

## BRITISH MUSEUM NATURAL RADIOCARBON MEASUREMENTS III

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The third series of radiocarbon measurements made at the British Museum Research Laboratory is reported in the following list. Equipment and method used are as described previously (British Museum I) and, as in previous lists, the error terms are not based solely on counting statistics, but are widened to include contributions of  $\pm 80$  years for possible isotopic fractionation effects and  $\pm 100$  years for the de Vries effect. Ages are calculated on a half-life of  $5568 \pm 30$  years. NBS oxalic acid is now used as a reference standard in place of 100-yr-old oak. The latter gave an age-corrected value almost exactly 95% of the oxalic-acid activity and thus no corrections are required to our previous date lists to bring them into line with the new standard.

### PRETREATMENT OF BONE AND ANTLER

One of the laboratory's long-term projects is an investigation into the reliability of bone and antler as source materials for dating. A number of measurements on such materials are reported here. In all cases, only the organic fraction of the sample was used as a source of carbon, and the procedure adopted was as follows: Sample was broken into small pieces, either by coarse grinding or pounding in a mortar, and was treated with cold dilute hydrochloric acid in order to remove carbonates and to decalcify the material. Resulting granular gel was washed thoroughly by repeated soaking with cold water and was finally dried, prior to combustion.

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### SAMPLE DESCRIPTIONS

#### I. ARCHAEOLOGIC SAMPLES

##### *A. Africa*

#### **BM-31. Magabengberg, N Transvaal 1020 $\pm$ 150**

Charcoal from bed 1 in Magabengberg cave, Magabengberg North Transvaal ( $23^{\circ} 15' S$  Lat,  $28^{\circ} 55' E$  Long). Found in association with Later Smithfield industry. Coll. December 1954 by Jean Humphries; subm. by Director, Archaeological Survey, Union of South Africa. *Comment*: the associated culture is similar to that found at Olieboompoort bed 3 (BM-42,  $870 \pm 150$ , this date list). The two dates thus corroborate each other.

#### **BM-42. Waterberg, W Transvaal 870 $\pm$ 150**

Charred bone from bed 3 in cave on W side of Olieboompoort, NW

Waterberg, Transvaal (23° 50' S Lat, 27° 40' E Long). Found in association with Later Smithfield industry. Coll. September and October 1954 by R. J. Mason; subm. by Director, Archaeological Survey, Union of South Africa. Relevant publication—Mason 1957, 1958. *Comment*: see BM-31.

### B. Egypt

#### BM-82. Abu Sir

**3950 ± 150**

Wood from Pyramid of Neferirkare (29° 53' N Lat, 31° 11' E Long). Coll. 1839 by J. S. Perring and presented to British Museum in 1840 (ref. 38259). Subm. by Dept. of Egyptian Antiquities. Relevant publication—Vyse, 1842. *Comment*: the wood was found in a situation that indicated it must have been built into the masonry at the time of erection of the building and therefore must be at least as old as the pyramid. As the accepted date for Neferirkare is 2460 B.C. (4420 B.P.) this sample provides another instance of Egyptian material giving a radiocarbon age less than the accepted one (Pennsylvania III).

#### BM-79. Tura Caves

**2130 ± 150**

Papyrus rope found buried in debris in one of the Tura caves, which are old stone quarries (29° 56' N Lat, 31° 18' E Long). Collector not known but the find is described by A. Lucas (Lucas, 1948). Received in British Museum in 1955, but not incorporated into the collection. There was no firm archaeological evidence to suggest the age of the rope, but it obviously was not modern, and as the site has been used as a source of stone for a very long period, a date was of some interest.

### C. Great Britain

#### BM-89. Blashenwell, Dorset

**6450 ± 150**

Bone, mainly ox, from the middle zone of layer of tufa, 8-ft thick at Blashenwell, Dorset, 1 mi SW of Corfe Castle (50° 29' 30" N Lat, 02° 04' W Long). Coll. ca. 1894 by Clement Reid and A. Wallace on field survey for the Geol. Survey. Mesolithic flints occur throughout the deposit. Subm. by W. F. Rankine (Great Austins, Farnham, Surrey, England). The culture is suspected to be Maglemosian, on evidence of marginal finds of tranchets. Relevant publications—Reid, 1896; Clark, 1938; Arkell, 1947; Bury, 1950. *Comment*: date puts Blashenwell tufa (Middle zone) into the Early-Atlantic period. Reviewing the date as compared with Oakhanger (Rankine and Dimbleby, 1960), and assuming that the industry is Maglemosian, a 200-yr lag behind the latter is what one would expect.

#### BM-68. Ehenside Tarn, Cumberland

**3530 ± 150**

Wood from an implement found at Neolithic settlement at Ehenside Tarn (54° 26' N Lat, 03° 33' W Long). Precise position unstated. Coll. 1869 by Rev. S. Pinhorne and now in the British Museum. Subm. by Sub-Dept. of Prehistoric and Roman Britain, British Museum. Relevant publication—*Archaeologia*, v. 44, p. 273 ff. *Comment*: charred wood from same site was dated earlier (C-462, 4964 ± 300, Chicago I). This present result is late for British Neolithic, but not impossibly so.

