

Research Report **/2006

**Tree-Ring Analysis of Timbers from Park Farmhouse,
Arbury Park, Nuneaton, Warwickshire**

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Summary

Most timbers at the site were assessed as containing too few rings to make them suitable for dendrochronological analysis. A total of nine samples was taken from the jettied cross-wing and the cruck-framed hall range of this farmhouse. Two sequences matched each other and were combined, but both these, in common with several other samples exhibited bands of narrow rings, making them undatable.

Keywords

Dendrochronology
Standing Building

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Introduction

This grade II* listed house (NGR SP 330 898; Fig 1) is on the English Heritage Buildings at Risk Register. It is a timber-framed medieval farmhouse on a moated platform within the park of Arbury Hall. It consists of a cruck-framed hall range, with a jettied cross-wing. All bays of the hall range are smoke-blackened. It is thought that the cross-wing is probably contemporaneous, but tree-ring dating was requested by Nick Molyneux (English Heritage) in order to try and resolve this possibility, and look at the date of insertion of the floor. The building has suffered from a period during which repairs were not carried out, and has remained unoccupied since the death of the last tenant, during which time further deterioration of the fabric has occurred.

Methodology

The site was visited in December 2005. In the initial assessment, accessible oak timbers with more than 50 rings and traces of sapwood were sought. Those building timbers judged to be potentially useful were cored using a 15mm auger attached to an electric drill. The cores were glued to wooden laths, labelled, and stored for subsequent analysis.

The cores were prepared for measuring by sanding, using an electric belt-sander with progressively finer grit papers down to 400 grit. Any further preparation necessary, eg where bands of narrow rings occurred, was done manually. Suitable samples had their tree-ring sequences measured to an accuracy of 0.01, mm using a specially constructed system utilising a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC, which recorded the ring widths into a dataset. The software used in measuring and subsequent analysis was written by Ian Tyers (1999). Cross-matching and dating was accomplished by a combination of visual matching and a process of qualified statistical comparison by computer. The ring-width series were compared for statistical cross-matching, using a variant of the Belfast CROS program (Baillie and Pilcher 1973). Ring sequences were plotted to allow visual comparisons to be made between sequences on a light table. This method provides a measure of quality control in identifying any errors in the measurements when the samples cross-match.

In comparing one sequence or site sequence against another, t -values over 3.5 are considered significant, although in reality it is common to find t -values of 4 and 5 which are demonstrably spurious because more than one matching position is indicated. For this reason, it is necessary to obtain some t -values of 5, 6, and higher, and for these to be well replicated from different, independent chronologies and with local and regional chronologies well represented, unless the timber is imported. Where two individual sequences match with a t -value of 10 or above, and visually exhibit exceptionally similar ring patterns, they most likely came from the same parent tree.

When cross-matching between samples is found, their ring-width sequences are averaged to form an internal 'working' site mean sequence. Other samples may then be incorporated after comparison with this 'working' master until a final site sequence is established. This is then compared with a number of reference chronologies (multi-site chronologies from a region) and dated individual site masters in an attempt to

date it. Individual long series which are not included in the site mean(s) are also compared with the database to see if they can be dated.

The dates thus obtained represent the time of formation of the measured rings in each sample. These dates require interpretation for the construction date of the phase under investigation to be determined. An important aspect of this interpretation is the estimate of the number of sapwood rings missing. The sapwood estimates used here are based on those proposed for this area by Miles (1997), in which 95% of oaks contain 9–41 rings. Where complete sapwood or bark is present, the exact date of tree felling may be determined.

The dates derived for the felling of the trees used in construction do not necessarily relate directly to the date of construction of the building. However, evidence suggests that, except in the re-use of timbers, construction in most historical periods took place within a very few years after felling (Salzman 1952; Hollstein 1965).

Approximate locations of the timbers sampled for dendrochronology are shown in Figures 2 and 3.

