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**The Proboscidean Remains found at Barnwood, near
Gloucester**

by K. S. Sandford
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THE PROBOSCIDEAN REMAINS FOUND AT
BARNWOOD NEAR GLOUCESTER

by K. S. SANDFORD

IN a paper on *A Prehistoric and Roman Site at Barnwood near Gloucester*¹ Mrs E. M. Clifford gives the following section. The surface is about 80 feet above the Severn and about 100 feet above Ordnance Datum.

- Bed A Loamy soil with occasional quartzite pebbles,
1½–2 ft.
- „ B Brown marly siliceous sand and a few
quartzite pebbles, 1½–2 ft.
- „ C Clean water-worn stratified gravel of oolite
pebbles with pockets and seams of fine
quartz sand, 6–7 ft.
- „ D Rough clayey unstratified oolite gravel,
coarser and more angular towards base,
with isolated ooliths (instead of quartz
sand as in bed c), base not seen but gravel
dug to depth of 8 ft.

The following implements and faunal remains have been found :—

- Bed A —
- „ B Point of evolved Mousterian type, and
Upper Palaeolithic implements, including
Upper Aurignacian.
- „ C —

¹ *Transactions*, 1930, LII, 201–54.

Bed D Late Acheulean or early Mousterian implement, probably late Acheulean (described by M. C. Burkitt in *Antiquaries Journal*, 1921, 1, 234), and the following fauna :—

Elephas primigenius Blum. (Mammoth).
Rhinoceros antiquitatis Blum. (*tichorhinus*).

Equus caballus Linn.

Bos primigenius and (probably) *Bison priscus*, *Ovibos moschatus* (see Mrs Clifford's references to this animal).

Bos longifrons and sheep probably came from a higher bed.

The implements quoted above were identified by the Abbé Breuil and Mr Reginald A. Smith ; the fauna by the late Dr C. W. Andrews.

Further remains of *Elephas* found after Dr Andrews' death were seen in 1928 by the Abbé Breuil, who expressed the opinion that *Elephas antiquus* was represented. The suspected teeth were examined by Miss Bate at the British Museum, who suggested that a second opinion should be sought. Mrs Clifford sent me a collection of twenty-five molars and fragments of molars, but owing to my absence abroad I was unable to study them in time to submit a report before her paper was published.

The collection includes fourteen more-or-less complete molars: the remainder comprise dissociated plates, fragments too short for accurate measurement, and incomplete molars so worn by mastication that little more than stumps remain. As is usual in teeth so reduced by use, the plates are more widely separated than they were in the superior part of the tooth which has been removed by abrasion, and there results a false impression of a tooth consisting of a few lamellae separated by wide bands of cement. Owing to the same cause, moreover, the enamel is thicker than that exposed in a little-worn

tooth of the same animal. None of the fragments shows the median lozenge so often associated with the teeth of *E. antiquus*: they are similar in every way to worn stumps of molars of *E. primigenius* which form a certain proportion of all collections of that species which I have examined. On positive and negative evidence therefore I confidently identify them with *E. primigenius*, and not with *E. antiquus*.

Turning now to the larger remains, we find the greater parts of ten upper molars available for study: nine are probably ultimate molars, M₃, one may be a part of the penultimate molar. All show many plates, long, straight, and narrow as seen on the sides of the teeth; straight, narrow, and thin-enamelled as seen on the grinding surface. Such a description coincides precisely with that given by Dr Andrews. There is no feature reminiscent of *E. antiquus* in any of them. They are one and all to be assigned to the late (Siberian) form of *E. primigenius* Blum. (mammoth) and not to the earlier, so-called Ilford type. I can see no reason to associate any of them with Pohlig's *E. trogontherii*, or with any mutation or variety of that species. They present so clear a case that it seems unnecessary to describe them further. The length-lamellar ratio (*i.e.*, the quotient of the division of the length of tooth by the number of plates), and the frequency (the number of plates contained in 100 mm. at the crown) coincide at about 9 to 10, a factor characteristic of mammoth. In *E. antiquus* the ratio ranges from about 11 to 19, and the frequency from about 8 to 5.²

Of the lower molar teeth, five in number, three are so worn that with roots and surviving grinding plates they do not exceed 100 mm. in height. They are slender and

² Some notes on these figures and on measurement of elephant teeth will be found in a short paper on the fossil proboscidea of the upper part of the adjacent Thames basin in *Q. J. Geol. Soc.*, 1925, LXXXI, 62-86.

narrow, though the plates are relatively coarse (for the reason already given). If one may judge by the slightly incomplete contour of the basal parts of the teeth, and by the number of surviving plates, two, each with ten surviving plates in about 155 and 115 mm. respectively, are probably ultimate milk molars (that of 155 mm. may be first true molar), and one, with fragments of seven plates in about 100 mm., may be a second milk molar. All three are certainly of *E. primigenius*.

