



## The “Red Lady” ages gracefully: new ultrafiltration AMS determinations from Paviland

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### ABSTRACT

The “Red Lady” partial human skeleton found at Goat’s Hole, Paviland, in south Wales by William Buckland in 1823 is one of the iconic relics of the British Paleolithic. Originally thought to be Roman, a Paleolithic age has been suspected from the middle of the 19th century. Several attempts have been made at directly radiocarbon dating the “Red Lady,” and here we report new determinations that suggest that it is, by a significant margin, the oldest of a group of ‘rich,’ Mid-Upper Paleolithic burials. We list similar Gravettian-aged burials from Europe, which have been dated recently for comparison. In this paper, we also reconsider the chronology of human use of the cave, apart from as a burial location.

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### Introduction

Bone is an attractive material for archaeological dating, since it often dates *directly* the prehistoric event or period. Problems arise in dating bone from environments unfavorable to the preservation of collagen and in demonstrating the effective removal of contaminants to a sufficiently low level. A range of chemical pre-treatment methods has been brought to bear on the latter with varying degrees of success. A way forward may be the direct dating of single amino acid or tripeptide groups, which has been, and is, under development in the Oxford laboratory. The method used currently is an ultrafiltration protocol based on that originally outlined by Brown et al. (1988; see Bronk Ramsey et al., 2004 for details of the Oxford method). Research has shown that ultrafilters more effectively remove low molecular weight contaminants from bone collagen, and improve the quality of the collagen, as assessed by a range of analytical determinants (Higham et al., 2006). However, great care must be exercised to ensure the effective removal of humectant (glycerin) that is used as a coating on the regenerated cellulose or polyethersulphone membrane of the filter. Without effective removal, this compound may affect radiocarbon AMS measurements. This occurred at Oxford during 2000–2002. Suitable methods have now been implemented to remove the

contaminants and ensure that the ultrafilters are usable (Brock et al., 2007).

The application of ultrafiltration protocols has been particularly significant for dating Paleolithic-aged bone. Higham et al. (2006) and Jacobi et al. (2006) have shown that in many instances redating bone previously analyzed using older methods yielded significantly different, and often older, results when ultrafiltration was applied. This has been attributed to the preferential removal of low molecular weight contaminants from the extracted bone gelatin. We are involved in a large program of redating of Mid-Upper Paleolithic bone determinations from Britain and now continental Europe, as well as Late Glacial bone from the British Isles, based on assessments of potentially problematic dates produced earlier. Paviland is one of the sites of interest.

### A case study: Goat’s Hole, Paviland

Goat’s Hole at Paviland is east of Port Eynon on the south coast of the Gower Peninsula in south Wales. The cave is on the edge of the Bristol Channel and is only easily accessible at low tide. When inhabited by Paleolithic hunters it would have overlooked a grassy plain exposed by world-wide lowering of sea-levels, with the present day islands of Flat Holm, Steep Holm, Lundy, and Caldey being landlocked hills. Rich Late Pleistocene mammal faunas from Caldey are evidence of the abundant resources that existed on this plain and its very different geography (Walker, in press).

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The mouth of Goat's Hole is the most prominent of several closely-spaced cave openings. It opens beneath a 30 m high cliff of Carboniferous limestone, itself a prominent landmark and flanked on either side by valleys. The cave consists of a short passage 27 m in length and this is oriented approximately NE-SW. On its eastern side is a roof chimney. The cave entrance has probably been cut back by cliff retreat due to coastal erosion since the Pleistocene (Lowe, 2000) with the loss of any platform deposits.

Artifacts and bones have been collected from Goat's Hole since at least 1822 with the most recent exploration by Stephen Aldhouse-Green in 1997. Green excavated part of the filling of a natural hollow towards the front of the cave and on its western side. Of the many episodes of collection and excavation the most important were those of William Buckland in 1823, when the burial now known as the "Red Lady" was uncovered, and that of William Sollas in 1912. The latter is important as having produced the largest sample of lithics from the cave.

Whilst important observations were made about the Red Lady burial and its associated grave-goods (Buckland, 1823: 82–92), archival material is scarce for most of the other episodes of early investigation, leaving us with a collection of unstratified artifacts and mammalian remains. Understanding of this material depends upon typology and the careful application of radiocarbon dating.

### Lithic evidence for the chronology of human presence at Goat's Hole

The lithic evidence from Goat's Hole is important because it seems to document activity at times when a human presence cannot safely be inferred from the radiocarbon record. There are about 5,000 lithics from Goat's Hole and this is the largest surviving sample from a British cave used during the Pleistocene. Only the Later Upper Paleolithic (Final Magdalenian) site of Gough's Cave probably produced more material, but less of this survives (Jacobi, 2004). The lithics have been recently studied by Stephanie Swainston (1997,1999,2000), and aspects of the collection are presently being re-assessed by Rob Dinnis of the University of Sheffield. One of us (RMJ) has also looked at most of the lithics from Goat's Hole, and we are in broad agreement with Swainston, with the exception that we are uncertain about the reality of the evidence for a Late Middle Paleolithic occupation.

For us, the oldest artifacts from the cave are leaf-points, which include fragments of what may have been fully bifacially retouched points as well as blade-points ("Jerzmanowice" points), one of which is substantially complete. It is unclear whether all these leaf-points belong together or whether the fully bifacial points may be older than the blade-points (cf. Kozłowski, 1990). It is probable that these leaf-points belong to the initial stages of the Upper Paleolithic, with a possible age for the blade-points of 38–36,000 <sup>14</sup>C BP (Jacobi et al., 2006: 567–568). It is also possible that their makers were the last Neandertals to occupy this part of Europe (Jacobi, 2007).

The largest number of lithic artifacts is likely to be Aurignacian. Swainston (2000: 100–102) has provided a number of cogent reasons why this material should be regarded as belonging to a late Aurignacian (Evolved Aurignacian sensu Bordes, 2006). The observations which underpinned her reasoning included a presence of burins busqués, a presence of nosed and shouldered scrapers that outnumber carinate end-scrapers, and a rarity of "Aurignacian blades." That the Aurignacian from Goat's Hole should be a late Aurignacian as compared to the better understood sequence in southwestern France is of considerable interest, if the commonly-made assumption is correct that the distribution and spread of the Aurignacian is to be associated with that of the earliest anatomically modern human populations into Europe. Artifact typology would seem to confirm that the British Isles were one of the last areas of Western Europe to be reached, and it is possible that colonization by modern humans was delayed by the adverse climate associated with Heinrich Event 4, which may come between the last Neandertals and the first anatomically modern humans in northwest Europe.

