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Ancient Monuments Laboratory
Report 59/1999

DENDROCHRONOLOGICAL ANALYSIS OF TIMBERS FROM APETHORN FOLD FARMHOUSE, HYDE, TAMESIDE

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Summary

Apethorn Fold is the surviving remains of what was once an especially fine cruck-framed farmhouse and shippon. There are four surviving trusses as well as some original purlins and ridge-pieces. It is a grade II* listed building and on the Buildings at Risk register (English Heritage 1999). This report covers the dendrochronological analysis of a series of samples taken from the crucks, and some other surviving timbers. This analysis was undertaken to clarify the dating of the surviving timbers so as to inform listed building consent and repair decisions. The results indicate that the structure was probably constructed within the period AD 1522-42.

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DENDROCHRONOLOGICAL ANALYSIS OF TIMBERS FROM APETHORN FOLD FARMHOUSE, HYDE, GREATER MANCHESTER

Introduction

This document is a technical archive report on the tree-ring analysis of oak timbers from Apethorn Fold Farmhouse, Hyde (NGR SJ 9432 9359). The area is currently in the unitary authority of Tameside, formerly part of Greater Manchester. It is beyond the dendrochronological brief to describe the building in detail or to undertake the production of detailed drawings. As part of a multifaceted and multidisciplinary study of the building, elements of this report may be combined with detailed descriptions, drawings, and other technical reports at some point in the future to form either a comprehensive publication or an archive deposition on the building. The conclusions may therefore have to be modified in the light of subsequent work.

Apethorn Fold is located to the south of the Manchester suburb of Hyde (Fig 1). The building is grade II* listed and on the Buildings at Risk register (English Heritage 1999). The building is in need of substantial remedial works and has been the victim of extensive vandalism. The surviving structure consists of four cruck trusses, forming a north-south aligned range. This range is thought to have originally been a byre, hall and service end (Fig 2). Later the northern service end was replaced by a small cross-wing (Burke and Nevell 1996; Nevell and Hradil 1998; Pacey 1971).

A dendrochronological dating programme of the timbers was requested by Jane Harding from English Heritage to inform a solution to this difficult case and any future repairs and alterations to this important building. Preliminary tree-ring analysis undertaken by the University of Manchester (Nevell and Hradil 1998) suggested that the building may contain timber elements dating from the early-thirteenth century and the seventeenth century.

Methodology

The general methodology and working practises used at the Sheffield Dendrochronology Laboratory are described in English Heritage (1998). The methodology used for this building was as follows.

A brief survey identified those oak timbers with the most suitable ring sequences for analysis. Those with more than 50 annual rings and some survival of the original sapwood and bark-edge were sought. The dendrochronological sampling programme attempted to obtain cores from as broad a range of timbers, in terms of structural element types, scantling sizes, and carpentry features.

The most promising timbers were sampled using a 15mm diameter corer attached to an electric drill. The cores were taken as closely as possible along the radius of the timbers so that the maximum number of rings could be obtained for subsequent analysis. The core holes were left open. The ring sequences in the cores were revealed by sanding.

The complete sequences of growth rings in the samples that were selected for dating purposes were measured to an accuracy of 0.01mm using a micro-computer based travelling stage (Tyers 1997a). The ring sequences were plotted onto semi-log graph paper to enable visual comparisons to be made between sequences. In addition cross-correlation algorithms (Baillie and Pilcher 1973) were employed to search for positions where the ring sequences were highly correlated. These positions were checked visually using the graphs and, where these were satisfactory, new mean sequences were constructed from the synchronised sequences. The *t*-values reported below are derived from the original CROS algorithm (Baillie and Pilcher 1973). A *t*-value of 3.5 or over is usually indicative of a good match, although this is with the proviso that high *t*-values at the same relative or absolute position must be obtained from a range of independent sequences, and that these positions are supported by satisfactory visual matching.

All the measured sequences from this assemblage were compared with each other and any found to cross-match were combined to form a site master curve. These, and any remaining unmatched ring sequences were tested against a range of reference chronologies, using the same matching criteria: high *t*-values, replicated values against a range of chronologies at the same position, and satisfactory visual matching. Where such positions are found these provide calendar dates for the ring-sequence.

