

Ancient Monuments Laboratory
Report 5/2000

TREE-RING ANALYSIS OF TIMBERS
FROM LATHOM HOUSE, LANCASHIRE

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Summary

Analysis of 20 oak samples taken from timbers removed from the surviving west wing of Lathom House, a Palladian-style house with documentary evidence for medieval precursors and later alterations, led to the dating of two groups of timbers. An early group of five timbers, dated to the late-fifteenth century, were felled after AD 1475, indicating reuse of timbers possibly from a house associated with Thomas Stanley and dated on documentary grounds to c AD 1490. A second, later group of six timbers, were dated to the mid-eighteenth century. Estimated felling dates for this group indicate a probable felling range of AD 1736-?64. Hence these could be associated with the construction of the Palladian-style house by Giacomo Leoni, dated on documentary evidence to AD 1724-40.

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Introduction

This document is a technical archive report on the tree-ring analysis of oak timbers removed from Lathom House (NGR SD459092), a grade II* listed building. 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.

The present building comprises the surviving west wing of a Palladian-style house constructed by Giacomo Leoni in the early-eighteenth century. Timbers extracted during recent dismantling of the roof exhibit redundant joints indicative of reuse of timbers from earlier buildings on the site. Documentary records indicate that the present house is located on a manorial site dating back to the eleventh century. The house was apparently rebuilt in *c* AD 1490 by Thomas Stanley, when he was made Earl of Derby. The house was partially destroyed in the Civil War, then partially rebuilt in *c* AD 1660, and again in *c* AD 1770. The Leoni house (including the present west wing) was constructed sometime between AD 1724 and 1740, when presumably most of the sampled timbers were reused. The Leoni house was altered by T H Wyatt in AD 1862 when an extra floor was added to the west wing along with service buildings (Fletcher pers comm).

This survey was commissioned by Jane Harding of English Heritage to establish the date of the reused timbers removed from the roof of the west wing and determine whether they could have come from the late fifteenth-century house.

Methodology

Methods at the Lampeter Dendrochronology Laboratory in general follow those described in English Heritage (1998). Details of the methods used for the dating of this building are described below.

Samples from thirty timbers were taken using a chainsaw to provide slices. Seven of these, from softwood timbers, were retained by the Sheffield Dendrochronology Laboratory for possible use in an on-going research project. The remaining oak samples were allowed to dry out and then sanded with progressively finer grades of paper to reveal their ring sequences.

The complete sequences of growth rings in the samples which were selected for dating purposes were measured to an accuracy of 0.01 mm using a micro-computer based travelling stage (Tyers 1997). 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; Munro 1984) 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 satisfactory visual matching supports these positions.

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 the British Isles (Tyers 1998). 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.

Results

A total of 30 samples were taken from the removed timbers, of which 23 were oak (Table 1). The original sample numbers have been retained, hence the numbering sequence of the oak samples is not continuous. Due to the exposure of the timbers to the elements following their removal from the house, their surfaces had become eroded and no sapwood survived on any of the recovered samples. This also meant it was not possible to identify heartwood/sapwood boundaries with certainty. Three samples (**14**, **18**, and **25**) when examined in the laboratory were rejected due to an insufficient number of rings for reliable analysis (Table 1). The resultant 20 series were initially compared with each other. Five of the samples cross-matched to form an internally consistent group (Table 2a), whilst a further six samples cross matched to form a separate group (Table 2b). An 97-year five-timber mean named Lathomt5, and a 94-year six-timber mean, named Lathomt6, were calculated and then compared with dated reference chronologies from throughout the British Isles and northern Europe. Table 3a shows the correlation of the five-timber mean sequence at

the dating position identified at AD 1369-1465 inclusive, and Table 3b shows the correlation of the six-timber mean sequence at the dating position identified at AD 1633-1726 inclusive. Table 4 lists the two mean sequences, Lathomt5 and Lathomt6, and the dated timbers are indicated graphically in Figure 1 (a and b).

The nine measured samples which did not match the rest of the material were compared with dated reference chronologies from throughout the British Isles and northern Europe without any dating being obtained.

Conclusion

Five samples (**03, 04, 09, 17, and 19**) produced dates with the last surviving ring dated to the latter half of the fifteenth century. The dating evidence is consistent with the original use of these timbers in the construction of the house recorded in documentary records associated with Thomas Stanley and dated to *c* AD 1490.

