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RADIOCARBON DATES FROM THE OXFORD AMS SYSTEM: ARCHAEOMETRY DATELIST 4

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INTRODUCTION

This fourth list of accelerator dates includes material dated in the same period as Datelists 2 and 3 (Gillespie *et al.* 1985; Gowlett *et al.* 1986a) and subsequently. The dates have been obtained by basically the same methods as described in Gillespie *et al.* (1985), where questions of errors, standards, backgrounds and fractionation are discussed (p.237).

In accordance with international radiocarbon convention all dates given are based on a half-life of 5570 years and expressed in radiocarbon years before AD 1950 (years BP). This convention was reaffirmed at the Trondheim radiocarbon conference (Kra and Stuiver 1986). Errors are quoted as one standard deviation, and are our estimate for the total error in the system, including sample chemistry. The estimates have been confirmed by measurements on known age material (see below). As previously all bone dates are carried out on amino acids of collagen (Gillespie *et al.* 1984b), except those based on burnt bone. The latter are prepared in a similar way to the pretreatment for charcoal (see Batten *et al.* 1986). All combining procedures and significance tests used in the datelist are derived from Ward and Wilson (1978).

As the Oxford accelerator continues to maintain a high output it has become evident that space and time would not permit all dates to be published in *Radiocarbon*. The pressing need is for rapid publication, but space is also limited in *Archaeometry*, and certainly would not allow both preliminary and final publication for all dates. We therefore intend these lists primarily to put dates into the public domain, along with a precise reference to context, location, submitter and existing publications. This will not always meet the ideal of full discussion, for which other arrangements are likely to be more appropriate (e.g. papers in Gowlett and Hedges (1986) where many dates are discussed at length).

For convenience references to previous *Archaeometry* Datelists are henceforward made in the form 'see *Arch.List* 1', etc. The full references are given at the head of the bibliography.

LOW COLLAGEN BONES

In the initial phases of dating (1983–4) bones were normally only dated if a sufficient yield of amino acids could be obtained from *c.* 1 gram. A desirable yield for dating is *c.* 30 mg, and consequently bones down to *c.* 15% of the modern value (*c.* 200mg/g) could be treated routinely (as in Gillespie *et al.* 1984b). Subsequently dates for low collagen samples have been run by processing large quantities of bone (5–10 g, and up to 100 g in extreme cases). It has gradually become apparent that some dates where collagen content was less than 5% modern tend to be

underestimates (for discussion see Gowlett and Hedges 1986). This affects only a very small number of the published dates, but the following archaeological dates are likely to be too young:

OxA-174 Etiolles, *Arch.List* 2, p.120
OxA-361 Cuello, *Arch.List* 2, p.122 (see comment by Hammond, and Hammond *et al.* (1979).
OxA-362 Cuello, *Arch.List* 2, p.122
OxA-505 Marsangy, *Arch.List* 2, p.121 (see below)
OxA-461 Belloy-sur-Somme (see below)

This problem is likely to be much more apparent in low-collagen bones of greater age, where any contamination has much more effect. It may account for one or two discrepancies in earlier Upper Palaeolithic dates cited below, from Oxford and other laboratories.

KNOWN AGE MATERIAL

Dates for known age material were fully listed recently (*Arch.List* 3). The following additional dates have been run:

Pompeii

OxA-792 Pompeii human mandible 2000 ± 100

Comment: This is a repeat of the sample used for OxA-606 (1930 ± 80), with which it is compatible. The combined result for seven dates is now 1970 ± 35 BP. The expected age for AD 79 on the Belfast curve is *c.* 1930 BP (Pearson and Baillie 1983). We have previously assumed an 'average' age of 1940 for Pompeii as not all sample material is short-lived or precisely synchronous, and on this basis agreement remains satisfactory.

Tree Ring 1000 AD

OxA-826 Tree ring AD 1000, bristlecone pine 1010 ± 80

Comment: the expected value using the Seattle curve (Stuiver 1982) is *c.* 1000 BP. The combined value of seven measurements (see *Arch.List* 3, p.116, for the previous six) is 975 ± 25.

Other Tree Ring Measurements

Measurements have been made on several other tree rings of various known ages back to *c.* 4000 BC. These include both Belfast oak and North American bristlecone pine.

OxA-763 Tree ring AD 1887, bristlecone pine 90 ± 60
OxA-767 Tree ring AD 1887, bristlecone pine 120 ± 70

Comment: expected value is *c.* 90 BP

OxA-766 Tree ring AD 490, Irish oak 1520 ± 100
OxA-780 Tree ring AD 490, Irish oak 1920 ± 100
OxA-874 Tree ring AD 485, bristlecone pine 1600 ± 90

Comment: expected value is *c.* 1550 BP. No difference is to be expected between Irish oak and North American bristlecone of the same age (Pearson and Baillie 1983). OxA-780 is about 3.5 standard deviations from the known age value. Unlike most other known age samples which were dated from two sample wires according to normal procedures it was dated from a single wire target which gave an anomalous beam current but no internal indication of an anomalous isotopic ratio.

OxA-779 Tree ring AD 10, bristlecone pine 1910 ± 80
OxA-795 Tree ring AD 10, bristlecone pine 2040 ± 80

Comment: expected value is *c.* 1990 BP.

OxA-796	Tree ring 995 BC, bristlecone pine	2840 ± 80
OxA-901	Tree ring 995 BC, bristlecone pine	2810 ± 60

Comment: expected value is *c.* 2840 BP.

OxA-764	Tree ring 3995 BC, bristlecone pine	5220 ± 80
OxA-875	Tree ring 3995 BC, bristlecone pine	5140 ± 100

Comment: expected value is *c.* 5180 BP.

Mary Rose

Additional dates from the Mary Rose which sank off Portsmouth (50°43'N, 1°3'W) in 1545 AD (Rule 1982), samples provided by I. Oxley, Mary Rose Trust. Numerous butchered pork joints which had been stored in the orlop deck of the ship were preserved under sail cloths and sediments. Both dates are based on a pig rib dated previously (OxA-424); expected value for material of short life is *c.* 300 BP.