The tree-ring dates produced by this process initially only date the rings present in the timber. The interpretation of these dates relies upon the nature of the final rings in the sequence. If the sample ends in the heartwood of the original tree, a *terminus post quem (tpq)* for the felling of the tree is indicated by the date of the last ring plus the addition of the minimum expected number of sapwood rings which are missing. This *tpq* may be many decades prior to the real felling date. Where some of the outer sapwood or the heartwood/sapwood boundary survives on the sample, a felling date range can be calculated using the maximum and minimum number of sapwood rings likely to have been present. The sapwood estimates applied throughout this report are a minimum of 10 and maximum of 46 annual rings, where these figures indicate the 95% confidence limits of the range. These figures are applicable to oaks from England and Wales. Alternatively, if bark-edge survives, then a felling date can be directly utilised from the date of the last surviving ring. The dates obtained by the technique do not by themselves necessarily indicate the date of the structure from which they are derived. It is necessary to incorporate other specialist evidence concerning the re-use of timbers and the repairs of structures before the dendrochronological dates given here can be reliably interpreted as reflecting the construction date of phases within the structure.

A further important element of the tree-ring analysis of buildings and archaeological assemblages is the identification of 'same tree' groups within the sampled material. Inspection of timbers, both in buildings and archaeological sites, often suggests that the patterns of knots or branching in timbers are so similar that they appear to be derived from a single tree. Tree-ring analysis is often used to support these suggestions. The identification of 'same tree' groups is based on a combination of high levels of matching between samples, extremely similar longer term growth trends, and individual anatomical anomalies within the timbers. High *t*-values are not by themselves necessarily indicative of two series being derived from a single tree. Conversely low t-values do not necessarily exclude the possibility. It is the balance of a range of information that provides the evidence.

Results

The timbers in this building are in a poor condition. The southern end of the building has no roof, and the timbers are thus exposed to the weather. This end of the building has also been extensively burnt at some stage since Pacey's (1971) article, resulting in the loss of the carved decoration on the cruck, complete loss of some of the original timbers, and also the loss of the outermost sapwood rings. The northern end still has some surviving roof, but this is not complete resulting in significant problems of damp in these timbers as well, and also safety concerns relating to the potential for falling roof slates. The cross-wing was deemed unsafe to enter (Nevell pers comm) and so was not sampled.

Examination of the knot and branch patterns on the cruck trusses showed clearly that each blade in each truss was derived from a halved tree and that the other half of the tree had been used for the other blade in the same truss. The extreme growth patterns, potential loss of outermost rings, and the deep cracking within the timbers meant that the sampling was likely to have a high failure rate. As a result it was decided to sample each cruck blade, and two other timbers which were safely accessible and appeared to contain sufficient rings for analysis. A total of 10 timbers were selected as most suitable for sampling (Table 1; Fig 2). The samples were numbered **1-10** inclusive. The cruck numbering sequence followed was that of Pacey (1971). During sampling two holes were identified in cruck blades C and E which correspond with the reported sampling locations of the previous study (Nevell and Hradil 1998, 42).

Two of the 10 samples when examined in the laboratory were rejected since the cores had too few rings for reliable analysis. The eight remaining samples were measured and then compared with each other, initially in truss pairs. For each truss a new average sequence was constructed using the fragmentary parts of the samples contained from each blade. These cruck means were then compared with each other and three were found that matched together to form an internally consistent group (Table 2). A 134-year site mean chronology was calculated, named APETHORN (Fig 3). The site mean was then compared with dated reference chronologies from throughout British Isles and northern Europe. Table 3 shows the correlation of the mean sequences at the dating position identified for the sequence, AD 1379 – AD 1512 inclusive. Table 4 lists the site mean chronology.

The remaining truss mean (Cruck E-E') did not match either the rest of the material from Apethorn nor dated reference chronologies. This timber has the same patina, a similar average growth rate, and is not noticeably different from the three dated trusses. It seems likely this timber is also from the dated phase, though this cannot be proven dendrochronologically.

Interpretation

The 134-year chronology APETHORN is dated AD 1379 – AD 1512 inclusive. It was created from six samples, derived from three trees. None of the dated samples were complete to bark-edge, but four dated samples are complete to the heartwood/sapwood boundary (Table 1; Fig 5). Inspection of the bar diagram (Fig 5) suggests that each cruck pair is contemporary, ie they are all part of a single phase of felling. Combining the interpretation of these samples suggests they were felled between AD 1522 and AD 1542. As timber is usually used green (Charles and Charles 1995) the construction date of the structure is likely to be in this period.