Aldhouse-Green and Pettitt (1998: 765; Pettitt, 2000) have suggested that radiocarbon determinations on pieces of carbonized large-mammal bone may give an age for this Aurignacian occupation. These determinations are given in Table 1. Research at the Oxford Radiocarbon Accelerator Unit (ORAU) has shown, however, that dates of burned bone can be unreliable. The protein content of bone is significantly reduced by burning, which means that extracting collagen is not practical. Burning also speeds diagenesis, which is closely linked with increasing contamination under certain conditions. Burning may alter  $\delta^{13}\text{C}$  values, probably because of the differential loss of amino acids. The addition of contaminants may, of course, also play a significant role. What is frequently dated is pyrolyzed collagen, often mixed with the sediment matrix. Low carbon determinations of burnt bone ought to be viewed with caution.

Probably our best chance of establishing the likely age of the British Aurignacian will come from the discovery of new sites, or by extrapolation from the dating of humanly modified materials from Western European levels with a similar artifact combination. We have already implemented the latter approach, with dating of material from the Abri Pataud and La Ferrassie, both in the Dordogne. The results are awaited. For the moment there is a single determination from the British Isles for what is clearly an Aurignacian antler or bone point, probably a lozenge-shaped point (*pointe losangique aplatie*), found at Uphill Quarry, near Weston-super-Mare, in North Somerset (Table 2).

This result is clearly older than the mean age of close to ~29,000 <sup>14</sup>C BP suggested for the Aurignacian at Goat's Hole (Aldhouse-Green and Pettitt, 1998: 765). For reasons given above we consider this result to give a far better indication of the age of Aurignacian settlement in Britain.

Unfortunately, there are no lithic artifacts of Aurignacian type from Uphill Quarry, and it remains an assumption that all British Aurignacian find-spots may be of about the same age. However, it is

**Table 1**  
Radiocarbon determinations of burned bone from Paviland

Lab no.	Element	Radiocarbon age BP ( $\pm 1\sigma$ )	Reference
OxA-7877	Indeterminate carbonized bone fragment	27,780 $\pm$ 320	Aldhouse-Green and Pettitt, 1998; Tables 1, 2
OxA-7789	Indeterminate carbonized bone fragment	28,860 $\pm$ 260	Aldhouse-Green and Pettitt, 1998; Tables 1, 2
OxA-365	Indeterminate carbonized bone fragment	29,600 $\pm$ 1900	Gowlett et al., 1986: 118–119

**Table 2**  
Radiocarbon date of an antler/bone point from the Uphill Quarry site, North Somerset

Lab no.	Element	Radiocarbon age BP ( $\pm 1\sigma$ )	Reference
OxA-13716	Antler or bone point	31,730 $\pm$ 250	Higham et al., 2006: 189

interesting to observe that where lithics of Aurignacian type have been found, these show marked similarities as between find-spots.

There is a single incomplete tanged artifact from Goat's Hole. This has been compared with the "Font-Robert" points that appear to be a marker of the "Fontirobertian," an early stage in the Gravettian of Western Europe (Bosselin and Djindjian, 1994; Bosselin, 1996). Similar artifacts have been excavated from Cathole (Cat's Hole) also on Gower, and found at a small number of other localities in southern and central England. As a group, these finds have been compared with points from the site of Maisières-Canal near Mons in central Belgium (Haesaerts and de Heinzelin, 1979). Finally, there are from Goat's Hole a small number of abruptly modified (backed) blades which clearly belong to the Later Upper Paleolithic. These are of different types and would seem to document more than one visit to the cave during the time of the Late Glacial Interstadial. Since these lie outside the topic of this paper they are not considered further.

### The Red Lady

The bony remains of the Red Lady were excavated in January 1823 by William Buckland, Reader in Mineralogy and Geology at the University of Oxford. Buckland gives a remarkably clear account of the discovery. He wrote,

"... In another part ... I discovered beneath a shallow covering of six inches of earth nearly the entire left side of a human female skeleton. The skull and vertebrae, and extremities of the right side were wanting; the remaining parts lay extended in the usual position of burial, and in their natural order of contact, and consisted of the humerus, radius, and ulna of the left arm, the hand being wanting; the left leg and foot entire to the extremity of the toes, part of the right foot, the pelvis, and many ribs; in the middle of the bones of the ankle (sic) was a small quantity of yellow wax-like substance resembling adipocere. All these bones appeared not to have been disturbed by the previous operations (whatever they were) that had removed the other parts of the skeleton. They were all of them stained superficially with a dark brick-red colour, and enveloped by a coating of a kind of ruddle, composed of red micaceous oxide of iron, which stained the earth, and in some parts extended itself to the distance of about half an inch around the surface of the bones. The body must have been entirely surrounded or covered over at the time of its interment with this red substance. Close to that part of the thigh bone where the pocket is usually worn, I found laid together, and surrounded also by ruddle, about two handfuls of small shells of the nerita littoralis in a state of complete decay, and falling to dust on the slightest pressure. At another part of the skeleton, viz. in contact with the ribs, I found forty or fifty fragments of small ivory rods nearly cylindrical, and varying in diameter from a quarter to three quarters of an inch, and from one to four inches in length. Their external surface was smooth in a few which were least decayed; but the greater number had undergone the same degree of decomposition with the large fragments of tusk before mentioned; most of them were also split transversely by recent fracture in digging them out, so that there are no means of knowing what was their original length, as I found none in which both extremities were unbroken; many of them also are split longitudinally by the separation of their laminae, which are evidently the laminae of the large tusk, from a portion of which they have been made. The surfaces exposed by this splitting, as well as the outer circumference where it was smooth, were covered with small clusters of minute and extremely delicate dendrites; so also was the circumference of some small fragments of rings made of the same ivory, and found with the rods, being nearly of the size and

shape of segments of a small teacup handle; the rings when complete were probably four or five inches in diameter. Both rods and rings, as well as the nerite shells, were stained superficially with red, and lay in the same red substance that enveloped the bones; they had evidently been buried at the same time with the woman" (1823: 87–89).

The bones excavated by Buckland consist of ribs and the os coxae and upper and lower limb remains of the left side, together with the distal leg and foot elements of the right side. They are the bones of a healthy, young adult male (Trinkaus and Holliday, 2000). They have been the recent source of DNA (Sykes, 2000) dietary information as derived from stable isotopes (Richards, 2000) and of material for radiocarbon dating.

The burial was close to the west (left) wall of the cave and parallel with it. The body may have been supine. The red staining which is so visible on the bones may be from ochre scattered over the body, or may have been absorbed by the bones from ochre used in the coloring and preparation of clothing (Aldhouse-Green, 2000a: 234–235).