OxA-793	Mary Rose pig rib	360 ± 80
OxA-825	Mary Rose pig rib	310 ± 80

Comment: these two dates bring the total on the Mary Rose to four (see *Arch.List* 3, p.117). The combined value is now 310 ± 35 BP.

Domesday Book

1986 is the 900th anniversary of the compilation of Domesday Book. The book has been rebound this year, and in connexion with this rebinding the Public Record Office asked the laboratory to undertake dating of the oldest extant covers of the two volumes of Domesday Books. These covers have been stored for more than 150 years since rebinding in the last century (Forde 1986). Both Great and Little Domesday had brown leather covers embellished with metalwork, reputed to be of Tudor age. The Little Domesday cover has underlying older bindings, covering oak boards. The Great Domesday cover is on beech boards with no traces of previous bindings.

OxA-660	Great Domesday parchment AD1086	990 ± 60
OxA-661	Great Domesday soft spine	550 ± 65
OxA-662	Great Domesday brown cover	300 ± 80
OxA-663	Great Domesday beech board	220 ± 70
OxA-664	Great Domesday centre fold scrap	1160 ± 100
OxA-665	Little Domesday oak board	1140 ± 70
OxA-666	Little Domesday white inner	660 ± 60
OxA-667	Little Domesday brown cover	480 ± 60
OxA-820	Little Domesday brown cover	420 ± 90

Comment: OxA-660 and 664 can be regarded as known age (*c.* AD 1086 or 920 BP). OxA-660 agrees well with this, but OxA-664 appears rather old. It was a fragment of parchment and glue found in rebinding, and it is just possible that the glue has an older radiocarbon age. If Domesday had been dated as an unknown from these two samples, it would have appeared as *c.* AD 985–1025 at 1 sd, but *c.* AD 890–1140 at 2 sds. OxA-665 demonstrates that the Little Domesday oak board is *c.* 9th–10th century, but binding evidence shows that it is not the original cover (Forde, pers. comm.). OxA-666 appears to document the historically recorded fourteenth century resewing and repair. OxA-667 and 820 can be combined to give 460 ± 50, strongly suggesting an unrecorded fifteenth century rebinding of Little Domesday. OxA-662 and 663 suggest that the similar brown binding of Great Domesday was made considerably later, probably in Tudor times or soon afterwards. C. Mortimer (pers.comm.) notes from XRF analysis that the brass corner and centre plates are of very pure brass, with *c.* 32% zinc, indicating use of the granulation technique of manufacture which was introduced in the 1570s. OxA-662 and 663 would fit very well with radiocarbon levels in the mid-sixteenth century, though many later values are possible (*cf.* curve of Pearson and Baillie 1983).

The amino acid yield for OxA-661 was very low, but if the date is reliable it indicates that the soft spines were retained from an earlier binding.

Temple of Tuthmosis IV

Straw from a mud brick incorporated in temple of Tuthmosis IV (XVIII Dynasty), Thebes, Egypt (25°43'N,

32°36'E), submitted by R. L. Wilson, Sub-department of Geophysics, Liverpool University. The sample has high security of context as it was taken directly from a standing wall.

OxA-917 Straw from mud brick, sample E46 3150 ± 80

Comment: The calendrical estimate for Tuthmosis IV is 1400–1390 BC. It is generally reckoned that New Kingdom historically-derived dates are accurate within *c.* 10 years. The date was run as a 'blind test' as the historical value was not known to REMH at the time of the dating. Following the Belfast curve (Pearson *et al.* 1982) the expected value is *c.* 3100 BP.

OLD WORLD PALAEOLITHIC AND MESOLITHIC DATES

England

Northampton Lyngby Axe

This specimen comes from gravel workings at Earl's Barton, Northamptonshire (NGR SP875625), in the same area as a bone point (OxA-500: 9420 ± 160 BP). Submitted by G. Teal and J. Cook.

OxA-803 Lyngby Axe 10 320 ± 150

Comment (J. C.): This artefact is shaped from a reindeer antler which has been detached from the skull and the brow tine trimmed back to a short hollow stump with the cut edge parallel to the shaft. Such objects are known right across the North European Plain, including southern Scandinavia, and occur in association with stone artefacts of the Lyngby-Bromme-Segebro, Ahrensburgian and Chwalibogowician-Swiderian technocomplexes of the Late Glacial (Allerod-Younger Dryas). This example is the first recorded find from Britain and its date is consistent with other dates for reindeer in in Britain, and with the dating evidence for Lyngby axes in Scandinavia. *Comment* (Lab.): *cf.* Y-159–2 (10 320 ± 250) reindeer antler from Stellmoor (Lanting and Mook 1977, p.25), where more than 40 Lyngby axes were found (Rust 1943).

Gough's New Cave

Bones from Gough's New Cave, Somerset (NGR ST467539). Submitted 1984/5 by R. M. Jacobi, Univ Lancaster & A. P. Currant, Dept Palaeontol. British Mus (Nat. Hist.). For an account of the site see Jacobi (in press). Previous accelerator dates from the site are published in *Arch.Lists* 2 and 3. Of the following specimens M49744 and M49839 are in BMNH collections, 1.1/29 at Cheddar Caves Museum.

OxA-813 Astragalus of *Bos primigenius*, M49744 11 900 ± 140
OxA-814 Talus of Cheddar Man 1.1/29 9100 ± 100
OxA-815 Maxilla of *Sus scrofa*, M49839 1740 ± 60

Comment: The *Bos* and *Sus* specimens were both found in the cave earth/breccia unit (in Parry's spits 11 and 12 respectively). The dates were intended to test whether these species were present in the lateglacial; for *Bos* this is also confirmed by OxA-588 (12 030 ± 150; *Arch.List* 3); there is no other record of pig for this period, but no indication of intrusive bones among the other dates, hence the late Roman result underlines the value of direct dating.