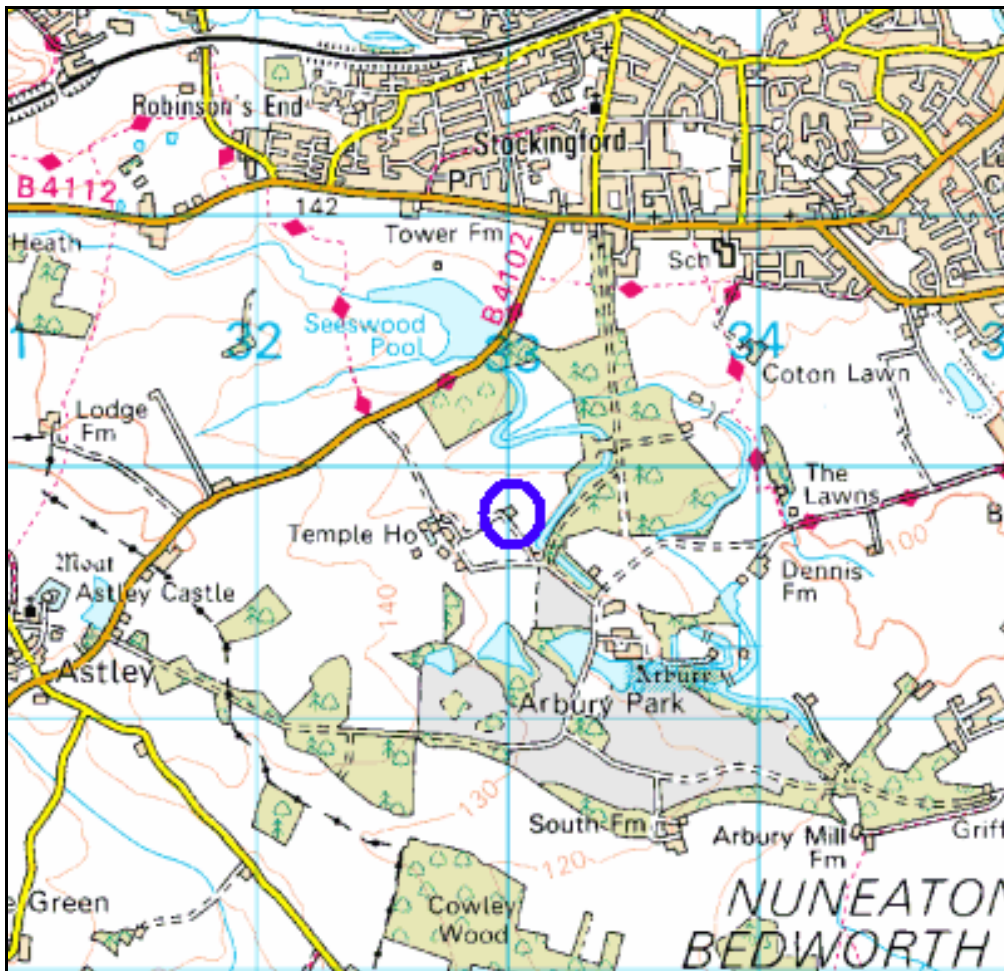


Figure 1: Map showing the location of Park Farm, Arbury (circled).