Discussion

The combination of the poor survival of the outer surfaces of the timbers, the deep cracking of the timbers, and the original selection of trees with series of narrow growth bands has resulted in a project with an unusual degree of technical difficulty. The fragmentary cores has lead to some data here being apparently anomalous at first sight (see the markedly different average growth rates of samples **1** and **6** which are both are from cruck B-B' and were identified as two halves of the same tree, Table 1). Here the measured part of sample **1** consists only of the inner fast growing section, whilst its pair (sample **6**) includes the slower outer section as well. It is also evident that there is some variation in the heartwood/sapwood boundaries identified for different sections of the same tree pairs, again using the samples from cruck B-B' as an example one core appears to be complete to the heartwood/sapwood boundary at AD 1472 whilst the other core has its boundary at AD 1496, such variation may seem excessive but some variability is common in both modern and medieval trees (Baillie 1982, 49; Hughes *et al* 1981, 353-4) whilst some archaeological sections show variation of more than 30 years in the heartwood/sapwood boundary around the circumference (author unpubl). In addition the narrow banding makes the accurate assessment of the numbers of unmeasured rings difficult (see eg Baillie 1982, 50 and 62) and the poor condition of the timbers themselves makes the identification of the heartwood/sapwood boundary not entirely secure. For the interpretations given here sapwood estimates have been applied to each pair using the evidence for each blade, and then combined to provide an estimate for each cruck. The repeating series of narrow bands in the timbers may be the result of a woodland management regime, such as pollarding, or due to periodic outbreaks of defoliating insects.

Taking into account these technical issues it is still apparent that the dendrochronological results outlined above clearly indicate the three southern surviving trusses B-B', C-C', and D-D' were erected in the second quarter of the sixteenth century, probably in the period just before the dissolution of the monasteries.

This more extensive programme of work has demonstrated that the previous study (Nevell and Hradil 1998) has produced incorrect dendrochronological dating evidence. The ring sequence from cruck blade C spans AD 1379-1495. There is no evidence that this timber dates to AD1212+20-30 years (*contra* Nevell and Hradil 1998, 22). This analysis has also found no evidence to support the date of AD1630+? for cruck blade E. The validity of the dates proposed by the Manchester group must therefore be questioned.

Unfortunately it is not possible to analyse the data collected by the Manchester group using the methodology presented here, nor is it possible to run the data collected for this study using their methods. This is because their report (Burke and Nevell 1996) provide the information outlined necessary to re-examine their data (English Heritage 1998, 26). Even if the dates of timbers sampled by the Manchester group had been correct, the interpretation of these dates to provide dating evidence would be problematic because this relies on only a single timber from each 'phase'. More extensive sampling provides a more robust estimate for the date of construction (English Heritage 1998, 21), and this approach is particularly appropriate in this case because of the technical problems of identifying the heartwood/sapwood boundaries, the tendency of the material to crack whilst coring, and the presence of repeating series of very narrow growth bands.

Conclusion

The dendrochronological analysis of timbers from Apethorn indicates the timbers were felled in the early- or mid-sixteenth century. This can be interpreted as the construction date of the building.

If, or when, any remedial works take place it is assumed these may allow safer, and easier, access to the roof and cross-wing. At that stage additional sampling should perhaps be considered.

Acknowledgements

The sampling and analysis programme was funded by English Heritage. Dr Mike Nevell kindly facilitated access to the property and helped carry the generator over the wall. Arnold Pacey kindly provided copies of his survey drawings. Cathy Groves (Sheffield University, Dendrochronology Laboratory) and Alex Bayliss (English Heritage, Ancient Monuments Laboratory) provided useful discussion of the results.