The remains of Cheddar man were discovered around Christmas 1903 in a small lateral chamber of the cave (the so-called 'Cheddar Man fissure'), during improvements to the 'visitor potential' of the cave. There is no known relationship to stratigraphy elsewhere in the cave. The date was intended to investigate the alternative possibilities of 'lateglacial *or* very early postglacial age', and establishes the latter. This accords with dates for several other cave burials in the south-west (*cf.* Stringer 1986, and the following results).

Aveline's Hole

Bones from Aveline's Hole, Burrington, Somerset (NGR ST476587), excavated 1919–33 by University of Bristol Spelaeological Society (Davies 1922), submitted 1985 by R. M. Jacobi, identified by A. P. Currant. All dated specimens are in the museum of the University of Bristol Spelaeological Society.

OxA-799 Right distal humerus, *H. sapiens* M1.13/23 9100 ± 100
OxA-800 Right distal humerus, *H. sapiens* M1.13/24 8860 ± 100
OxA-801 Antler (part) unshed, Red deer M1.2/5 12 100 ± 180

OxA-802 Antler (part), shed, Reindeer 9670 ± 110

Comment: All items were found in a *c.* 1 metre thick 'cave earth' beneath flowstone. OxA-799 and 800 date two separate human individuals, assumed to represent burials. Previous dates on human remains are BM-471 (9144 ± 110) on combined bones, and Q-1458 (9090 ± 110) on large sample of small bone fragments.

OxA-801 and 802 were aimed at beginning to unravel the faunal 'sequence' of the cave, and its possible relationship to human activity before use of the cave as an inhumation cemetery. Both of the deer dates fit in with the temporal distributions of the species at other sites (e.g. *Cervus elaphus* in Gough's Cave, and possibly Misbourne; for *R. tarandus* see Clutton-Brock and Burleigh 1983), and are significantly different from the human dates.

Soldier's Hole

Bones from Soldier's Hole, Cheddar, Somerset (NGR ST469540), excavated by R. F. Parry in 1928–9 (Parry 1931), submitted 1985 by R. M. Jacobi, courtesy of the Manchester Museum.

OxA-691	Reindeer calcaneum, Spit 12	> 34 500
OxA-692	1st phalanx reindeer, Spit 13	29 300 ± 1100
OxA-693	Astragalus of reindeer, Spit 14	> 35 000
OxA-694	Distal end of tibia, *cf. Bovini*,Spit 16	19 300 ± 400

Comment: The first three dates on bones in spits of Unit 4 (regarded as Middle Devensian) were intended to date the upper part of Unit 4, from which 3 'leaf points' were excavated by R. Parry. The dates for reindeer are in accordance with expectation, but the large bovine specimen must be intrusive. It was unusually well preserved, with a collagen content of *c.* 75% modern, several times higher than for the other samples.

Church Hole Cave

Bone from Church Hole Cave, Holbeck, Nottinghamshire (NGR SK534741), excavated by Dawkins and Mello in 1876 (Dawkins 1877; Mello 1877), specimen in Manchester Museum, submitted 1985 by R. M. Jacobi.

OxA-735 Humerus shaft of Mountain hare LL7431 12 240 ± 150

Comment: The sample from the 'breccia unit' consisted of consolidated sediment containing bone and charcoal fragments together with a flint blade. It is important for establishing chronology of human use of the Crags area, and gives an estimate for date of flint assemblage, bone and antler items from same cave.

Elder Bush Cave

Bones from Elder Bush Cave, Wetton, Staffordshire (NGR SK097548), excavated by Wilson and Bramwell 1935–52 (Bramwell 1964, 1973), and submitted by R. M. Jacobi 1985 after identification by C. Grigson. Bone sample is from deer carcase excavated in 1947 by D. Bramwell and the Peakland Archaeological Society, found in sector 2 layer 10 and described as a 'cache'.

OxA-811	Vertebra of *Cervus elaphus*	10 600 ± 110
OxA-812	Charcoal from breccia attached to vertebra	9000 ± 130

Comment: Date on vertebra of juvenile red deer whose ribs bones show clear cutmarks establishes time of human activity at the cave in the Lateglacial, and provides timefix for local presence of the deer species. The deer was previously described as reindeer (Bramwell 1964, Campbell 1977). The result on the charcoal is significantly later, and appears to give a date for the formation of the breccia.

Mother Grundy's Parlour

Bones from Mother Grundy's Parlour, Creswell, Derbyshire (NGR SK536743), excavated 1924 by A.L. Armstrong (1925), specimens from Manchester Museum submitted 1985 by R. M. Jacobi, identified by A. P. Currant.

OxA-733	Bone fragment, *cf. Bovini*, LL7370	12 060 ± 160
OxA-734	Bone fragment, *cf. Bovini*, LL7371	12 190 ± 140

Comment: The dates are attempts to establish ages of individual bones within filling of a hearth feature. The two dates are effectively the same and closely comparable with dates for bovines at Gough's Cave (see above). Two other

dates for the site are Q-1438 (11 285 ± 180 BP) and Q-1459 (11 160 ± 170 BP) both based on bulked bone fragments.

Misbourne

Animal bones from Misbourne Viaduct, Gerrard's Cross, Buckinghamshire, submitted by M. Farley and R. Wilson (NGR TQ01628798). The site was identified during the construction of the M25 in 1983, and a rapid investigation carried out. The principle deposit was a form of tufa containing numerous snails. In a soil formed on gravels, and in two definable horizons of tufa, animal bones and worked flint were found with evidence for *in situ* knapping. Preliminary analysis of the flintwork (R.M. Jacobi) the animal bone (R. Wilson) and the tufa (R. Preece) suggested the site to belong to the late Mesolithic-Neolithic transition.