**BM-86. Galley Hill****3310  $\pm$  150**

Bone, fragments of the humeri of the Galley Hill skeleton (British Museum Natural History, ref. E. M. 255-6). Found in 1888 by Robert Elliot at a depth of 8 ft in gravel of the 100-ft terrace of River Thames in a gravel pit 180 yards NW of All Saints Church, Swanscombe, Kent (51° 27' N Lat, 00° 18' E Long). Subm. by K. P. Oakley, British Museum Natural History. Skeleton was originally thought to be contemporaneous with Paleolithic gravel, but this was later doubted. Fluorine dating in 1949 showed it to be an intrusive burial "prehistoric but probably post-Paleolithic." Relevant publications—Newton, 1895; Oakley and Montagu, 1949. *Comment*: the post-Paleolithic dating is confirmed.

**Grimes Graves series**

Two samples (BM-87 and BM-88) from the Grimes Graves flint mines (52° 25' 39" N Lat, 00° 38' 41" E Long). These were chosen as part of a program to check suitability of antler as a material for dating, since a number of antler samples from this site are available in the British Museum. Archaeologic evidence points to each pit having been filled within a relatively short time, so the difference in level between the two samples is not significant. Coll. 1937 and 1938 by A. L. Armstrong; subm. by Sub.-Dept. of Prehistoric and Roman Britain, British Museum. *Comment*: Grimes Graves flint mines are generally associated with the Windmill Hill British-Neolithic culture. Sufficient dates are not yet available for this, but at the present time the dating would appear to be rather late.

**BM-87. Depth 14 ft****4270  $\pm$  150**

Charcoal from pit 15.

**BM-88. Depth 11 ft****4050  $\pm$  150**

Antler from pit 15.

**BM-80. West Hartlepool, Submerged Forest****8700  $\pm$  180**

Antler from shore at West Hartlepool, County Durham (54° 41' N Lat, 01° 13' W Long). Coll. (date not recorded) and subm. by C. T. Trechmann, Castle Eden, County Durham. Antler was associated with Mesolithic flakes and implements and came from a bed of peat and trees which overlies hard, stony boulder clay and continues below low-tide mark to join the moorlog of the North Sea. It is the most northerly occurrence of coastal peat that has yielded implements. Relevant publications—Trechmann, 1936, 1947. *Technical matters*—Sample was in an unusually good state of preservation and in section presented (1) a dark, almost black, outer layer, (2) an intermediate light-colored zone, (3) a central spongy core, also light in color. Outer layer gave appearance of being fire blackened or charred and this and the intermediate zone were both composed of dense, compact material which was high in carbon (ca. 18%) and might be expected to be little affected by contamination from the environment. The central core, on the other hand, had a lower carbon content (ca. 7%) and, since its surface to volume ratio was much higher, might be expected to show effects due to contamination with younger organic material absorbed from its environment. Results tabulated below support these

ideas and also indicate that dialysis during the pretreatment has no effect on the result. Results obtained on outer and intermediate zones are in accord with archaeological and geologic estimates.

<b>BM-81.</b>	Dark outer layer, treated with HCl as described above.	<b>8680 <math>\pm</math> 180</b>
<b>BM-80.</b>	Light-colored intermediate zone. Treated as above.	<b>8700 <math>\pm</math> 180</b>
<b>BM-90.</b>	Spongy central zone. Treated as above.	<b>8100 <math>\pm</math> 180</b>
<b>BM-83.</b>	Spongy central zone. Digested with HCl and dialysed.	<b>8110 <math>\pm</math> 180</b>

#### Windmill Hill series

Three samples from Neolithic site at Windmill Hill, Avebury, Wiltshire (51° 26' 28" N Lat, 01° 52' 32" W Long). Sample A from the Neolithic (Windmill Hill) occupation surface, sealed beneath the bank of the Neolithic camp and is thus contemporary with first phase of the Neolithic settlement, prior to the construction of the camp. Associated Neolithic pottery and other artifacts are indistinguishable from those in use immediately after construction of the camp and there is no evidence of earlier (Mesolithic) occupation. Sample B, charcoal from the rapidly-forming primary silt of the camp ditches, (obtained from two cuttings in the outer ditch and one in the middle ditch). It can be shown that both middle and outer ditches were dug at the same time and that formation of the primary silt would have been complete by the end of 15 yr, at the most. This charcoal is therefore virtually contemporary with the construction of the camp. Sample E is from a well-preserved old turf line found in one of the outer ditch cuttings associated with Late Neolithic Beaker, Peterborough, and Rinyo-Clacton wares. Coll. June to August 1958 and subm. by I. F. Smith, Church Walk Cottage, Avebury, Marlborough, Wilts. Relevant publications—Smith, 1958, 1959. *Comment*: date range accords well with present expectations, in view of the series for comparable material from Ireland (D-36, D-37, D-38—Watts, 1960, and Dublin I).