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Table 1

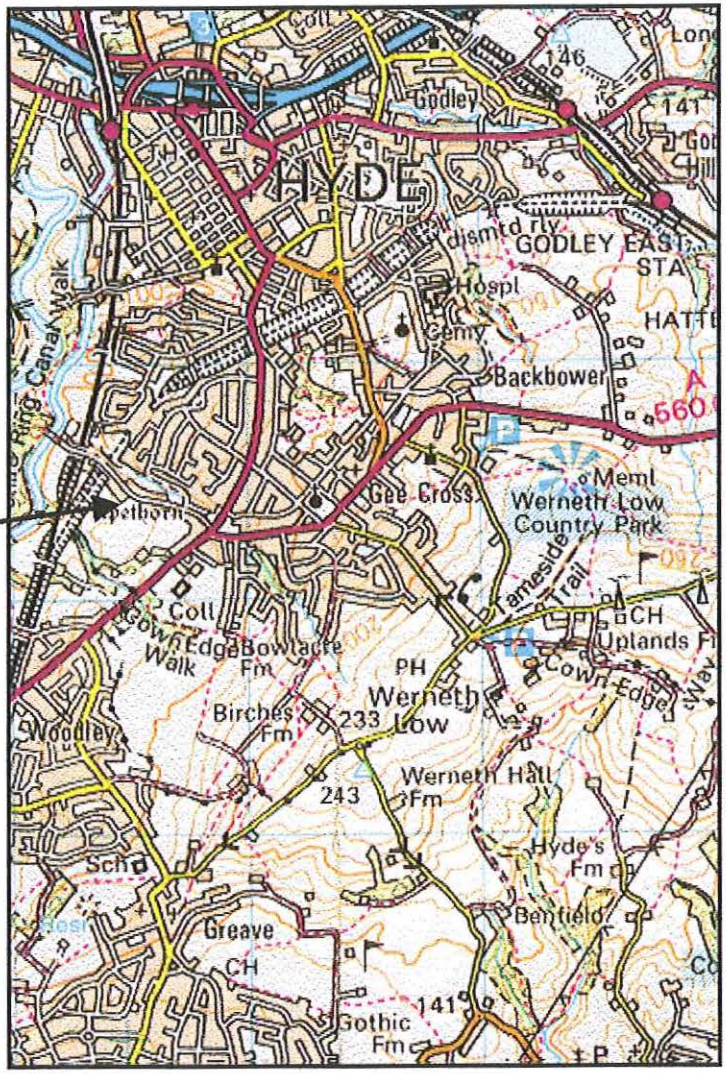
List of samples

Core No	Origin of core	Cross-section size (mm)	Cross-section of tree	Total rings	Sapwood rings	ARW mm/year	Date of sequence	Felling period
1	Cruck blade B	500 x 260	Half	40+*53*	?h/s	5.34	AD 1380-1419	After AD 1482
2	Cruck blade C	560 x 280	Half	117+*5*	?h/s	2.67	AD 1379-1495	AD 1510-46?
3	Horizontal lapped over blade C	245 x 95	Whole				Not measured	
4	West purlin from blade C' to D'	210 x 140	Quarter				Not measured	
5	Cruck blade C'	550 x 250	Half	89	-	2.69	AD 1399-1487	After AD 1497
6	Cruck blade B'	500 x 240	Half	79+*20*	h/s	1.90	AD 1398-1476	AD 1506-42
7	Cruck blade D'	540 x 250	Half	92	h/s	3.14	AD 1420-1511	AD 1521-57
8	Cruck blade D	540 x 280	Half	104	h/s	3.50	AD 1409-1512	AD 1522-58
9	Cruck blade E	450 x 190	Half	70+*19*	h/s	2.19	Undated	
10	Cruck blade E'	440 x 200	Half	38	?h/s	2.31	Undated	

Total rings = all measured rings, *+(value)* = additional heartwood rings that were only countable, the felling period column is calculated using these additional rings.
Sapwood rings: h/s heartwood/sapwood boundary, h/s? possible heartwood/sapwood boundary.
ARW = average ring width of the measured rings

Figure 1 Location of Apethorn Fold Farmhouse

Apethorn Fold Farmhouse



ANCIENT MONUMENTS LABORATORY - NEW SITE FORM

Site number allocated: 2805

Site name: APETHORN FOLD FARMHOUSE

(In the case of sites where a similar name already exists on Labfile please give a subdivision based on the particular area or the name of the excavator - eg Ipswich (Elm Street) or Chelmsford (Drury))

County: GREATER MANCHESTER (TAMESIDE UNITARY AUTHORITY) NGR: SJ 9432 9359

Other names by which this site is known: /
(eg HWCM 20813)

Project name (if applicable)*: /
(eg Fenland Management Project)

Project code (if applicable)*: /
(eg FMP C/COT 5)

Name of excavator or contact: J.W. & C. BAGSHAW,
Address: BOWLACRE FARM,
BOWLACRE ROAD,
GEE CROSS, HYDE, CHESHIRE,
SK14 5ES

Dates of work Begin: 1999 End: 1999 **

Destination of archive (if known): GREATER MANCHESTER SMR.