OxA-601	Unfused distal metatarsal of *Bos*, Feature 603, 52–318	6190 ± 90
OxA-602	Cuboid of *Bos*, Feature 601A, 51–316	3730 ± 90
OxA-603	3rd phalanx of *Bos*, Feature 602, 49–318	4070 ± 100
OxA-618	Vertebral spine of*Bos*, Feature 602, 52–318	5970 ± 100
OxA-619	Magnum of *Bos*, Feature 603, 52–316	6100 ± 120
OxA-620	3rd phalanx of *Bos*, Feature 603, 50–313	2500 ± 150
OxA-621	Vertebra, prob. *Cervus elaphus*, Feature 602, 53–321	12 530 ± 200

Comment (M. F.): The dates in general confirm the observed stratigraphic sequence and indicate that the tufa was forming from the later Mesolithic into the later Neolithic. Two dates give problems: OxA-620 was expected to be contemporary with OxA-601 and OxA-619, but could be a downward intrusion due to rabbit activity. The early date of the red deer vertebra OxA-621 seems unlikely both on grounds of stratigraphy and since it appears to articulate with bone in the late Mesolithic horizon. The early presence of red deer cannot be ruled out (see Gough's Cave dates above).

Mesolithic of Ireland

Newlands Cross

Samples taken from tufa at Newlands Cross, Tallaght, County Dublin (53°17'N, 6°22'W), submitted by R. C. Preece, Godwin Laboratory, University of Cambridge (Preece *et al.* 1986). Terrestrial shells submitted by T. Yates, University College, London.

OxA-567	Seeds of *Eupatorium cannabinum*, 60–65cm	7600 ± 900
OxA-568	Seeds of *Eupatorium cannabinum*, 75–85cm	7600 ± 500
OxA-569	Amorphous organic material, 110–115cm	9720 ± 300
OxA-707	Shells of *Cepaea nemoralis*, 85–87cm	8300 ± 90
OxA-708	Shells of *Cepaea hortensis*, 85–87cm	8930 ± 150

Comment (R. C. P.): The series conforms well with the stratigraphic sequence. The seeds were recovered from the Postglacial (Littletonian) tufa overlying a buried soil (85–87cm) containing the dated shells and flint flake. OxA-569 dates an assemblage with arctic-alpine species at the base of the tufa immediately overlying till. The terrestrial shells were dated from inorganic material (carbonate) preselected by T. Yates.

The buried soil is developed within the tufa and merely represents retarded tufa growth and drying. OxA-568 was an attempt to date the buried soil (which contained no *Eupatorium*), so it provides a *minimum* age for the flint. OxA-707 and 708 were on shells within the soil itself, and are taken to date the soil and flint (OxA-707 conforms most closely to expectation). OxA-567 was an attempt to date levels which showed possible evidence of forest disturbance by Mesolithic man.

France: Late Upper Palaeolithic dates

The laboratory has continued the dating of late Palaeolithic sites in NW Europe within an in-house project (see *Arch.List* 3 for previous dates. As before the comments given on the dates below have been compiled by JAJG using information provided in French by the submitters.

Marsangy

Additional bone from the site of Le Pré des Forges, Marsangy, Yonne, (48°05'N, 3°25'E) published by Schmider

(1979), Delporte *et al.* (1982). Collected 1974 and submitted 1985 by B. Schmider. See *Arch.List* 3 for previous dates.

OxA-740	Le Pré des Forges C14 85	12 120 ± 200

Comment: The oldest of three dates from the site, it compares moderately well with OxA-178, but is much older than OxA-505 (9770 ± 180), and therefore casts no direct light on the discrepancy between the other two dates. B. Schmider remarks that the bone for OxA-505 was more shallowly buried, but that there is no evidence at all to indicate that it was intrusive. As it was a very low collagen bone, it is possible that the date is too young (see Gowlett and Hedges 1986). OxA-740 and 178 give the best indication of the age of the stone industry.

Moque Panier

Bones from the site of Moque Panier – Le Tilloy, near Ville Saint Jacques, Seine et Marne, France (48°58'N, 2°54'E), excavated 1970 by A. Leroi-Gourhan, submitted 1985 by M. Julien. The Magdalenian level was found at about 80 cm below surface level, inside a field on the plateau above the Seine valley.

OxA-730	Moque Panier C-151.88	12 300 ± 160
OxA-731	Moque Panier C-151.122	12 240 ± 160

Comment: This Magdalenian site, situated about 5 km from the well-known valley site of Pincevent, is of interest because it is a plateau site. Most of the fauna collected was horse while at Pincevent it is mainly reindeer. The site was thought to be contemporaneous or slightly older than Pincevent (Leroi-Gourhan and Brézillon 1972). The dates are in fact indistinguishable from the Oxford series on Pincevent (see *Arch.List* 3). The site may have been occupied at a different season from Pincevent (M. Julien, pers. comm.).

Belloy-sur-Somme

Bones and teeth from the site of Belloy-sur-Somme, 15 km north-west of Amiens in the Pas de Calais (49°58'N, 2°09'E), at a level of 18 metres. Excavated 1983/4 by J.-P. Fagnart (Fagnart 1984; see Commont 1913 for account of earlier excavations). The main archaeological layer is at the top of the loess covering the low terrace of the Somme, and is in a bleached horizon underlying the plough soil. The two excavated sectors, B117 and B131 are separated by about 60 metres. The sample for OxA-460 was submitted as coming from a slightly higher level.

OxA-460	Long bone from upper level, B117 15c	5255 ± 80
OxA-461	Horse tooth B117, S17, No. 17	8010 ± 110
OxA-462	Horse tooth B117, S18, No. 44	9720 ± 130
OxA-722	Horse tooth, repeat of OxA-461	10 110 ± 130
OxA-723	Horse tooth B131, H17, No. 215	9890 ± 150
OxA-724	Horse tooth B131, I19, No. 94	10 260 ± 160

Comment (Lab.): The considerably younger date of the upper level was established by OxA-460 on reasonably well preserved bone. Bones from the main level did not preserve sufficient collagen for dating, but this was possible on the horse teeth. OxA-461, on a sample very low in collagen, was plainly anomalous, and as a date of that period was unexpected the tooth was reidentified by A. P. Currant from the remaining portion. The repeat date, OxA-722, happened to be from a better preserved section of the tooth, and agrees well with other dates for this level.
Comment (J.-P. F.): Dates industry of final Palaeolithic in the Somme basin, belonging to the tradition of *Federmesser* groups, and characterised by a debitage of long blades including numerous 'bruised' pieces. The dates on horse teeth indicate an age at the end of Dryas III or beginning of Preboreal.