Only 25 ivory rods (bâtonnets) still exist and some of these were possibly found by Sollas (1913, 335). All are transversely snapped and most have split longitudinally along the natural grain of the ivory. None is pointed and none shows any preparation such as bevelling to aid hafting. Interestingly, Henry Balfour identified one fragment with its end preserved in Miss Talbot's collection at Penrice Castle. This was "... slightly swollen and well rounded off ..." (Sollas, 1913: 360). These observations suggest that the rods were not weapon tips (sagaies) and recent discussion has favored their interpretation as magical "wands" (Aldhouse-Green and Pettitt, 1998: 766; Aldhouse-Green, 2000b: 117).

Two small fragments of ivory rings survive, and differences in their cross-sections hint that they are from separate items. It is interesting that they were not apparently found at the wrists, suggesting that they may not have been bracelets, which would be the obvious interpretation for them.

The surviving periwinkle (*Littorina littorea*) shells have been perforated, suggesting that they had been strung. Similar shells are known to have been used as the decoration of skull-caps and clothing in Mid-Upper Paleolithic burials. However, their position near the thigh is unusual and Pettitt (2006: 296) has suggested that they had been sewn onto a loincloth. An alternative is that they formed parts of a rosary.

Buckland, in what was clearly intended as, in part, a reconstruction drawing of the context of finds before the cave had been disturbed by random digging, shows a complete skeleton. At its head is depicted a mammoth (*Mammuthus primigenius*) cranium with both tusks (1823: pl. XXI). The "... elephant's head and human skeleton..." are said in the explanation of this plate to be shown "... marked in the spot in which they were actually found..." (Buckland, 1823: 275). It was Abbé Breuil who pointed out to Dorothy Garrod the likelihood of an association between the mammoth skull and the interment, and that they should be considered together (Garrod, 1926: 62–63). Sollas later found boulders at the head and foot of where the burial would have been (1913: 335–336).

Originally, and for reasons which are inexplicable, Buckland thought that the skeleton was that of an exciseman, presumably overcome by smugglers (North, 1942: 108; Edmonds and Douglas, 1976: 150). Subsequently, and incorrectly as it turned out, he re-identified the bones as those of a female whose life he suggested would have been worthy of a romance entitled the "Red Woman" or "The Witch of Paviland" (Ibid.). It was suggested that the witch had lived and practiced in the cave during Roman or pre-Roman times (Buckland, 1823: 92). He argued that the grave goods had been made from ancient ivory found in the cave, which when she was

**Table 3**

Initial radiocarbon date of the Red Lady skeleton

Lab number	Element	Radiocarbon age BP ( $\pm 1\sigma$ )	Reference
BM-374	Human femur and tibiae	18,460 $\pm$ 340	Oakley, 1968; Barker et al., 1969: 289

alive, was still workable rather than in the decomposed state it had reached by the time of the excavation (Buckland, 1823: 90).

The likely Paleolithic age of the burial was recognized by Lartet and Christy (1875: II, 93–94) following a visit to the “Oxford Museum,” now the Oxford University Museum of Natural History, in 1863. On this visit they were accompanied by Hugh Falconer, and they were shown the Goat’s Hole material by Professor John Phillips. They were convinced of the similarities between the Goat’s Hole assemblage and the finds with which they had been closely involved from the rockshelter of Cro-Magnon at Les Eyzies-de-Tayac, where burials, most probably of Early Gravettian age (Henry-Gambier, 2002), had been found above occupation layers with Aurignacian artifacts (de Sonneville-Bordes, 1960: I, 72–73). Interestingly, Lartet and Christy were skeptical of Buckland’s identification of the Goat’s Hole human bones as female.

Despite this early perceptiveness, others remained unconvinced of the Paleolithic age of the human remains and the grave-goods. For example, Dawkins (1874: 232–234) repeats Buckland’s original arguments as to why both should be regarded as post-Pleistocene. This denial seems part of a more general prejudice against burial having been part of the behavior of the Paleolithic inhabitants of Europe.

A spur to Sollas excavating at Goat’s Hole was a visit in 1911 to the museum by Émile Cartailhac, who expressed the opinion that the burial was of Aurignacian age—Aurignacian being used then in a rather general sense for the earlier part of the Western European Upper Paleolithic including the Gravettian. Cartailhac was at the time working on the monograph on the caves at Grimaldi near Menton where there were Mid-Upper Paleolithic burials (de Villeneuve et al., 1906–1912).

As already noted, the excavation by Sollas produced abundant Upper Paleolithic artifacts. Although of mixed ages, these were seen as supporting a morphological and metrical comparison of the Red Lady bones with those of Western and Central European early Cro-Magnons (Sollas, 1913: 365–371). Subsequently, a Paleolithic age for the burial has never been seriously contested.

The first attempt to date directly the Red Lady was made by the British Museum Research Laboratory, at the instigation of Kenneth Oakley, who was at the British Museum (Natural History) and responsible for the section on the British Isles in the “Catalogue of Fossil Hominids” (Oakley et al., 1971; Table 3). This date was accepted by Oakley (1968, 1971), who concluded that in Britain proto-Solutrean points and Aurignacian artifacts went on being made long after they had been superseded in France.

Bowen (1970) pointed out that, if correct, this would imply a human presence at Goat’s Hole when glacier ice was just six kilometers or so north of the cave. The rigors of contemporary climate might have meant that it was used only in the summer months. The result was also accepted by John (1971), but he tempered this acceptance with the caution that “... we should at least consider the possibility of error as a result of undiscovered contamination in the sampled bone...” (1971: 142, italics as in original). John’s paper is important for its suggestion that there had been a break in the human occupation of south Wales during the intense cold associated with the Last Glacial Maximum. Subsequent research seemed to indicate that at this time not only would there have been no humans in south Wales, but probably also none at all in the remainder of the British Isles (Campbell, 1977: 199) and perhaps anywhere north of the Loire and west of the Essonne (Jacobi, 1980: 31).

John’s (1971) original doubts have been proved correct by two more recent determinations for the Red Lady. These have shown

the bones to be older by a considerable margin than the Last Glacial Maximum and to be amongst the oldest of a small group of Mid-Upper Paleolithic burials found with ochre, ornaments applied to body or clothing, and sometimes bones of large, dangerous herbivores (Pettitt, 2006). The new determinations were on bone powder left over from Oakley’s dating attempt, and stored at the Natural History Museum, and on a piece of ochre-stained rib recognized by Stephanie Swainston amongst the collection of the Oxford University Museum of Natural History (Table 4).