Two lower molar teeth remain to be described. One, which is broken into three parts but is otherwise in good condition, except for some loss of inter-lamellar cement at the two fractures, shows sixteen lamellae and the small posterior fold or talon in about 200 mm. It has, therefore, a ratio of 12.5 and a frequency of 8. The other tooth is less complete, one part consisting of eight lamellae in a little more than 100 mm. (the frequency thus approximating to 8); another part contains three plates, and there are loose fragments of two or three more plates. There can be little doubt that both teeth are ultimate molars.

The plates of the more fragmentary tooth are remarkably massive, and the enamel of both is perhaps a little thicker than in the other teeth in the collection. The most noteworthy feature is the pattern of the plates where their truncated edges are exposed on the grinding surface: even the more heavily abraded plates show a marked lobation. In the more fragmentary tooth this takes the form of a central very long and shallow oval with a less marked oval either side of it: towards the posterior end of the tooth this arrangement breaks down into the usual clusters of cusps arranged transversely across the tooth, an essentially normal condition. In the more perfect tooth the central oval is smaller, but is broader than the rest of the plate. Neither of these conditions is very remarkable, but they mark a distinction from the normally straight and plain transverse ridges so typical of the Siberian mammoth on the one hand,

and on the other approach the median lozenge-shaped expansion so often seen in molars of *E. antiquus*. The similarity is only superficial, however: the oval expansion cannot be confused with the 'antiquus lozenge', and the enamel bears no relation either in thickness or arrangement to that of *E. antiquus*. It is true that the ratio and frequency fall on the border line of the two species, but it is on that line that the old or Ilford type of mammoth also falls. These two teeth from Barnwood can be matched almost exactly by another from the Upper Thames which has not even the most superficial appearance of similarity to any molar of *E. antiquus*. This tooth, which I have numbered S.44 in the collection of the Oxford University Museum, contains seventeen lamellae, and anterior and posterior talons are preserved, in a total length of 235 mm.³ The frequency is 7.5 and the ratio 13.1, and the two Barnwood teeth fall comfortably on the *primigenius* side of these figures. In all three the enamel is thick and the lamellae are wide, and the type of folding of the enamel is the same. Only the expanded oval along the median line of the plates in one of the Barnwood teeth suggests a superficial similarity to the expansion seen in some molars of *E. antiquus*, but as already stated, the comparison cannot be maintained.

I suggest, therefore, that the last two Barnwood teeth to be described belong also to *E. primigenius*, probably to the older Ilford form which was indigenous in this country before the true Siberian mammoth arrived and replaced it. For a time the two seem to have existed side by side.

Judged by their fauna and human implements the lower gravels of Barnwood may be compared with Miss M. E. Tomlinson's⁴ no. 2 terrace in the Severn Avon and

³ See *Q. J. Geol. Soc.*, 1925, LXXXI, pl. VI, figs. 1 and 2.

⁴ *Q. J. Geol. Soc.*, 1925, LXXXI, 137 *et seqq.*, and *Procs. Birmingham Nat. Hist. & Phil. Soc.*, 1929, xv, 157 *et seqq.*

with the Summertown-Radley terrace of the Upper Thames basin. Their heights above the adjacent rivers differ appreciably (Barnwood 80 feet, no. 2 terrace 30-40 feet, Summertown upper limit about 20 feet). Barnwood is remarkable for the presence of musk ox, *Ovibos moschatus*. Among the material sent to me for identification I am unable to find *E. antiquus*, although on the grounds of the comparisons made above there is no reason why it should not be represented in the series in beds c or d.

As Mrs Clifford has pointed out, the Barnwood sections were described sixty years ago by W. C. Lucy, and his discovery of musk ox (*Ovibos*) there has subsequently recalled attention to them on a number of occasions.⁵ We owe their recent detailed study to Mrs Clifford, and it is greatly to be hoped that they will continue to be under such keen observation. They have already proved to be of exceptional importance.

The following sketches of plates taken from the central parts of ultimate molars may serve to illustrate the statements made above.



A. The general pattern of plates of *E. antiquus*. It will be noticed that the enamel is coarsely folded, and that it expands near the median line to form a marked 'lozenge'. The type of folding persists in teeth of this species even if the lozenge is absent. This pattern is not seen in any of the Barnwood teeth.

⁵ W. C. Lucy, 'Gravels of the Severn', *Procs. Cotteswold N.F. Club*, 1872, v, 78; see also further references given by Mrs Clifford, *Transactions*, LII, 209-10.



B. The pattern typical of the teeth of Siberian mammoth. The transverse sections of plates seen in worn molars of this species invariably show many narrow and straight plates, devoid of the elaborate folds seen in *E. antiquus*. Minute crinkling may be seen on the inside and outside of the enamel, but this is distinct from the entire folding seen in *E. antiquus*. This pattern is plainly visible in the Barnwood teeth.



C. A worn plate of one of the two teeth from Barnwood assigned to the old or Ilford type of *E. primigenius*. It lacks the entire folding of *E. antiquus* and the pattern is clearly that of *E. primigenius*, with an exaggerated and persisting central lobe in most of the plates (as in the one shown).