Laugerie Haute Est

Bones from rockshelter of Laugerie-Haute Est, Les Eyzies, France (45°47'N, 1°0'E), excavations of Mme G. Guichard (1976). Collected 1984 from section by J. A. J. Gowlett. The phases of Magdalenian are those attributed to the levels before the dating, and largely confirmed by it. The bones all appear to be of reindeer, and some were found to have cutmarks.

OxA-480	Magdalenian III, top, X10	14 730 ± 250
OxA-492	Magdalenian III, base, X10	14 770 ± 180
OxA-759	Magdalenian III, base, X9	14 320 ± 180

OxA-760	Magdalenian II (?), X9	15 730 ± 200
OxA-761	Magdalenian II (?), X8	14 320 ± 180
OxA-762	Magdalenian II or III, B11, side section	14 100 ± 180

Comment: Dates OxA-480 to 761 are from the main section which runs out from the shelter backwall approximately perpendicular to it. Dates OxA-480, 490 and 759 date the deposition of the Magdalenian III level and show that it was deposited in a fairly short interval. OxA-760 and 761 were *c.* 30 cm and *c.* 50 cm respectively below the base of the known Magdalenian III. OxA-760 is decidedly older, but OxA-761 is indistinguishable from the later group. OxA-762 dates a portion of lateral section under a large fallen stone block, and not directly stratigraphically relatable to the main section.

Combe Saunière

Bones from the rockshelter of Combe Saunière I, Sarliac sur l'Isle, France (45°14'N, 0°52'E), excavated 1978–1983 by J.-M. Geneste (see Geneste in Rigaud 1982).

OxA-410	IIIa, top, F20/G20/H20	15 750 ± 230
OxA-459	IIIb(3), G20d	15 480 ± 210
OxA-481	IIIc, H20a, 'degraded'	14 990 ± 220
OxA-768	Repeat of OxA-481A1	14 260 ± 200
OxA-769	Repeat of OxA-481A2	14 800 ± 240
OxA-770	Repeat of OxA-481A3	14 770 ± 200
OxA-482	IIIc, H20a, 'intrusive'	26 920 ± 800
OxA-486	IIIa–b, H20 Dallage	22 100 ± 440
OxA-487	IIIa–b, I20 Dallage, 'intrusive'	10 140 ± 120
OxA-485	IV(1), I18, owl	16 300 ± 220
OxA-488	IVa(1), H21d	17 700 ± 290
OxA-489	IV(1), I18c	19 450 ± 330
OxA-751	IV(2),H21c	15 190 ± 200
OxA-752	IV(8),H20a	19 490 ± 350
OxA-753	IV(9),H20a	19 630 ± 320
OxA-754	IV(10),H20a	15 200 ± 200
OxA-755	IV(11),H20a	14 890 ± 200
OxA-756	IV(12),H20a	15 120 ± 200
OxA-757	IV(14),H20a	18 860 ± 320
OxA-758	V(3),G18b	21 640 ± 400

Comment: The dates are arranged in descending stratigraphic order. Couche III contains a Magdalenian, not defined as to phase, but most likely to be a middle Magdalenian. Couche IV contains an Upper Solutrean industry. Couche III seems to be considerably disturbed. Stratigraphically, Layers IIIa, b and c occupy a ditch dug in Magdalenian times; it contains coarse aerated sediments. By contrast, Couche IV is homogeneous in all its horizons, stratigraphically undisturbed, with well marked subdivisions, and with archaeological finds very fresh. The dating of individual bones has produced a considerable proportion of problematic results, so that cultural attributions should not be made from individual dates. J. M. Geneste remarks that secondary disturbances of the *in situ* deposits of a taphonomic nature can be geological, animal or human in origin. Couche IIIa–b Dallage is an indurated horizon marking a period of erosion, and hence a stratigraphic hiatus between Couche III and IV. It would seem normal to find here pre- and post-Solutrean finds, as well as Solutrean objects *in situ*. This would account for OxA-486 and 487. In Couche IIIc, OxA-482 (different state of preservation from other bones in this layer) could have been brought up by a burrowing mammal, or by the human inhabitants who dug the pit (Square H20A) in Couche III times. The discordant dates in Layer IV are much more difficult to explain.

In terms of time range rather than stratigraphy the dates group markedly at *c.* 14–15,000 and *c.* 19,000 BP, a fact in accordance with the observations above concerning a hiatus in deposition, and with the broad cultural attributions. There are also some earlier dates, presumably for bones derived from the recorded Perigordian occupations.

Earlier Upper Palaeolithic sites, Dordogne, France

Results from sites within the earlier Upper Palaeolithic dating programme suggested by P.A. Mellars. In the case of La Ferrassie and Le Flageolet further dates are planned.

Abri du Facteur, Tursac

Reindeer bones from Abri du Facteur at Tursac, near Les Eyzies, France (45°48'N, 1°2'E), excavated by H. Delporte (1968), submitted by H. Delporte and P. A. Mellars. All bones are from the single archaeological layer Couche 10/11. The industry is Perigordian Vc 'Noaillian'. This level produced the famous 'Venus de Tursac' (Delporte 1968).

OxA-583	Long bone fragment, 729	24 720 ± 600
OxA-584	Long bone fragment, 970	24 210 ± 500
OxA-585	Long bone fragment, 1073	24 400 ± 600
OxA-586	Antler fragment, 1565	24 690 ± 600
OxA-594	Bone fragment, ?Reindeer metapodial, 489	25 450 ± 650
OxA-595	Long bone fragment, 1567	25 630 ± 650

Comment (Lab.): The dates are a consistent series, and when subjected to a combining test are all effectively the same. The combined mean would be *c.* 24 750 BP. The standard deviation should not be much reduced from that of the individual dates since the dominant estimated error is in assessment of chemistry background.