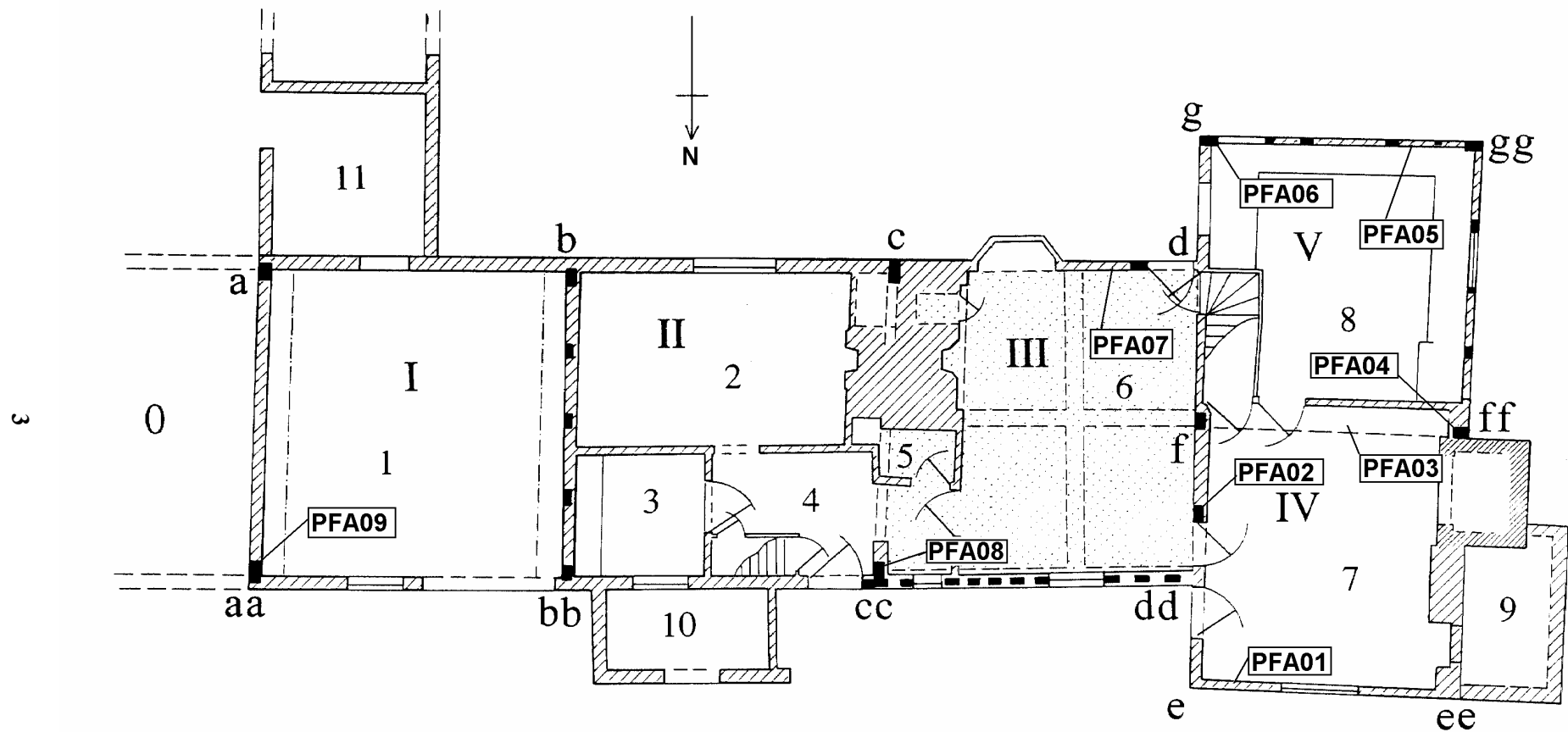
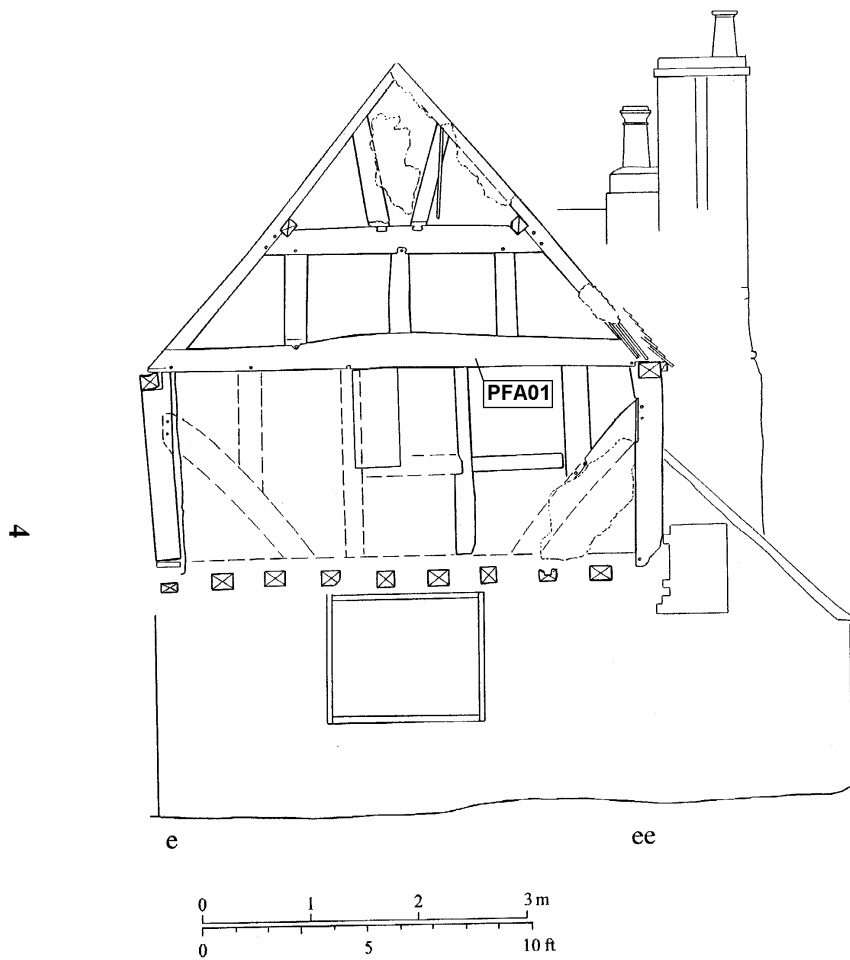