As observed by Aldhouse-Green and Pettitt (1998: 757), the new dating of the Red Lady moved discussion away from the plausibility, or otherwise, of human settlement in northwest Europe during the Last Glacial Maximum. Instead, recent research on Goat’s Hole has been aimed at understanding the relationship between the burial and the other evidence for human activity, as well as setting both into the contexts of a local mammalian biostratigraphy and patterns of cave-use by brown bears (*Ursus arctos*) and spotted hyaenas (*Crocota crocuta*). As a part of achieving this goal, an ambitious program of radiocarbon dating has been undertaken, using as samples organic artifacts and determinable animal bones (Aldhouse-Green and Pettitt, 1998: 757–758). The dating of artifacts had been initiated by Patricia McComb who investigated the age of one of three bone “knives” that had been found in the cave between 1836–1840. The other pair were directly dated by Aldhouse-Green and Pettitt (1998) as part of the new initiative, as were two ivory artifacts (Table 5).

The youngest of the three ages for the bone knives was judged unreliable on the basis of carbon to nitrogen (C/N) atomic ratios, and it was suggested that sample pretreatment had failed to remove all of the contamination introduced by an unknown preservative.

The ivory pendant is egg-shaped, partly polished, and with a biconical perforation at its narrower end (Aldhouse-Green, 2000b, his Fig. 7.3.C1). It had been found by Sollas, washed out of the cave-earth by the sea. Sollas (1913: 363) recognized that it had formed as an abnormal growth in a portion of mammoth tusk found by Buckland (1823: 86), and this refit can be taken as evidence that it had been extracted and presumably modified at Goat’s Hole. The radiocarbon age for the pendant (OxA – 7111) seemed to indicate ivory working sometime after the Red Lady burial, possibly quite some time after if the material was in a fossil state when it was worked.

The still more recent determination of 21,100  $\pm$  550 <sup>14</sup>C BP (OxA – 7112) is for a small piece of whittled ivory (Aldhouse-Green, 2000b, his Fig. 7.9.H7). This may be one of “...three fragments of ... ivory, which had been cut into unmeaning forms by a rough edged instrument, probably a coarse knife, the marks of which remain on all their surfaces ...” (Buckland, 1823: 89).

The determination is potentially of considerable interest for suggesting that humans were still present in south Wales, even if only seasonally, just a short time before the Last Glacial Maximum. That this was still possible, was explained by the ameliorating effects of the Atlantic seaboard (Turner, 2000: 137), a maritime zone which also allowed a continued presence of large predators, such as the spotted hyaena and an ungulate such as the red deer (*Cervus elaphus*), which is not found on the tundra<sup>1</sup>.

<sup>1</sup> The identification of a partial dentary as red deer (*Cervus elaphus*) is uncertain and careful comparisons with other cervid material suggest the possibility that it could be Irish giant deer (*Megaloceros giganteus*). This is irresolvable at present.

**Table 4**  
Previous Oxford radiocarbon dates on the Red Lady skeleton

Lab number	Element	Radiocarbon age BP ( $\pm 1\sigma$ )	Reference
OxA-1815	Bone powder from femur and tibiae	26,350 $\pm$ 550	Hedges et al., 1989: 209
OxA-8025	Ochre-stained rib fragment	25,840 $\pm$ 280	Aldhouse-Green and Pettitt, 1998: 759

What is interesting, is that the determinations for each of these artifacts seem to be younger than those for the Red Lady, and that this burial appears younger than the likely age of most of the lithics from Goat's Hole. This has given rise to some comment. Whilst it would be possible to interpret the pattern of ages as evidence for a series of unconnected visits, discussion has favored an interpretation wherein Goat's Hole figures as an "... unusual place ..." that had been the goal of special journeys, even pilgrimage, over a period of about 5,000 years (Aldhouse-Green and Pettitt, 1998: 765; Aldhouse-Green, 2004: 20–21). These visits were marked by the burial ( $\sim 26,000$   $^{14}\text{C}$  BP), the deposition of the bone knives ( $\sim 23,000$   $^{14}\text{C}$  BP), and a period of ivory working ( $\sim 21,000$   $^{14}\text{C}$  BP), with some of the ivory already being fossilized at the time it was worked (Aldhouse-Green and Pettitt, 1998: 761 and 765). The knives possess silhouettes that could be seen as stylized human representations, perhaps related to the "Venus figurines" found elsewhere in Europe (Aldhouse-Green and Pettitt, 1998: 766–767; Aldhouse-Green, 2000b: 126–129), while the egg-shaped pendant was considered by Sollas (1913: 364) to have had magical properties (1913: 364), due to its discovery as a growth in a diseased mammoth tusk. Aldhouse-Green (2000a: 246) has identified Goat's Hole and the hill above it as constituting a sacred place (*locus consecratus*) and has argued that, as Britain became almost wholly abandoned during the period of climatic downturn towards the Last Glacial Maximum, Goat's Hole exerted a special pull—it became a *persistent place* (sensu Schlanger, 1992).

Below, we present evidence that the Red Lady is even older than currently thought and that there is reason to doubt a Mid-Upper Paleolithic human presence at Goat's Hole close to the time of the Last Glacial Maximum.

### The application of ultrafiltration to Goat's Hole

Initially, we decided to re-ultrafilter samples of excess bone gelatin from Goat's Hole archived permanently at ORAU. Samples of bone gelatin were rehydrolyzed and ultrafiltered in pre-cleaned filters after Bronk Ramsey et al. (2004). Samples of bone gelatin  $>30$  kDMW were lyophilized and combusted using a CHN elemental analyzer interfaced with an IRMS operating in continuous flow mode. Samples were passed after checking for CN atomic ratios,  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ , as well as %N and %C.  $\text{CO}_2$  samples were graphitized and AMS dated (Table 6).

Comparison between the re-ultrafiltered gelatin samples (coded NRC in Table 6) and the original determinations (coded AG) shows that, in many instances, the results are not statistically different. There are some notable exceptions. For example, a reindeer astragalus, initially dated at  $19,980 \pm 220$   $^{14}\text{C}$  BP (OxA-6985), produced a re-ultrafiltered determination of  $23,700 \pm 140$   $^{14}\text{C}$  BP (OxA-

16602). Our initial question regarding some of the determinations that were redated was, how reliable are these new dates? Some remained peculiarly placed chronologically. For instance, the fragment of a right dentary of a large cervid (sp. indet.) was initially dated at  $15,250 \pm 120$   $^{14}\text{C}$  BP (OxA-6929). This date, on the basis of an original identification of the specimen as red deer, was argued by Aldhouse-Green and Pettitt (1998: 768) to represent evidence for less extreme climatic conditions during the Last Glacial Maximum, perhaps due to the maritime location of Goat's Hole in western Britain. Turner (2000: 137) argued similarly. A re-ultrafiltered determination of this sample yielded a result of  $18,655 \pm 75$   $^{14}\text{C}$  BP (OxA-13434), still within the height of the Last Glacial Maximum.

