

Ancient Monuments Laboratory
Report 16/94

TREE-RING ANALYSIS OF OAK
TIMBERS FROM LODGE FARM,
KINGSTON LACY ESTATE, DORSET

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Summary

Dendrochronological analysis of oak samples from Lodge Farm, Kingston Lacy Estate, resulted in the production of a *terminus post quem* for felling of AD 1411, and a tree-ring chronology spanning the period AD 1248-1399.

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Introduction

Lodge Farm is situated within the Kingston Lacy Estate, which lies approximately two miles north-west of Wimborne Minster, Dorset (ST 97430215). It was originally a hunting lodge and, on architectural evidence, is thought to be of late fourteenth or early fifteenth-century date with various later alterations (Papworth pers comm). In 1985 a series of five core samples and three *in situ* measurements were taken for tree-ring analysis by David Haddon-Reece, then of English Heritage. They were from various phases of the building which ranged in date from medieval to eighteenth-century, but the analysis did not produce any tree-ring dates. Lodge Farm was refurbished in 1986, during which the solar floorboards were removed and replaced. On stylistic grounds the floorboards appeared to be an original feature of the building (Papworth pers comm). A fragment of a floorboard produced a radiocarbon date of 630 ± 60 BP (Har-10241), corrected to 1265-1420 Cal AD, 2σ age range (Stuiver and Pearson 1986), which supported the stylistic evidence. In late 1993 cross-sectional slices were removed from seven floorboards and the data from the 1985 study were made available for re-examination. The dendrochronological analysis was undertaken with the aim of producing precise dates for the timbers and hence additional dating evidence for the construction of the hunting lodge.

Method

The samples from the solar floorboards were prepared for measurement using standard dendro-chronological techniques (Baillie 1982; HILLAM 1985). The growth rings of the samples were measured to an accuracy of 0.01mm on a travelling stage. This is connected to an Atari microcomputer which uses a suite of dendrochronology programs written by Ian Tyers (pers comm 1993). The ring sequences of the floorboards and the 1985 samples were plotted as graphs using an HI-80 Epson plotter attached to the Atari. The graphs were then compared with each other to check for any similarities between the ring patterns which might indicate contemporaneity. This process is aided by the use of programs on the Atari microcomputer. The crossmatching routines are based on the Belfast CROS program (Baillie and Pilcher 1973; Munro 1984) and measure the amount of correlation between two ring sequences. The Student's *t* test is then used as a significance test on the correlation coefficient. All *t* values quoted in this report are identical to those produced by the original CROS program (Baillie and Pilcher 1973). Generally a *t* value of 3.5 or over represents a match, provided that the visual match between the tree-ring graphs is acceptable (Baillie 1982, 82-5).

Dating is achieved by crossmatching ring sequences within a phase or building and combining the matching patterns to produce a site master curve. This master curve and any unmatched ring sequences are then tested against reference chronologies to obtain absolute dates. A master curve is used for absolute dating

purposes whenever possible as it enhances the common climatic signal and reduces the background noise resulting from the local growth conditions of individual trees.

The results only date the rings present in the timber and therefore do not necessarily represent the felling date. If the bark or bark edge is present on a sample, the exact felling year can be determined. In the absence of bark surface the felling date is calculated using the sapwood estimate of 10-55 rings. This is the range of the 95% confidence limits for the number of sapwood rings on British oak trees over 30 years old (Hillam *et al* 1987). Where sapwood is absent, the addition of 10 rings (the minimum number of sapwood rings expected) to the date of the last measured heartwood ring produces a probable *terminus post quem* for felling. During timber conversion a large number of outer rings could be removed but, as this is unquantifiable, the actual felling date could be much later.

Once the felling date range or *terminus post quem* for felling has been calculated, factors such as stockpiling, re-use, repairs, and seasoning of timber must be considered since they might affect the interpretation of the tree-ring dates. Seasoning of timber is thought to have been a fairly rare occurrence until relatively recent times. Evidence indicates that timber was generally felled as required and used whilst green (eg Rackham 1990, 69). Construction which utilises primary, rather than re-used, timber is therefore likely to have occurred shortly after felling. Thus, whilst the date obtained for the measured tree-ring sequence is precise and has been achieved by a completely independent process, the interpretation of tree-ring dates can be refined by studying other architectural and documentary evidence.

