since then. To assess to what extent



Figure 7. Plan survey of Gough's Cave.

the engraving may have been modified by natural processes over the last 12,000 years, it is necessary to consider rates of dissolution and wall-rock retreat in phreatic conduits.

Dissolution rates in karst streams vary from 0.10 mm year to 0.8 mm year (Dreybrodt and Eisenlohr, 2000). High and Hanna (1970) measured erosion rates, using a micro-erosion meter, of approximately 0.5 mm per year at a resurgence where stream waters are nearly saturated. Similarly, Smith et al, (1995) recorded rates of 0.22-0.51 mm per year from cave streams in the Yarrangobilly and Coolman plain in Australia.

Even using a conservative estimate of 0.05 mm of erosion per year, it is still possible, given a flood frequency of one day per year, for 1.6 mm of wall rock retreat to occur since the Late Upper Palaeolithic. In reality, the length of time the engraving is likely to have been submerged was probably significantly less. Prior to 1890, the area may have been buried by sediment, and not open to floodwater. Although wall rock dissolution can still occur in saturated sediment, the flux of aggressive water is much reduced, as is the overall dissolution rate. However, even if we assume that floodwaters have only been able to circulate around the alcove since the site was opened up in 1898, over 0.1 mm of wall rock retreat could have occurred given an erosion rate of 0.5 mm per year and a flood frequency of 1 day per year, since that time.

Clearly, these rates are only an estimate and the exact frequency and extent of flooding in this area can never be known. However, that sufficient erosion will have taken place to have partially obscured a human origin for this figure is well within the grounds of possibility.

CONCLUSIONS

Photographic and laser recordings seem to support the observation that the engraved lines visible on the alcove wall may constitute deliberate drawing. No similar markings have been seen on the walls of this cave. Some parts of the figure are clearly natural in origin but the line of the head and the back show features consistent with it having been engraved with a stone tool. These have been partially obscured by the presence of the figure in a part of the cave that has been subject to repeated flooding. The figure appears to be that of a mammoth. Such an interpretation is consistent with an LUP origin.

There is thus a possibility that this represents a genuine example of LUP cave art, the first such to be noted in Southern England. Whether any future examples will come to light at this site is open to doubt, as, in addition to the problems of flooding outlined above, so much of the rock wall of the cave has been modified, by blasting and other rock-removal techniques, at times when no thought would have been given to the possibility of such finds.

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