La Ferrassie, Dordogne

Dates from La Ferrassie (44°56'N, 1°02'E), rockshelter site near Les Eyzies. H. Delporte and A. Tuffreau have conducted excavations since 1968 (Delporte and Tuffreau 1973; Delporte 1984). The site was first excavated 1896–1929, leading to the discovery of several Neanderthal skeletons. Samples submitted by H. Delporte and P. A. Mellars.

OxA-401	La Ferrassie B7	23 800 ± 530
OxA-402	La Ferrassie D2x	27 900 ± 770
OxA-403	La Ferrassie D2h	27 530 ± 720
OxA-404	La Ferrassie E	26 250 ± 620
OxA-405	La Ferrassie G1	29 000 ± 850
OxA-409	La Ferrassie K4	28 600 ± 1050

Comment: A series of dates has recently been published by the Gif Laboratory (Delibrias *et al.* 1986). Some dates were there reported to be too young because of 'recent contamination of bones *in situ*'. A similar effect could be operating on some of the dates above, though not in a uniform way: OxA-402 to 404 are older than Gif dates from the corresponding levels, but OxA-409 is younger than Gif-4277 (31 300 ± 300) for the same level.

Le Flageolet, Bézenac, Dordogne

Bones from various levels of Le Flageolet I rock shelter (44°51'N, 1°5'E), site in a cliff overlooking the Dordogne River immediately upstream from Saint-Cyprien; excavated by J.-Ph. Rigaud (1976a, 1976b, 1982).

OxA-447	Le Flageolet I, V	25 700 ± 700
OxA-448	Le Flageolet I, I/II/III	24 600 ± 700
OxA-579	Le Flageolet I, VI, Perig. Noailles	26 500 ± 900
OxA-596	Le Flageolet I, IV, Perig. Noailles	23 250 ± 500
OxA-597	Le Flageolet I, VIII-1, Aurig. cf. II	24 800 ± 600
OxA-598	Le Flageolet I, XI	33 800 ± 1800

Comment: The dates can be compared with those produced by the Lyon laboratory (Evin *et al.* 1985). The general agreement is good, but both laboratories have some dates which appear too young (e.g. OxA-597). Laboratory contamination of ammonia was suspected at Lyon (Evin *et al.* p.445), but the 'agreement' between OxA-597 and Ly-1608 could imply a contamination or other problem encountered by both laboratories.

Upper Palaeolithic of Poland

Kraków-Spadzista Street

Mammoth bone from an Upper Palaeolithic dwelling at Krakow-Spadzista Street, Kraków, Poland (50°4′N, 19°57′E) submitted by J. K. Kozlowski of Instytut Archeologii, Kraków (see Kozlowski and Kubiak 1972).

OxA-635	Mammoth bone, Site C2–4	20 200 ± 350

Comment: Mammoth ivory from cultural level in top of solifluxion loam, underlying 3.5 m of younger loess III. The date is compatible with others from nearby Site B, in lowest part of the solifluction loam, e.g. GrN-6636 (23 040 ± 170) on charred bone, and Ly-631 (20 600 ± 1050) on bone OxA-635 is also consistent with Ly-2542 (21 000 ± 900) on bone from the same layer 6 at Site C2 (Evin *et al.* 1985).

Upper Pleistocene of Mallorca

Son Muleta Cave

Samples of *Myotragus* bone from the cave of Son Muleta, Mallorca (30°47′N, 2°41′E), excavated by W. Waldren (1982, 1984), and submitted by A. Rae for comparative work in uranium series dating of bone.

OxA-493	Son Muleta Cave X 150	36 000 ± 2500
OxA-494	Son Muleta Cave Z 300	10 500 ± 500
OxA-495	Son Muleta Cave Z 400	14 150 ± 200
OxA-496	Son Muleta Cave Z 600	12 890 ± 180
OxA-497	Son Muleta Cave O 175	12 020 ± 160
OxA-498	Son Muleta Cave E 300	9000 ± 3000
OxA-499	Son Muleta Cave EF 200–300	12 100 ± 180

Comment: The results are consistent with the time range of dates reported in Waldren (1982). In some cases, however, individual bones have dates 'old' or 'young' in relation to their stratigraphic position.

Late Palaeolithic of NW Greece

Klithi Rockshelter

Samples from Klithi Rockshelter, on right bank of Voidomatis Gorge, Pindus Mountains, Epirus (39°58′N, 20°41′E). Collected 1984 by J. A. J. Gowlett; submitted by G. N. Bailey, Department of Archaeology, University of Cambridge. Preliminary reports publ. by Bailey *et al.* (1983, 1985, 1986).

The top levels of the rock shelter could be dated only from charred materials, since collagen is entirely lacking in the bone (*cf. Arch.List* 2).

OxA-747	Charred bone S21d, Spit 15–16, Layer 14	3560 ± 1000
OxA-748	Charcoal P26b, 11–12,14	101.8 ± 1.0%
OxA-749	Charred bone Q24, Spit 15, Layer 16	14 200 ± 200
OxA-750	Charred bone P24, Spit 15–16, Layer 16	14 060 ± 200

Comment: These additional dates from Klithi rockshelter give extra information about the periods of human occupation (see Bailey *et al.* 1986). OxA-748 contains bomb carbon, and must relate to recent activity by shepherds, but OxA-747 gives the first indication of later prehistoric activity. OxA-749 and 750 demonstrate human occupation approximately two thousand years earlier than previously shown (*Arch.List* 3).

HUMAN REMAINS FOM EUROPE: PALAEOLITHIC AND LATER

England and Wales

Human remains of possible Palaeolithic or Mesolithic age submitted by C. B. Stringer (BMNH): see Stringer (1986).

Badger Hole

Specimens from Badger Hole, Wookey Hole, Somerset (51°13′N, 2°40′W, NGR ST532479); see Oakley *et al.* (1971).