Results

1. *Solar floorboards*. All seven samples were considered suitable for measurement since they contained over 50 annual growth rings, the minimum number usually required for reliable dating (Hillam *et al* 1987). A note was made of the orientation of their rings and the cross-sectional dimensions (Table 1a). Five of the floorboards were tangential planks (Figure 1) which ranged from 365mm-395mm wide and 15-20mm deep. The remaining two samples, *F04* and *F05*, appear to be radial planks but they are only 225mm and 265mm wide respectively. All the floorboards were already badly decayed when they were removed from Lodge Farm. Thus, bearing in mind their subsequent storage in a barn, it is possible that *F04* and *F05* were also tangential planks whose outer edges have been lost due to decay. No traces of sapwood were visible on any of the samples, and thus it is not possible to give an accurate assessment of age and size of the parent trees. However the floorboards appear to have been derived from trees over approximately 100 years old when felled.

The ring patterns of five samples crossmatched (Figure 2; Table 2). Although there is no precisely defined limit, studies on modern samples suggest that those samples which match with t values greater than 10 are likely to have originated from the same tree. The ring width data from *F01* and *F02* ($t=11.7$) were therefore averaged to produce a single sequence before being combined with the data from samples *F04*,

F05, and *F07* to produce a 152-year site master curve (Table 3). This was dated to the period AD 1248-1399 by comparison with numerous reference chronologies from the British Isles (Table 4).

Samples *F03* and *F06* matched with a *t* value of 16.4 and were combined to produce a single sequence, *F03/06*. This gave a tentative match with the site master curve. However this could not be confirmed by comparison with dated reference chronologies. Thus floorboards *F03* and *F06* remain undated.

A *terminus post quem* for felling was calculated for each of the dated samples (Table 5). If the five dated floorboard are contemporary, then they were probably all felled after AD 1411. The tree-ring analysis of the solar floorboards, assuming that they are associated with the initial building phase, indicates a construction date for Lodge Farm of some time after AD 1411.

2. *1985 data*. All available details of the samples are given in Table 1b. The data from samples *L03* and *L05* were discarded as the sequences contained less than 50 rings. The remaining six samples were tested against the new site master curve and numerous reference chronologies spanning the medieval period to present day. No consistent results were obtained for any of these samples therefore all remain undated.

Conclusion

Analysis of timbers from Lodge Farm, Kingston Lacy Estate, resulted in the production of a dated site chronology spanning the period AD 1248-1399. The tree-ring results show that the five dated medieval solar floorboards, thought to be associated with the primary construction phase, were probably all felled after AD 1411. This corresponds with the late fourteenth/early fifteenth-century construction date indicated by the architectural style.

Acknowledgements

The Sheffield Dendrochronology Laboratory is funded by English Heritage. I am grateful to Martin Papworth for providing general information about the building and also regarding the timbers sampled in 1985. I would also like to thank Ian Tyers for providing unpublished tree-ring software and David Haddon-Reece and Dan Miles for making available unpublished data.

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-  - bark
-  - sapwood
-  - heartwood
-  - timber

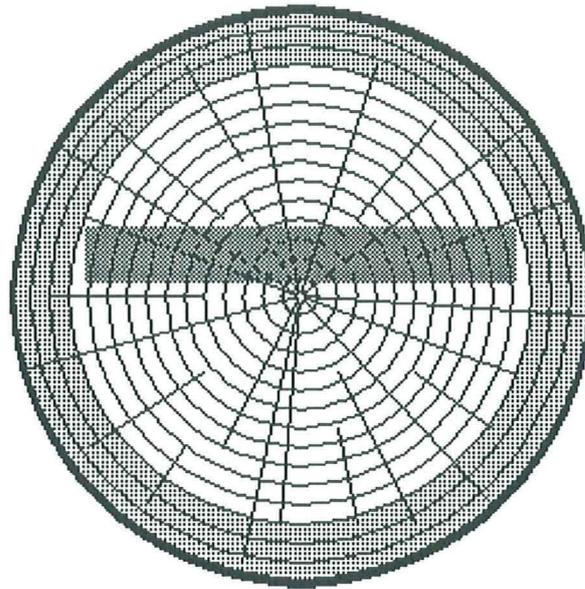


Figure 1: Diagram showing the method of conversion of the floorboards.