<b>BM-73.</b>	<b>Charcoal</b>	<b>Sample A</b>	<b>4910 <math>\pm</math> 150</b>
<b>BM-74.</b>	<b>Charcoal</b>	<b>Sample B</b>	<b>4530 <math>\pm</math> 150</b>
<b>BM-75.</b>	<b>Charcoal</b>	<b>Sample E</b>	<b>3500 <math>\pm</math> 150</b>

#### *D. India*

<b>BM-92.</b>	<b>Karle Caves</b>	<b>2240 <math>\pm</math> 150</b>
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Wood from a pin holding together ceiling beams of middle third of main cave (Chaitya cave), Karle (ca. 18° 46' N Lat, 73° 28' E Long), above village of Vehergao. Coll. September 1956 and subm. by D. D. Kosambi, PO. Deccan Gymkhana, Poona 4. Relevant publications—Fergusson and Burgess, 1880; also Archaeological Survey of Western India, v. 4. *Comment*: date hitherto accepted is 150 B.C., or later (2100 B.P.). Pin appears to have been young

wood at the time of felling and only a few yr need be allowed for seasoning, prior to its use. Radiocarbon age thus agrees with accepted age.

### *E. Iraq*

#### **Ur series**

Group of bone samples excavated by Sir Leonard Woolley during the period 1927 to 1930 at Ur ( $30^{\circ} 56' \text{ N Lat, } 46^{\circ} 08' \text{ E Long}$ ), and now in British Museum. Subm. by Dept. of Western Asiatic Antiquities. All are from Period A of Predynastic cemetery (Predynastic = Pre-First Dynasty of Ur but is now designated Early-Dynastic Period). Relevant publication—Woolley, 1934. *Comment*: the Royal Tombs are usually considered to be earlier than 2350 B.C., which is the provisional date for the end of the Early Dynastic period. Agreement between the burned and unburned bone suggests that there is unlikely to be any major error due to contamination of the sample. The discrepancy between the radiocarbon and accepted ages is thus not explained. However, it may be significant that Egyptian material of about this age also gives radiocarbon results which are younger than the archaeologically accepted ones (Pennsylvania III).

<b>BM-64. Skeleton of Mes-Kalam-Shar.</b>	
Ref P.G. 755	<b>3920 <math>\pm</math> 150</b>
<b>BM-70. Burned bone from a clay coffin.</b>	
Ref P.G. 1515	<b>4030 <math>\pm</math> 150</b>
<b>BM-76. Skeleton of Queen Shub-ad.</b>	
Ref P.G. 800	<b>3990 <math>\pm</math> 150</b>

### *F. Ireland*

<b>BM-78. Dalkey Island</b>	<b>4260 <math>\pm</math> 150</b>
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Fragments of human skeleton from Dalkey Island ( $53^{\circ} 14' \text{ N Lat, } 06^{\circ} 06' \text{ W Long}$ ) County Dublin, Ireland. It was found in one of two shell middens, covered by later archaeologic material. Both middens contained a Larnian (Mesolithic) flint industry, limpet scoops and polished stone axes. Coll. (date not recorded) by G. D. Liversage; subm. by D. R. Brothwell, Duckworth Laboratory, Cambridge, England. Relevant publication—Watts, 1960. *Comment*: material from the second midden has given a date of  $5300 \pm 170$  (D-38, Watts, 1960, and Dublin I). The finds suggest that southern midden, from which skeleton came, might well be younger than the northern one. There is no stratigraphic connection between the middens.

### *G. Spain*

<b>BM-85. Rio Tinto Mines</b>	<b>2400 <math>\pm</math> 150</b>
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Wood from a Romano-Spanish water wheel from the Rio Tinto mines, Spain ( $37^{\circ} 41' \text{ N Lat, } 06^{\circ} 30' \text{ W Long}$ ). Coll. 1889 by Rinched Museum and now in Greek and Roman Dept., British Museum. Subm. by Greek and Roman Dept., after doubts had been cast as to its antiquity. *Comment*: other wheels of this type have been found in mines in Spain and Portugal; some in associa-

tion with Roman pottery. Allowing for probable age of timber before fabrication, radiocarbon result is quite consistent with a Romano-Spanish origin.

## II. GEOLOGIC SAMPLE

### BM-95. Schreckhorn

**680 ± 150**

Wood (*Pinus cembra*) from surface of old right lateral moraine, beside the path from Baregg to Schwarzegg, 1700 m above sealevel on right bank of Lower Grindelwald Glacier (47° 35' N Lat, 08° 05' E Long). Coll. July 1947 by the late Pastor Nil of Grindelwald; subm. by Sir Gavin de Beer, Director, British Museum Natural History. *Comment*: tree must have been killed by a deterioration in climate. Dating was undertaken as part of research to establish date of the onset of this deterioration which closed Alpine passes in the 16th century A.D. (see Bern II for other dates from the Grindelwald).

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