OxA-679	Badger Hole I, juvenile mandible	9060 ± 130
OxA-680	Badger Hole III, cranial fragments	1380 ± 70

Paviland Cave

Specimen from Paviland Cave, Rhossili, S. Wales (51°33′N, 4°15′W, NGR SS437859), excavated by Buckland (1823), Sollas (1913). The specimen dated is the humerus of Paviland 2 from Sollas' excavations, not the well known 'Red Lady' skeleton (Paviland 1). Other accelerator dates for Paviland appeared in *Arch.List* 3, pp. 118–119.

OxA-681	Paviland 2, left humerus	7190 ± 80

General Comment: see Stringer (1986) for discussion of OxA-679–681.

Orton Meadows, Peterborough

Human frontal bone from Orton Meadows Gravel Pit near Peterborough, Cambridgeshire (52°35′N, 0°15′W, NGR TL163968); found 1984, identified by C. B. Stringer, submitted by A. Challands and R. Burleigh on behalf of Nene Valley Research Committee.

The skull was found in mechanical sieving operations following gravel extraction by a face-shovel. Thus the stratigraphic position of the skull could have been at any point within a depth of 0 to 3.9 m below ground surface, and may have included alluvial silts representing an extinct course of the R. Nene, near to which are known Bronze Age sites (Challands 1982). The atavistic appearance of the fragment, with its pronounced brow ridges, together with other faunal remains from the gravels, suggested that the skull might be ancient, possibly Palaeolithic.

OxA-504	Orton Gravel Complex 5	3390 ± 100

Comment: 'The primitive aspect of the frontal is not of itself a reliable guide to its age' (R. B.). This observation was borne out by the date, which is Bronze Age.

Robin Hood's Cave

Human mandible from Robin Hood's Cave, Creswell Crags, Derbyshire (53°15′50″N, 1°11′40″W; NGR SK534742), submitted by R. D. S. Jenkinson of Creswell Crags Visitor Centre. (See *Arch.List* 3, p.119, for other dates from this site.)

OxA-736	Human mandible RH23 P2218	2020 ± 80

Comment: Findspot was approximately 1 metre below prominent breccia horizon of known late Devensian age. The date is however of late Iron Age/early Roman period. In several cases direct dating has shown putatively Palaeolithic human remains to be intrusive from later periods.

ORIGINS OF AGRICULTURE

Hayonim

Samples from Hayonim Cave, western Galilee, Israel (29°55′N, 35°13′E), excavated 1965–1979 by O. Bar-Yosef (Bar-Yosef and Goren 1973; Sillen 1984), identified by M. Hopf.

OxA-742	*Lupinus* seed H77 4(9.7)	12 360 ± 160
OxA-743	*Lupinus* seed H76 4(5)	12 010 ± 180

Comment: Samples from Loc.4, a dwelling, regarded as Early Natufian from artefacts on typological grounds. The dates were intended to confirm whether the Natufians collected pulses; the positive results are among the few dates for early Natufian sites.

Netiv Hagdud

Samples from Netiv Hagdud, a 'Sultanian' mound in the lower Jordan Valley, Israel (31°59′N, 35°26′E), excavated 1983 by O. Bar-Yosef (Bar-Yosef *et al.* 1980) and identified by M. Kislev. The Sultanian is a heavy duty tool oriented facies of Pre-Pottery Neolithic A (Crowfoot-Payne 1976). Location of sample in grid system is II98R10, level 5.55. This is a rubbish zone, 2.60 m below surface, overlain by at least four building phases.

OxA-744 *Hordeum spontaneum/distichon* grains 9700 ± 150

Comment (O. B. Y.): One of the earliest securely stratified occurrences of domesticated two-rowed barley in the Near East.

Wadi Hammeh

Samples from Wadi Hammeh 27, in the foothills of the Ajlun Highlands, overlooking the Jordan Valley, *c.* 2 km north-east of the ancient site of Pella (modern village of Tabaqat Fahl) (35°38′N, 32°27′E). Collected by P. C. Edwards and S. Colledge, identified by S. Colledge and G. C. Hillman.

OxA-393	Charred seeds XX/D + /3/4 (unit b)	11 920 ± 150
OxA-394	Charred seeds XX/D/4/1	12 200 ± 160
OxA-507	Charred seeds XX/D + /5/1	11 950 ± 160

Comment (S. C.): OxA-393 was based on several species of small round seeds (*c.* 290 in total collection), including small legumes (e.g. *Trifolium/Ononis spp.*) small cruciferae and ranunculaceae types; OxA-507 on similar collection (*c.* 160 seeds in total). OxA-394 was based on charred masses of seeds (*?Chenopodium sp.*);

The three samples were taken from deposits inside one of the Natufian 'houses' (in plot D/D + , excavated by P. C. Edwards). Sample XX/D/4/1 was taken from a layer directly overlying a floor level; XX/D + /5/1 closely correlates with it. Sample XX/D/3/4 (unit b) was slightly higher in the stratigraphic sequence. All of these layers represented occupation debris and the sediments contained many worked Natufian flint and stone tools.

OxA-393 and 507 were dated from the humic component, OxA-394 from carbonaceous residue; the three dates are effectively the same, and demonstrate early Natufian occupation at *c.* 12 000 BP (for further details see Edwards 1984,; Edwards in press; Edwards and Colledge in press).

Jebel Naja

Sample from Jebel Naja 2321 aceramic Neolithic site, Black Desert, eastern Jordan (31°50′N, 37°25′E), excavated 1983 by A. Betts (1983, 1984, 1985). The site lies on a steep slope overlooking Wadi Quattafi where it emerges out of the basalt from its steep cut wadi onto the open gravel plains (Betts 1985, p.36). The site is centred around a cluster of corrals and cleared terraces. Trench 400 revealed the fill of a small hut; trench along outside of hut wall contained three firepits, ashy deposits, fire-cracked flint, and traces of a bead-making workshop. 2321 is a single period site. Sample came from level 408, a pit filled with black ash and diagnostic artefacts, sealed by 403 and cut into 407, both of which contain the same diagnostic material. The sample was *c.* 20 cm below surface.