Archaeological periods* **: MED

Funding organisation(s)* **: NW REGION

* - Please see Labfile for list of applicable values.

** - These fields may have as many entries as appropriate. Please continue overleaf if necessary.

Signed: Alex Bayliss Date: 9-12-99

Figure 2 Sketch plan of the building showing the truss numbering scheme used, based on an unpublished drawing by Smith and Pacey

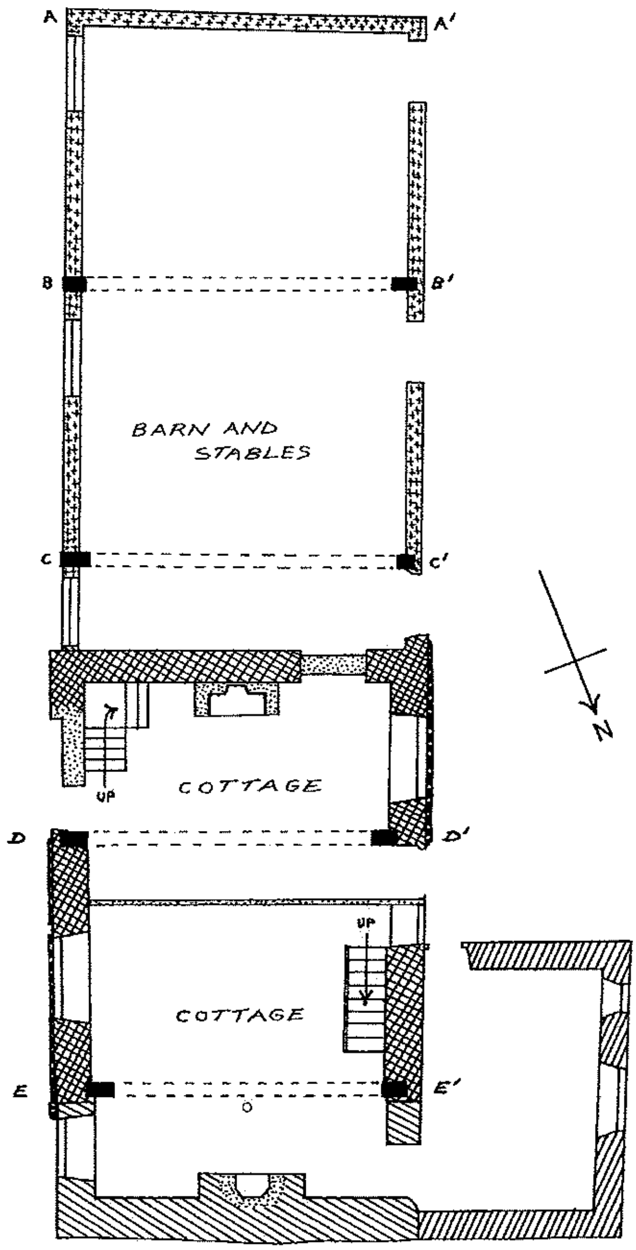


Figure 3 Cruck B-B' showing the approximate location of the samples, based on an unpublished drawing by Smith and Pacey