Therefore, we decided to try and resample and redat some bones in order to check the reliability of these new determinations, given their interpretational importance (these are coded AF/AF\* in Table 6). In the case of the large cervid, a fresh sample produced an ultrafiltered determination of  $21,380 \pm 170$   $^{14}\text{C}$  BP (OxA-16714), demonstrating the aberrant nature of the earlier determinations. This, and other results, showed that—for certain of these samples—resampling had a significant effect. This effect may be attributed to our avoidance, or partial avoidance, of museum glues or consolidants that are not removed by the re-ultrafiltration because of their high molecular weight or their collagen-based contaminants.

A partial dentary of spotted hyaena is potentially illuminating in this respect. It was originally dated to  $17,880 \pm 180$   $^{14}\text{C}$  BP (OxA-7087) and appeared to demonstrate a persistence of this species in south Wales until the time of, or just after, the maximum ice advance of the Devensian. We reultrafiltered gelatin archived in ORAU and obtained a determination of  $18,430 \pm 70$   $^{14}\text{C}$  BP (OxA-13378), a result not substantially different from the earlier measurement. The specimen was resampled, taking dentine from the posterior root of the  $\text{P}_4$ . Its age is now greater, at  $23,120 \pm 130$   $^{14}\text{C}$  BP (OxA-13659). It is still Britain's youngest spotted hyaena, and we remain suspicious of the age, particularly as the specimen has been heavily conserved in the past. A comparison of this determination with those for bones of woolly rhinoceros and antlers of reindeer that show the gnawing characteristic of that observed at hyaena dens reveals the latter to be much older (Table 7). This age difference is attributed to their greater individual bulk and the possibility that they offer for sampling beneath the likely level of the surficial conservation that is so apparent on all of them.

### Redating the Red Lady

In March 2006 we resampled two bones from the Red Lady: the partial rib that had already been dated (OxA-8025) and a fragment

**Table 5**  
Previous Oxford radiocarbon dates of bone and ivory artifacts from Paviland

Lab number	Element	Radiocarbon age BP ( $\pm 1\sigma$ )	Reference
OxA-7112	OUM. S.5079 Modified mammoth ( <i>Mammuthus primigenius</i> ) ivory	21,100 $\pm$ 550	Aldhouse-Green and Pettitt, 1998: 759
OxA-7111	OUM. Q.3 Pendant of mammoth ( <i>Mammuthus primigenius</i> ) ivory	24,140 $\pm$ 400	Aldhouse-Green and Pettitt, 1998: 759
OxA-6938	SM A836.1.35 Knife made from wild horse ( <i>Equus ferus</i> ) metapodial	18,190 $\pm$ 130	Aldhouse-Green and Pettitt, 1998: 759
OxA-7081	SM A836.1.34 Knife made from wild horse ( <i>Equus ferus</i> ) metapodial	22,780 $\pm$ 320	Aldhouse-Green and Pettitt, 1998: 759
OxA-1790	NMW 15.277.7 Knife made from wild horse ( <i>Equus ferus</i> ) metapodial	23,670 $\pm$ 400	Hedges et al., 1994: 342

OUM = Oxford University Museum of Natural History; NMW = National Museum Wales; SM = Swansea Museum.

**Table 6**  
Ultrafiltered and filtered gelatin radiocarbon determinations from fauna of Paviland<sup>a</sup>

OxA	Pcode	Material	Sample number/Species	Radiocarbon age BP	$\pm 1\sigma$	Wt. used (mg)	Yield (mg)	%Yld	%C	$\delta^{13}\text{C}$	$\delta^{15}\text{N}$	CN
6927	AG	Tooth	NMW 24.94/121 <i>Equus ferus</i>	23,580	320	360	4.8	1.3	33.6	-21.4	4.3	3.3
	AF*			Failed to produce collagen								
6929	AG	bone	NMW 24.94/67 <i>Cervid</i> indet.right dentary with P <sub>2</sub> and P <sub>3</sub>	15,250	120	840	29.2	3.5	32.5	-20.0	1.6	3.2
13434	NRC			18,655	75	840	12.1	1.4	42	-19.9	1.2	3.4
16714	AF			21,380	170	391	6.4	1.6	44	-19.8	3.7	3.2
6931	AG	bone	NMW 24.94/160 <i>Bison priscus</i>	31,100	800	900	49.7	5.5	44.8	-19.6	9.7	2.9
13435	NRC			30,320	170	900	28.7	3.2	43.9	-19.4	10.2	3.2
6933	AG	bone	NMW 24.94/39 <i>Ursus arctos</i>	29,300	480	620	29.0	4.7	33.8	-18.8	11.1	2.9
13436	NRC			29,740	150	620	10.1	1.6	40.4	-18.6	11.5	3.2
6936	AG	bone	SM Z 826.6.370 <i>Coelodonta antiquitatis</i>	32,500	700	900	16.4	1.8	42.2	-20.1	4.6	3.0
13437	NRC			32,870	200	900	5.0	0.6	44.3	-20.2	5.3	3.2
6981	AG	tooth	NMW 24.94/14.2 <i>Ursus arctos</i>	17,670	140	400	4.7	1.2	36.1	-19.0	8.7	3.3
16765	AF			28,750	600	399	4.2	1.1	24.9	-20.7	9.3	3.3
6984	AG	bone	NMW 24.94/164 <i>Bison priscus</i>	27,140	360	720	155.7	21.6	15.5	-20.3	8.4	3.0
13418	NRC			31,250	230	720	37.6	5.2	23.2	-20.2	8.4	3.3
6985	AG	bone	NMW 24.94/233 <i>Rangifer tarandus</i>	19,980	220	580	60.7	10.5	7.4	-18.7	2.2	3.0
16602	AF			23,700	140	519	13.9	2.7	46.4	-18.0	2.4	3.2
17560	AF*			24,240	110	570	23.3	4.0	43.6	-17.7	3.4	3.3
7081	AG	bone	SM A 836.1.34 <i>Equus</i> metapodial 'knife' or spatula	22,780	320	220	21.1	9.6	37.2	-20.0	5.7	3.2
13656	AF*			26,170	150	240	14.85	6.2	43.4	-19.7	5.8	3.2
7082	AG	bone	SM Z836.6.378 <i>Coelodonta antiquitatis</i>	>38,100		740	25.4	3.4	37.6	-19.7	5.5	3.0
13657	AF*			42,650	800	570	20.2	3.5	42.8	-19.8	6.0	3.2
7083	AG	antler	SM Z836.6.54 <i>Rangifer tarandus</i>	33,600	1200	920	95.1	10.3	42	-19.0	4.1	3.0
13438	NRC			31,990	180	920	30.5	3.3	43.9	-19.0	3.7	3.2
7085	AG	antler	SM Z836.6.59 <i>Rangifer tarandus</i>	35,400	1600	600	75.7	12.6	38.4	-19.0	4.7	3.2
13658	AF*			37,350	320	520	33.6	6.5	42.5	-18.6	5.8	3.2
7086	AG	bone	SM Z836.6.431 <i>Coelodonta antiquitatis</i>	35,200	1500	800	68.9	8.6	34.7	-20.3	5.4	3.1
13377	NRC			33,800	200	800	50.2	6.3	43.9	-20.2	5.4	3.4
7087	AG	bone	SM Z836.6.146 <i>Crocota crocuta</i>	17,880	180	740	23.9	3.2	36.9	-19.3	9.2	3.2
13378	NRC			18,430	70	740	9.7	1.3	44.6	-19.2	9.6	3.4
13659	AF*		Resampled with dentine from the posterior root of P <sub>4</sub>	23,120	130	420	11.1	2.6	43	-19.1	11.0	3.2
7089	AG	antler	SM Z836.4.432 <i>Rangifer tarandus</i>	37,800	0	960	162.9	17.0	43.5	-18.7	2.6	3.0
13439	NRC			40,570	370	960	43.2	4.5	44.7	-18.8	2.2	3.2
7108	AC	ivory	NMW 24.94/140M. <i>primigenius</i>	22,620	340	247.7	2.4	1.0	34	-20.3	15.0	2.8
16601	AF			22,210	160	259.1	7.8	3.0	45.9	-20.8	9.6	3.2
17559	AF*			21,710	120	508.4	11.9	2.3	43.8	-20.4	10.5	3.3