OxA-375 Charcoal from level 408, pit. 7430 ± 100

Comment: 2321 belongs to a group of sites which contain flint tools that cannot be equated with any known Near Eastern sequence. Almost 100 of these sites are now known and only one previously excavated, in the 1930s. It was thought that the date could potentially lie anywhere between 12 000 and 3000 BC.

Wadi el Jilat, Jordan

Samples from a survey and excavation project conducted by the British Institute in Amman in the Azraq area of Jordan (31°30′N, 36°23′E), directed by A. N. Garrard; see Garrard *et al.* (1985, 1986).

OxA-519 Site 9, Square 1, Deposit 2A, burnt bone 21 150 ± 400

Comment: Burnt bone collected from an Upper Palaeolithic occupation contained in a weathered palaeosol. Since no soil is forming in this area under present arid conditions, the date provides a useful indication of a period of more humid climatic conditions with continuous probably steppic vegetation cover.

OxA-520 Site 10, Square 7, Deposit 11B, charcoal 14 790 ± 200

Comment: This one phase Epipalaeolithic occupation is likely to represent a short term encampment, as many of the artefacts were conjoinable and the tool kit was very restricted. It had a low microlithic component and bore little resemblance to that from any other Epipalaeolithic site in the region. The occupation was contained in aeolian silts indicating drier conditions at the time of formation.

OxA-521	Site 8, Square 3, Deposit 4C, charcoal	13 310 ± 120
OxA-636	Site 8, Square 3, Deposit 4D, burnt bone	10 540 ± 160

Comment: This site was heavily deflated and was contained (like site 10 and the upper phase of site 6) in an aeolian silt accumulation. The industry contains elements of those found in all three phases at Jilat 6, and it is possible that there is some mixing as a result of earlier periods of deflation and/or rodent burrowing.

OxA-522	Site 6, Square 4, Deposit 12A, charcoal	11 740 ± 80
OxA-523	Site 6, Square 2, Deposit 12A, burnt bone	11 450 ± 200
OxA-524	Site 6, Square 4, Deposit 8A, charcoal	15 520 ± 200
OxA-525	Site 6, Square 1, Deposit 5A, charcoal	16 010 ± 200
OxA-539	Site 6, Square 1, Deposit 14A, charcoal	7980 ± 150

Comment: Dates obtained from a 2 x 2 m sounding which was cut through the highest part of an 18 000 sq m Epipalaeolithic 'tell'. The trench was cut to a depth of 1.5 m, but only the top 1.0 m yielded occupation deposits, which could be divided into three phases separated by semi-sterile deposits. OxA-524, 525 are from the top phase, of very dense occupation contained in aeolian deposits indicating dry conditions; three obvious floor levels, the upper one consisting of crushed lime and the lower two of compacted red pigmented surfaces. There were many rodent burrows, but every effort was made to isolate the contents of these. The lithic assemblage was very distinctive comprising a geometric backed bladelet assemblage dominated by triangles along with some lunates and micrograveltes. The only close parallel was found at Ein Gev IV in Palestine, and is thought to date to between 11–13 000 BP.

20–30 cm of semi-sterile sediments separate the underlying middle phase, which is a short term occupation in a soil profile, indicating more humid conditions. The industry was again very distinctive, characterised by large non-geometric microliths of which La Mouillah points are the most prominent. This sort of material has been radiocarbon dated in Sinai to 12 500–14 000 BP. OxA-522, 523 are from this phase.

The lowest phase is a short term occupation in soil profile indicating more humid conditions, separated from overlying horizon by 8–12 cm of semi-sterile sediments. The industry was again quite different – this time being dominated by thin, finely made, curved pointed, arched-backed bladelets. There is a very close parallel in Kebara level C, which is thought to date (on relative grounds) no later than 14 500 BP. The only datable sample was a very small piece of charcoal retrieved by flotation (OxA-539).

Comment (Lab.): A. Garrard believes that the late date (OxA-539) may be the result of contamination in the earth-flushing process. The inversion in the other dates is unexplained, and further dates are needed to investigate the issue.

OxA-526	Site 7, Square 6, Deposit 28A, charcoal	8810 ± 110
OxA-527	Site 7, Square 8, Deposit 25A, charcoal	8520 ± 110

Comment: This site produced an industry reminiscent of the early to mid Pre-Pottery Neolithic B of the Levant, and the two dates are well within the expected range. Three clusters of stone structures were visible at the site surface and a portion of a stone circle was excavated which was built from stone slabs placed on end, with internal subdivisions.

The site was most interesting for evidence of subsistence, preserving plant remains including wild einkorn, emmer, barley, various small-seeded grasses, legumes, chenopods, liliaceae, etc.; but also a number of grains of cultivated hulled barley and cultivated einkorn. Further excavation may determine whether the cultivars were processed locally or perhaps imported. By contrast, the faunal remains were more or less identical to those on the earlier Jilat sites (mainly gazelle, but with ass, hare, fox. wolf and tortoise). There was absolutely no trace of closely-husbanded livestock, in particular ovi-caprids, such as were found at most of the contemporary sites in western Jordan and Palestine where cultivated plants are attested.

BRITISH NEOLITHIC

Peak Camp

Additional date from Peak Camp, Gloucestershire (NGR SO92431502), excavated by T. C. Darvill, collected 1981 by J. A. J. Gowlett. See Darvill (1986) for discussion of dates.

OxA-638 Bone, I 24 4290 ± 80

Comment: This is a further date from the enclosure ditch, younger than those previously obtained (*Arch.List* 2, p.242).

West Kennet Long Barrow

The fourth in a series of dates on skeletons buried in West Kennet Long Barrow, near Avebury, Wiltshire (NGR SU104677), excavated by R. J. Atkinson and S. Piggott (Piggott 1962). Previous dates in *Arch.List* 2; see Gowlett *et al.* 1986b for account of dates and discussion by Profs. Piggott and Atkinson.

OxA-563 Skeleton I, NW Chamber (Eu.1.5.142) 4780 ± 90

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