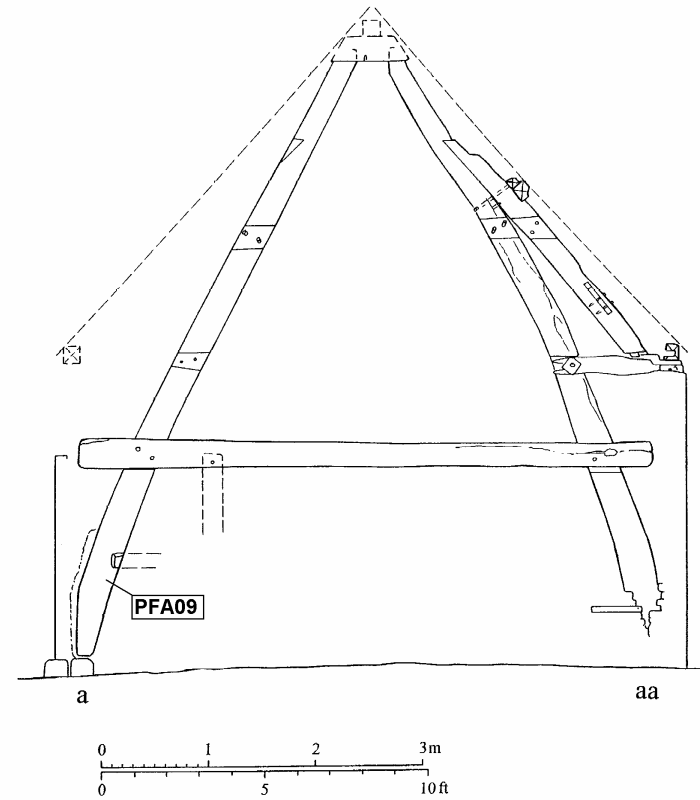