<sup>a</sup> AF = ultrafiltered gelatin determinations; AG = filtered gelatin determination; NRC ('Non-Routine Chemistry') = samples of re-ultrafiltered gelatin archived from the previous gelatin (AG) date, as described in the text; AC determinations = bone was decalcified with the insoluble residue hydrolyzed and treated with activated charcoal before the separation of the amino acids from inorganic solutes with cation-exchange columns and Dowex 50W-X8 resin (see discussion in Higham et al., 2006); \* denotes a solvent extraction prior to collagen extraction; Stable isotope ratios are expressed in ‰ relative to vPDB and nitrogen to AIR; Mass spectrometric precision is  $\pm 0.2\text{‰}$  for carbon and  $\pm 0.3\text{‰}$  for nitrogen; Wt. used is the amount of bone pretreated and the yield represents the weight of gelatin or ultrafiltered gelatin in milligrams; %yield is the wt.% collagen which should not be < 1wt.% at ORAU-this is the amount of collagen extracted as a percentage of the starting weight; %C is the carbon present in the combusted gelatin-for ultrafiltered gelatin this averages  $41.0 \pm 1\%$ ; CN is the atomic ratio of carbon to nitrogen, at ORAU this is acceptable if it ranges between 2.9-3.5; NMW = National Museum Wales; SM = the Swansea Museum.

of left scapula retaining part of the axillary border. The scapula had also been re-discovered in 1996 in the collection of the Oxford University Museum of Natural History by Stephanie Swainston. Although it is unclear whether they had been excavated by Buckland or Sollas, both bones were included by Trinkaus and Holliday (2000) in their description of the Red Lady partial skeleton. They differ from the other bones of the Red Lady in appearing to be unconserved.

As a precaution, however, the samples were solvent washed prior to AMS dating using a sequence of solvents (acetone, methanol, chloroform, then distilled H<sub>2</sub>O). The bones were decalcified and gelatinized using the routine Oxford method. After gelatinization, 1 ml of the ~8 ml soluble gelatin was recovered and

lyophilized. This is the 'AG' fraction shown in Table 8. The remaining gelatin was ultrafiltered.

The new results show that the earlier determinations for the Red Lady are too young (Table 8). Both OxA-16412 and 16502 are much older than the original gelatin determination from the rib recovered by Swainston. Since the gelatinization method used to produce OxA-8025 was largely the same as that used for OxA-16502, the most likely reason for the difference in age may be due to a more careful sampling and physical cleaning of the dated specimen. The ultrafiltered determination is not statistically different from the new gelatin determination. The Q1/30 determinations are in good general agreement with the rib dates, but when the OxA-16413 result is compared statistically with the ultrafiltered

**Table 7**  
Ultrafiltered bone gelatin ages for hyaena gnawed bones and antlers from Goat's Hole

Lab number	Specimen	Swansea Museum code	Radiocarbon age BP ( $\pm 1\sigma$ )
OxA-13437	Woolly rhinoceros ( <i>C. antiquitatis</i> ), humerus	Z 836.6.370	32,870 $\pm$ 200
OxA-13377	Woolly rhinoceros ( <i>C. antiquitatis</i> ), humerus	Z 836.6.431	33,800 $\pm$ 200
OxA-13657	Woolly rhinoceros ( <i>C. antiquitatis</i> ), humerus	Z 836.6.378	42,650 $\pm$ 800
OxA-13438	Reindeer ( <i>Rangifer tarandus</i> ), antler	Z 836.6.54	31,990 $\pm$ 180
OxA-13658	Reindeer ( <i>Rangifer tarandus</i> ), antler	Z 836.6.59	37,350 $\pm$ 320
OxA-13439	Reindeer ( <i>Rangifer tarandus</i> ), antler	Z 836.4.432	40,570 $\pm$ 370

**Table 8**  
New AMS dates of the Red Lady of Paviland<sup>a</sup>

OxA number	Pretreatment code	Radiocarbon age BP ( $\pm 1 \sigma$ )	Wt.used (mg)	Coll. Yield (mg)	%yld	%C	$\delta^{13}\text{C}$	$\delta^{15}\text{N}$	CN
Q1/29 Red Lady: ochre-stained rib fragment									
8025	AG	25,840 $\pm$ 280	680.0	10.2	1.5	31.0	-18.4	9.9	3.4
16412	AF*	28,870 $\pm$ 180	664.4	22.6	3.4	42.2	-18.2	10.4	3.2
16502	AG*	28,400 $\pm$ 320	664.4	23.2	3.5	39.2	-18.6	10.1	3.3
Q1/30 Red Lady: ochre-stained scapula fragment									
16413	AF*	29,490 $\pm$ 210	724.8	18.9	2.6	41.9	-18.2	10.3	3.2
16503	AG*	28,820 $\pm$ 340	724.8	23.2	3.2	39.0	-18.8	9.9	3.3

<sup>a</sup> See caption to Table 6 for analytical details.

date for Q1/29 using Ward and Wilson's (1978) error-weighted mean test, it just fails to pass chi-squared [ $t = 5.02$  {chi squared = 3.84 (0.05),  $df = 1$ }].