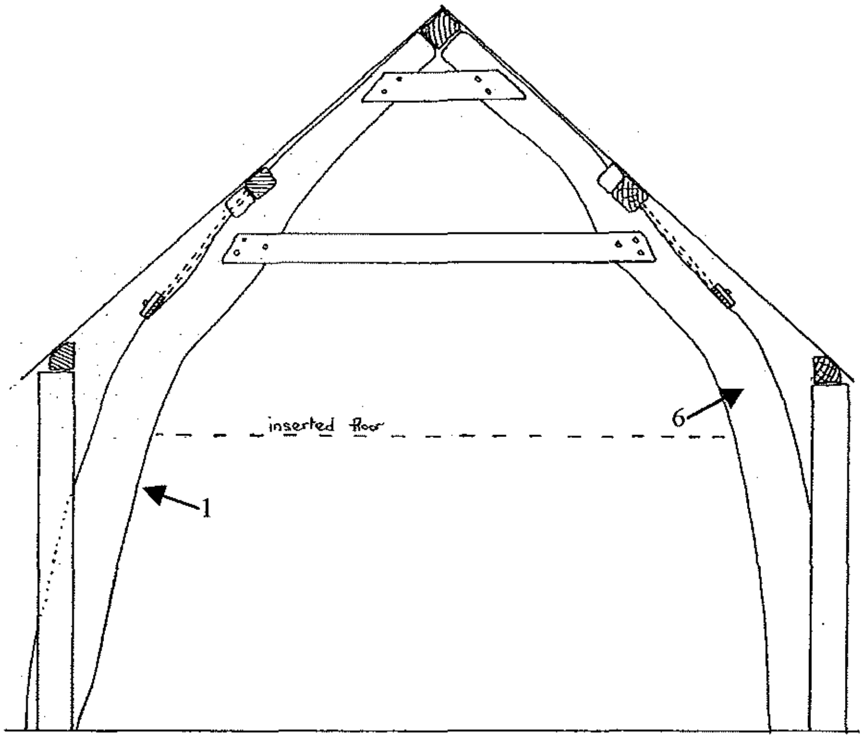


Figure 4 Cruck C-C' showing the approximate location of the samples, based on an unpublished drawing by Smith and Pacey

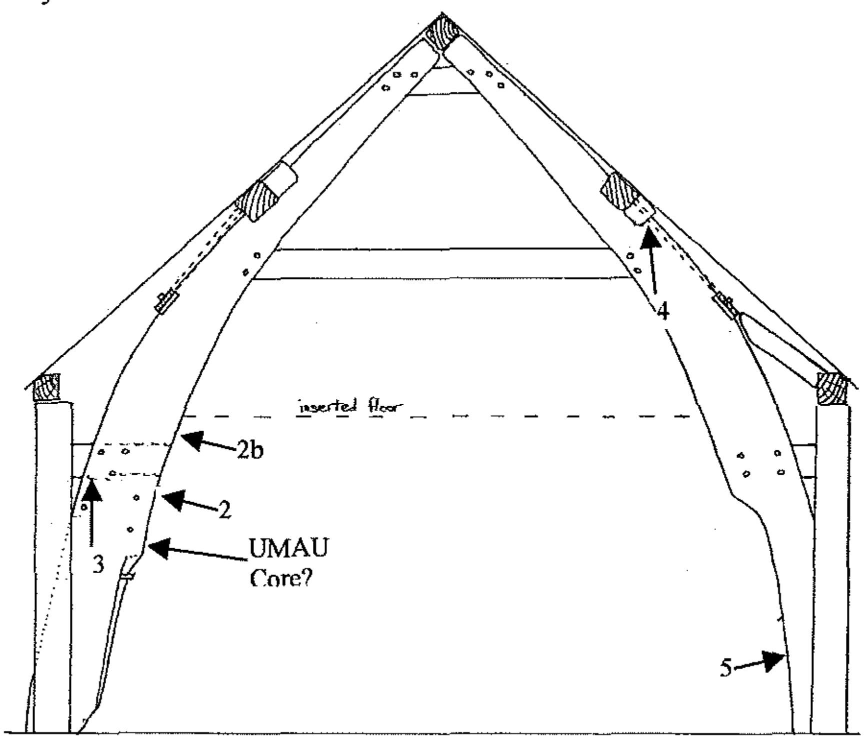


Figure 5 Cruck D-D' showing the approximate location of the samples, based on an unpublished drawing by Smith and Pacey