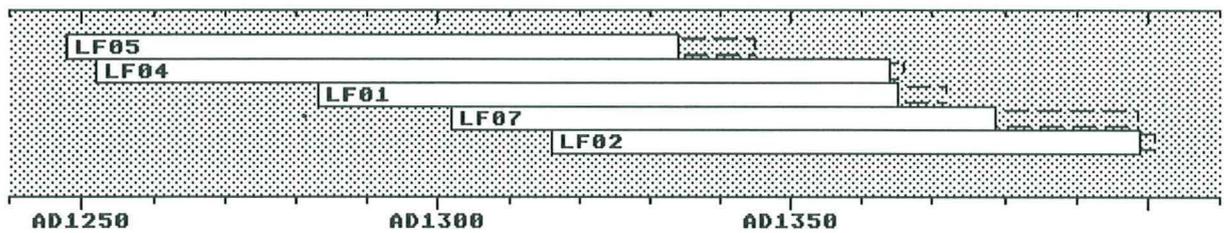


Figure 2: Bar diagram showing the relative positions of the dated ring sequences from Lodge Farm, Kingston Lacy Estate.

Table 1a: Details of the tree-ring samples from the solar floorboards of Lodge Farm, Kingston Lacy Estate. + - indicates unmeasured rings; ARW - average ring width (mm/year).

<u>Sample</u>	<u>Number of measured rings</u>	<u>ARW</u>	<u>Sketch</u>	<u>Dimensions (mm)</u>	<u>Comment</u>
F01	83+	1.44		365x20	+7 unmeasured heartwood rings
F02	84+	1.00		370x15	+2 unmeasured heartwood rings
F03	65+	1.49		370x15	+18 unmeasured heartwood rings
F04	113+	1.87		225x20	+2 unmeasured heartwood rings
F05	87+	2.54		265x20	+11 unmeasured heartwood rings
F06	87	1.29		365x15	-
F07	78+	1.19		395x20	+20 unmeasured heartwood rings

Table 1b: Details of the tree-ring samples taken in 1985 from Lodge Farm, Kingston Lacy Estate. ARW - average ring width (mm/year). No information is available about sapwood rings.

<u>Sample</u>	<u>Function</u>	<u>Number of rings</u>	<u>ARW</u>	<u>Comments</u>
L01	screen panel	94	2.15	-
L02	screen panel	75	2.84	-
L03	screen panel	37	1.82	rejected
L04	floor beam	108	2.21	-
L05	tiebeam	47	3.05	rejected
L06	attic floor beam	80	1.41	-
L07	solar floor north wall	95	2.26	-
L08	solar floor middle beam	85	2.51	-

Table 4: Results of comparisons between the site master curve and reference chronologies spanning the medieval period. All chronologies are independent.

<u>Reference chronology</u>	<u>t value</u>
Field Place Farm barn, West Sussex (Bridge 1993)	4.19
London: Blackfriars wreck 3 (Tyers 1992)	5.66
London: Pickfords B revetment 2 (Tyers forthcoming)	4.73
London: Southwark boats 3 (Tyers 1990)	5.56
London: Trig Lane (Brigham <i>et al</i> 1992)	5.64
Pebble Court, Swinbrook (Haddon-Reece and Miles 1992)	4.61
The Round Tower, Windsor Castle, Berks (Haddon-Reece and Miles pers comm)	3.59
Tiverton Castle, Devon (Haddon-Reece pers comm)	3.61
Germany: West (Hollstein 1980)	3.48
Germany: South (Becker 1981)	3.61
Northern France (Pilcher 1987)	4.05

Table 5: Details of the tree-ring dates. + - indicates the presence of unmeasured rings.

<u>Sample</u>	<u>Number of measured rings</u>	<u>Date span of measured rings</u>	<u>Unmeasured rings</u>	<u>Date of outer ring</u>	<u>Felling date</u>
F01	83+	AD 1283-1365	7	AD 1372	after AD 1382
F02	84+	AD 1316-1399	2	AD 1401	after AD 1411
F04	113+	AD 1252-1364	2	AD 1366	after AD 1376
F05	87+	AD 1248-1334	11	AD 1345	after AD 1355
F07	78+	AD 1302-1379	20	AD 1399	after AD 1409