We have compared the two ultrafiltered determinations with the radiocarbon dated sediment sequence from the Cariaco Basin, Venezuela (Hughen et al., 2006). This record is tied against the Hulu Cave oxygen isotope record and a series of U/Th determinations to enable absolute calendrical pins and cross-matching with other records, particularly Greenland ice core data. There is improved agreement between Cariaco and other proxy records, particularly the data obtained by Fairbanks et al. (2005). Previous comparisons suggested some differences, generated as a result of the age model used on the Cariaco Basin data (see for example Chiu et al. (2007)). The recent reanalysis of the age model, and an additional 187 radiocarbon measurements of foraminifera from the core, have resulted in improved resolution. We think that the revised Cariaco data set is sufficiently improved in comparison with other data sets to allow its tentative use in this instance for comparison purposes. The results of our comparison are shown in Fig. 1. The OxCal R\_Combine method produced a mean comparison age against Cariaco of 33,990–33,370 cal BP (68.2 prob.) and 34,050–33,260 cal BP (95.4 prob.). In Fig. 1 we compared these data against the NGRIP GICC05 modelled  $\delta^{18}\text{O}$  data set that shows a high correlation for the Paviland determinations with the Greenland Interstadial 6.

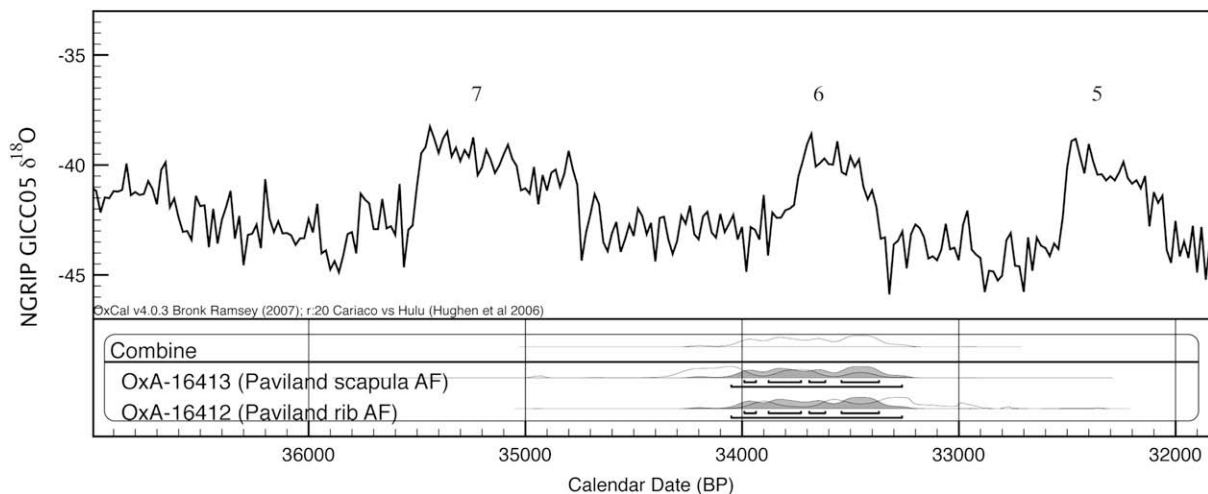
## Discussion

Pettitt (2006: 293–296) included the Red Lady amongst a group of elaborate inhumations of Mid-Upper Paleolithic age. As already noted, their grave goods frequently included the bones of large, dangerous herbivores, ochre, and the decoration of body or clothing

with beads, often manufactured from shells. Where these burials have been directly dated they belong between the 27th and 24th millennia BP and are associated with cultural groupings more recent than the Aurignacian (Pettitt, 2006: 292–293). The ages for the Red Lady are clearly greater and indicate a much earlier origin for these elaborate inhumations in Western Europe.

Inhumations have not yet been confirmed from the Aurignacian where, when human remains occur, it is usually in the form of isolated elements, most frequently teeth (Henry-Gambier et al., 2004: 53–54). The largest collection of human material probably attributable to the Aurignacian is from Mladeč in central Moravia where it appears to have entered karstic cavities through roof-openings (Svoboda, 2000; Svoboda et al., 2002: 957–958; Wild et al., 2005). Whilst we recognize that it is hazardous to argue from negative evidence, the seeming absence of burials from the Aurignacian would favor continued association of the Red Lady with the elaborate inhumations of the Mid-Upper Paleolithic, despite its now somewhat greater age (Table 9).

How early the Mid-Upper Paleolithic began in Western Europe is not precisely established, nor is it wholly clear which was its earliest technology. One area of Western Europe that has received much archaeological attention is the Dordogne, and its Upper Paleolithic sequence has often been extrapolated to a wider area. Here, recent reviews suggest that the Fontirobertian, along with the Bayacian, represented the earliest stage of the Gravettian and, with it, of the Mid-Upper Paleolithic (Bosselin and Djindjian, 1994; Bosselin, 1996). As already noted, the Fontirobertian is recognized through a presence of tanged knives or weapon-heads known as Font-Robert points, examples of which have been found in the British Isles, including at Goat's Hole. So far, this is the only type of Gravettian for which there is evidence in Britain.



**Fig. 1.** The new AMS dates for the Red Lady plotted against the Cariaco Basin radiocarbon record and the Hulu Cave age model. Data is compared with the NGRIP GICC05  $\delta^{18}\text{O}$  record of Andersen et al. (2006) and Svensson et al. (2006). See text for details.