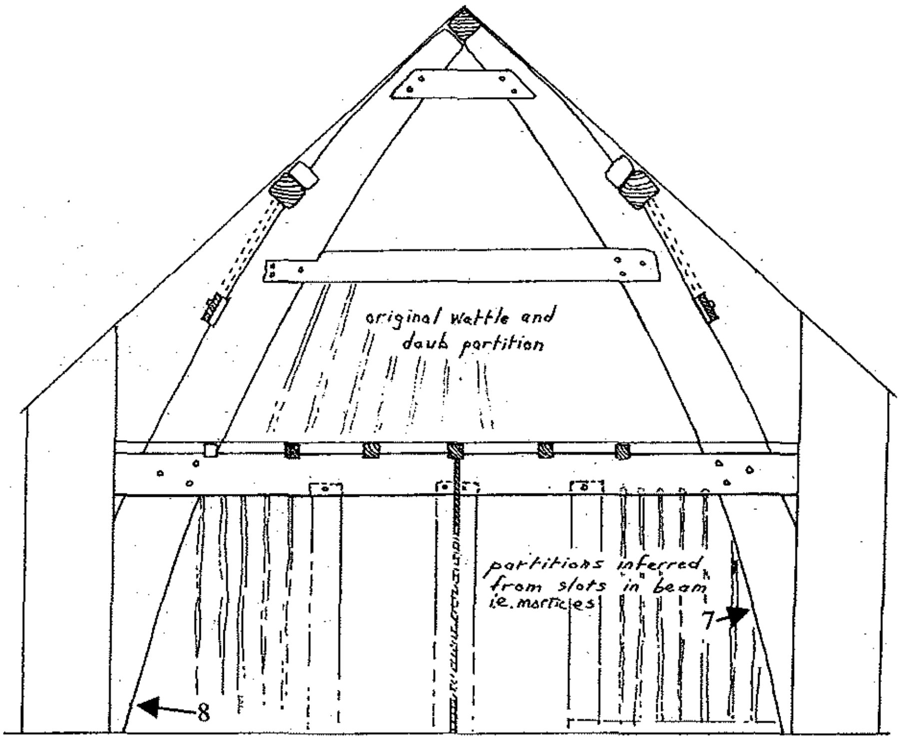


Figure 6 Cruck E-E' showing the approximate location of the samples, based on an unpublished drawing by Smith and Pacey

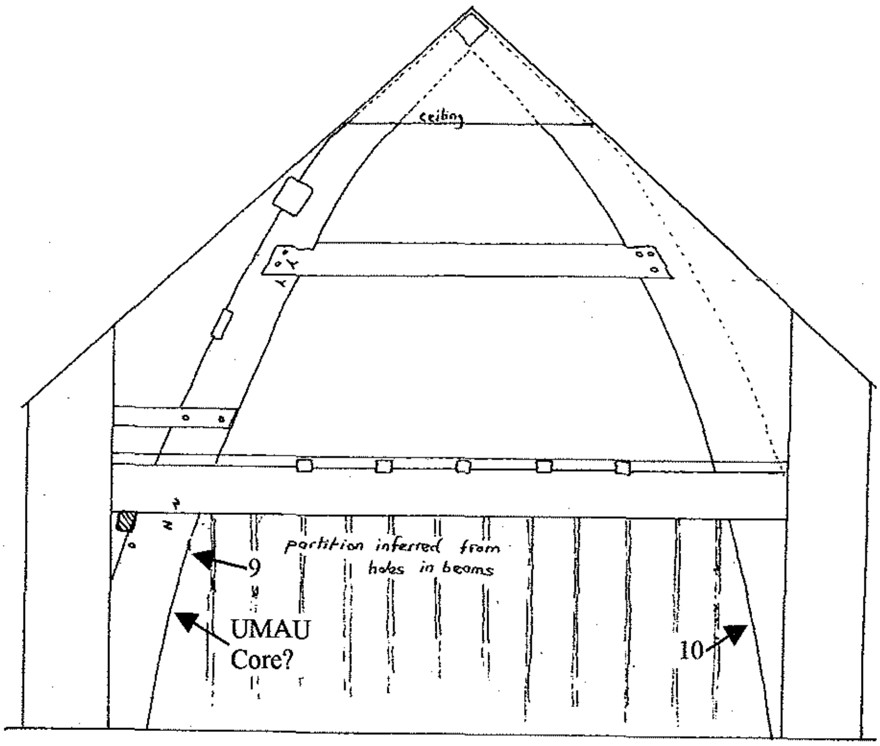
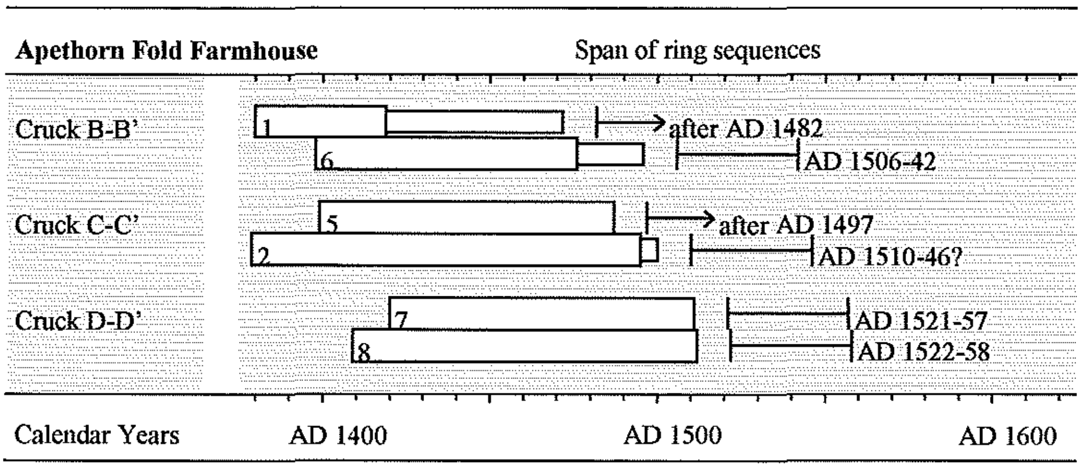