Figure 2: Plan of Park Farmhouse, Arbury, showing the approximate positions of the timbers sampled for dendrochronology. Adapted from an original drawing by R. Meeson



a)



b)

Figure 3: Cross-section drawings of a) the north end wall of the cross-wing, and b) the cruck at the east end of the hall range, showing timbers sampled for dendrochronology. Adapted from original drawings by R. Meeson

Results and Discussion

Most of the timbers in the roofs of both the hall range and the cross-wing, and the inserted floor, were assessed as having too few rings to be suitable for dendrochronological dating.

All timbers sampled were of oak (*Quercus* spp.). Details of the samples and their locations are given in Table 1. Many of the sequences were found to be too short for further analysis to be justified, but cross-matching was found between two samples, **PFA03** and **PFA05** ($t = 4.2$ with 79 years overlap; Fig 4), and the two series were combined to form a new series, **PFA0305**. Neither this series, nor the other series considered long enough to analyse, gave consistent matching against the reference material, and they remain undated.

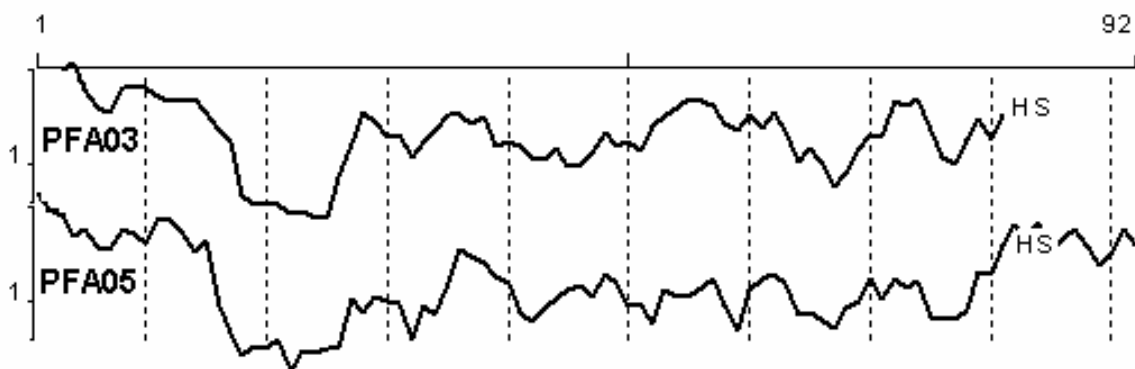


Figure 4: Ring-width plots of the matching samples **PFA03** and **PFA05** showing their abrupt growth changes. HS = heartwood-sapwood boundary. The vertical axis represents ring width (mm) on a logarithmic scale

Most series showed the bands of narrow rings apparent in Figure 4, suggesting that the trees used had either been managed in some way, or perhaps had suffered contemporaneous disease episodes. These periods of poor growth in relatively young trees meant that none of the timbers sampled, which had been judged the most likely to yield results as they contained the most rings, could be dated.

Acknowledgements

This work was commissioned by John Meadows of the Scientific Dating Service, English Heritage. Access was arranged by Bob Meeson, who introduced me to the building, assisted with the fieldwork, and supplied the drawings used. Nat Alcock was also present at the time of sampling and added to on-site discussions about the building. Cathy Groves, Sheffield University, and John Meadows made useful comments on an earlier draft of this report.

Table 1: Details of oak (*Quercus* spp.) timbers sampled from Park Farmhouse, Arbury Park, Nuneaton, Warwickshire

Sample Number	Timber and position	No of rings	Mean width (mm)	Mean sens (mm)	Sapwood complement
CROSS-WING					
PFA01	North tiebeam	<40	NM	-	h/s
PFA02	Stud in east wall	49	2.21	0.26	h/s
PFA03	Middle tiebeam	79	1.88	0.22	h/s
PFA04	West post, middle truss	51	2.65	0.29	3
PFA05	South tiebeam	92	1.66	0.25	8
PFA06	South-east corner post	<40	NM	-	h/s
HALL RANGE					
PFA07	South purlin at west end	<40	NM	-	h/s
PFA08	North cruck, second truss from west	<40	NM	-	h/s
PFA09a		29	1.87	0.27	h/s
PFA09b		44	2.98	0.25	-
PFA09	North cruck of east end truss	47	2.95	0.24	h/s

Key: h/s bdry = heartwood/sapwood boundary - last heartwood ring date; NM = not measured; mean sens = mean sensitivity.

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