**Table 9**  
Comparison of radiocarbon dates for elaborate Mid-Upper Paleolithic burials in Europe

Lab no.	Material	Radiocarbon age BP ( $\pm 1\sigma$ )	Ref.
<b>Paviland</b>			
OxA-16412	Human bone	28,870 $\pm$ 180	This paper
OxA-16502	Human bone	28,400 $\pm$ 320	This paper
OxA-16413	Human bone	29,490 $\pm$ 210	This paper
OxA-16503	Human bone	28,820 $\pm$ 340	This paper
<b>Cro Magnon</b>			
Beta-157439	Shell (periwinkle: <i>Littorina littorea</i> )	27,680 $\pm$ 270	Henry-Gambier, 2002
<b>Sungir 2</b>			
AA-36474	Human bone	27,210 $\pm$ 710	Kuzmin et al., 2004
AA-36475	Human bone	26,200 $\pm$ 640	Kuzmin et al., 2004
OxA-9037	Human bone	23,830 $\pm$ 220	Kuzmin et al., 2004
<b>Sungir 3</b>			
AA-36476	Human bone	26,190 $\pm$ 640	Kuzmin et al., 2004
OxA-9038	Human bone	24,100 $\pm$ 240	Kuzmin et al., 2004
<b>Sungir 1</b>			
OxA-9036	Human bone	22,930 $\pm$ 200	Kuzmin et al., 2004
AA-36473	Human bone	19,160 $\pm$ 270	Kuzmin et al., 2004
<b>Dolní Věstonice II, Triple burial (DVII 13-15)</b>			
GrN-14831	Charcoal (associated)	26,640 $\pm$ 110	Svoboda et al., 2002
ISGS-1617	Charcoal (associated)	24,970 $\pm$ 920	Svoboda et al., 2002
ISGS-1616	Charcoal (associated)	24,000 $\pm$ 900	Svoboda et al., 2002
<b>Krems Wachtberg</b>			
Poz-1290	Unknown material from 'occupation horizon'	26,580 $\pm$ 160	Einwögerer et al., 2006
<b>Dolní Věstonice II, Male burial (DV II 16)</b>			
ISGS-1744	Charcoal (associated)	26,390 $\pm$ 270	Svoboda et al., 2002
GrN-15277	Charcoal (associated hearth)	25,740 $\pm$ 210	Svoboda et al., 2002
GrN-15276	Charcoal (associated)	25,570 $\pm$ 280	Svoboda et al., 2002
<b>Lagar Velho</b>			
GrA-13310	Charcoal (associated)	24,860 $\pm$ 200	Pettitt et al., 2002
OxA-8421	Bone (red deer: <i>Cervus elaphus</i> )	24,660 $\pm$ 260	Pettitt et al., 2002
OxA-8423	Bone (red deer: <i>Cervus elaphus</i> )	24,520 $\pm$ 240	Pettitt et al., 2002
OxA-8422	Bone (rabbit: <i>Oryctolagus cuniculus</i> )	23,920 $\pm$ 220	Pettitt et al., 2002
<b>Barma Grande 6 (burnt burial)</b>			
OxA-10093	Human bone	24,800 $\pm$ 800	Formicola et al., 2004
<b>Brno (Francouzská Street)</b>			
OxA-8293	Human bone	23,680 $\pm$ 200	Pettitt and Trinkaus, 2000
<b>Arene Candide ('Il Principe')</b>			
OxA-10700	Human bone	23,440 $\pm$ 190	Pettitt et al., 2003

The Fontirobertian of the Dordogne is thought to date from the period of cooler climate between the Maisières and Tursac Interstadials (28–26,000 BP), but to have had an origin in northwestern Europe during the Maisières Interstadial, as evidenced at the Belgian site of Maisières-Canal (Haesaerts and de Heinzelin, 1979). Southwards movement of the population was triggered by the cold that followed the Interstadial (Djindjian, 2003: 289). There are relatively few radiocarbon determinations for the Fontirobertian in the Dordogne. However, we are currently working on a dated sequence from the large rockshelter of La Ferrassie and will report results shortly.

Our knowledge of the dating of the earliest Gravettian in northwest Europe depends upon the interpretation of radiocarbon determinations from Maisières-Canal. This has remained controversial because the dated samples included humates from the fossil soil formed during the Maisières Interstadial within which the Gravettian artifacts were contained (Gilot, 1984: 119–120; Haesaerts and Damblon, 2004). The fauna from Maisières-Canal is small, but it includes cut-marked bones of arctic hare (*Lepus timidus*), a bear (*Ursus cf. arctos*), and reindeer, as well as smashed bones of mammoth and much charred mammoth bone. Cut-marked bones, and bones and tusks shown on section drawings are currently being dated at Oxford and preliminary results confirm an age of between 29–28,000  $^{14}\text{C}$  BP. These will add appreciably to our understanding of the Gravettian in north-west Europe, including the British Isles, and to our interpretation of its relationships with the Gravettian of the Dordogne.

#### Human use of Goat's Hole following the Red Lady burial

It has also been possible to re-sample three artifacts whose apparent ages provided supporting arguments for human visits to Goats' Hole in the time following the burial and during the downturn in climate towards the Last Glacial Maximum.

The first of these artifacts is one of the three bone knives, each made on a splinter taken from the anterior face of a wild horse metapodial. The three are so similar to one another (Aldhouse-Green, 2000b, his Fig. 7.7) that it is probable that they were deposited in the cave as a group, and that a direct determination for one would be valid for the others.

All three knives have been very heavily conserved. In re-sampling one of the pair at Swansea Museum (A 836.1.34) it was possible to drill material from directly beneath where the previous dating sample had been taken in the hope of avoiding this conservation, but there can be no certainty that we were wholly successful. The new result is significantly older than any of the dates previously obtained for the knives at 26,170  $\pm$  150  $^{14}\text{C}$  BP (OxA-13656; Table 6). However, we prefer to regard this as a minimum age, and as potentially unsafe evidence for human visitation to the cave subsequent to the burial or for a human presence in the British Isles.

We resampled, and attempted to redate, the ivory pendant found by Sollas (OUM Q.3) and the piece of whittled ivory, which was probably one of those found by Buckland (OUM S.5079). In both cases, we were unable to extract any undegraded collagen. In our experience, this casts major doubt on the reliability of the

earlier radiocarbon determinations from both pieces, and hence, on the scenario that the cave had been visited by ivory workers subsequent to the burial of the Red Lady.

Taken together, the evidence for human visits to Goat's Hole subsequent to the Red Lady burial is now hardly credible. Instead, the archaeology of this cave is now telling us a simpler story. The earliest use of the cave was during the Initial Upper Paleolithic. To this time we attribute the leaf-points. In turn, these leaf-points belong to the technocomplex known as the Lincombian-Ranisian-Jerzmanowician which, as its name implies, was probably spread across Northern Europe (Desbrosse and Kozłowski, 1988). The next occupation was Aurignacian, and it is to this period that the greater number of artifacts probably belong. The technology is that of an evolved Aurignacian. Aldhouse-Green and Pettitt (1998: 765; Pettitt, 2000) have suggested that hearths were lit, for which tangible evidence survives in the form of carbonized bones several of which have been radiocarbon dated. The results may be minimum ages. If humans alternated occupancy of Goat's Hole with another carnivore at the time of the leaf-points and the Aurignacian, it would seem to have been with spotted hyaenas. Later the cave may have been used by brown bears. There is a single broken Font-Robert point. If it is indeed the only Gravettian lithic artifact from the cave, it could have entered still hafted and with its tip lost to breakage, perhaps as the result of a hunting accident. Whether it was replaced at the cave, we can never know.

The burial of the Red Lady is attributed to the Early Gravettian and associated with it were many of the ivory artifacts from the cave. In many ways the story of Goat's Hole resembles that of the shelter of Cro-Magnon where Gravettian burials overlay hearth layers with Aurignacian artifacts, the shelter changing from a place for the living to a place for the dead. The selection of Goat's Hole for the burial may have been influenced by evidence of earlier use still being visible on its floor, thereby making a physical connection with real, or imagined, ancestors. Alternatively, selection may have been no more than serendipity.

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