Figure 7 Bar diagram showing the chronological positions of the dated timbers. The felling period for each sequence is also shown



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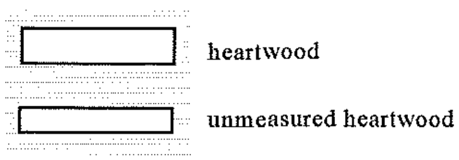

Table 2

t-value matrix for the timbers forming the chronology APETHORN. KEY: - = t-values under 3.0

	Cruck C/C'	Cruck D/D'
Cruck B/B'	5.06	4.72
Cruck C/C'		-

Table 3

Dating the mean sequence APETHORN, AD 1379-1512 inclusive. t-values with independent reference chronologies

Area	Reference chronology	t-values
East Midlands	East Midlands (Laxton and Litton 1988)	6.40
Greater Manchester	Stayley Hall (Nayling forthcoming)	8.58
Herefordshire	King's Pyon barn (Groves and Hillam 1993)	5.50
Ireland	Belfast Regional Master (Baillie 1977)	6.56
Lancashire	Hurstwood Great Barn (Nayling 1998)	6.84
Shropshire	Ightfield (Groves 1997)	7.36
Staffordshire	Black Ladies (Tyers 1999)	6.69
	Burton-on-Trent, Sinai Park (Tyers 1997b)	4.76
Wales	Welsh Border mean (Siebenlist-Kerner 1978)	6.05
Yorkshire	Calverley Hall (Hillam 1982)	5.42
	Elland (Hillam 1984)	6.37

Table 4

Ring-width data from site master APETHORN, dated AD 1379-1512 inclusive

Date	Ring widths (0.01mm)										No of samples									
AD 1379									522	329									1	2
	335	282	316	326	340	420	307	373	364	435	2	2	2	2	2	2	2	2	2	2
	490	416	378	367	304	353	345	355	406	540	2	2	2	2	2	2	2	2	2	2
AD 1401	371	433	570	546	519	448	315	368	361	308	2	2	2	2	2	2	2	2	3	3
	310	329	354	303	355	331	352	364	258	340	3	3	3	3	3	3	3	3	3	3
	269	262	321	271	266	292	347	359	410	347	3	3	3	3	3	3	3	3	3	3
	417	467	315	387	329	356	309	368	319	321	3	3	3	3	3	3	3	3	3	3
	306	238	400	418	351	241	279	324	311	244	3	3	3	3	3	3	3	3	3	3
AD 1451	312	288	226	251	211	299	272	263	213	212	3	3	3	3	3	3	3	3	3	3
	193	210	226	212	216	232	263	160	126	137	3	3	3	3	3	3	3	3	3	3
	128	116	195	177	229	206	255	231	234	213	3	3	3	3	3	3	2	2	2	2
	197	158	213	227	212	185	234	189	166	142	2	2	2	2	2	2	2	2	2	2
	139	70	52	63	81	83	87	99	140	144	2	2	2	2	2	1	1	1	1	1
AD 1501	133	145	150	219	262	242	209	181	230	235	1	1	1	1	1	1	1	1	1	1
	215	275									1	1								