A further six samples (**05, 10, 15, 22, 23, and 24**) have dated to the mid-eighteenth century. Two of these samples (**10 and 15**), both from possible joists or roof trusses (Fletcher pers comm), cross matched with a high *t*-value (Table 2b) indicating that they derived from the same parent tree, and possibly the same original timber. Estimated felling dates for those timbers with probable heartwood/sapwood boundaries indicate a probable felling range for this group of AD 1736?-64. Hence these could be associated with the construction of the Palladian-style house by Giacomo Leoni, dated on documentary evidence to AD 1724-40.

Acknowledgements

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References

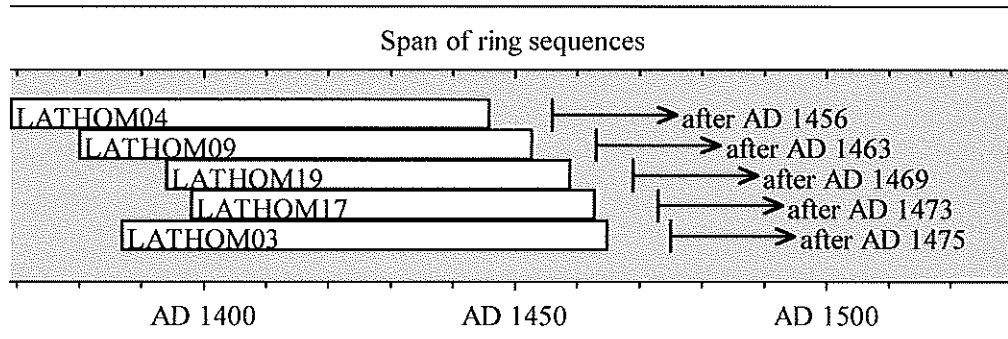
- Baillie, M G L, and Pilcher, J R, 1973 A simple crossdating program for tree-ring research, *Tree Ring Bulletin*, **33**, 7-14
- Barefoot, A C, 1975 A Winchester dendrochronology for 1635-1972 AD - its validity and possible extension, *J Inst Wood Sci*, **7**, 25-32
- English Heritage, 1998 *Guidelines on producing and interpreting dendrochronological dates*, London
- Groves, C, forthcoming *Dendrochronological research in Devon. Phase 1 - the pilot study*, Anc Mon Lab Rep
- Groves, C, 1998 *Tree-ring analysis of oak timbers from Lightshaw Hall, Golborne, Lancashire*, Anc Mon Lab Rep, **77/98**
- Haddon-Reece, D, Miles, D, Tapper, M C, and Fletcher, J M, 1987 List 22 - Tree-ring dates from the Ancient Monuments Laboratory, Historic Buildings and Monuments Commission for England, *Vernacular Architect*, **18**, 54-5
- Haddon-Reece, D, Miles, D H, and Munby, J T, 1990 List 38 - Tree-ring dates from the Ancient Monuments Laboratory, Historic Buildings and Monuments Commission for England, *Vernacular Architect*, **21**, 46-50
- Hillam, J, 1984 *Tree-ring analysis of timbers from Elland Old Hall, West Yorkshire*, Anc Mon Lab Rep, **4165**
- Howard, R, Laxton, R R, and Litton, C D, 1999 *Tree-ring analysis of timbers from Bretby Hall, Bretby, Derbyshire*, Anc Mon Lab Rep, **43/99**
- Leggett, P A, 1980 *The use of tree-ring analyses in the absolute dating of historical sites and their use in the interpretation of past climatic trends*, unpubl PhD Thesis, CNA A (Liverpool Polytechnic)
- Munro, M A R, 1984 An improved algorithm for crossdating tree-ring series, *Tree Ring Bulletin*, **44**, 17-27
- Nayling, N, 1998a *Dendrochronological Analysis of Timbers from Old Abbey Farm, Risley, Cheshire*, ARCUS Rep, **412**
- Nayling, N, 1998b *Tree-ring analysis of timbers from Hurstwood Great Barn, Lancashire*, Anc Mon Lab Rep, **67/98**
- Nayling, N, forthcoming *Tree-ring analysis of timbers from Stayley Hall, Greater Manchester*, Anc Mon Lab Rep
- Tyers, I, 1995 *Tree-ring analysis of St Bartholomew's Church, Lower Sapey, Hereford and Worcester*, Anc Mon Lab Rep, **14/95**
- Tyers, I, 1996 *Tree-ring analysis of the tower of St John The Baptist Church, Mamble, Hereford and Worcester*, Anc Mon Lab Rep, **22/96**
- Tyers, I, 1997 *Dendro for Windows program guide*, ARCUS Rep, **340**
- Tyers, I, 1998 *Tree-Ring analysis and wood identification of timbers excavated on the Magistrates Court Site, Kingston upon Hull, East Yorkshire*, ARCUS Rep, **410** (2 volumes)

Tyers, I, forthcoming *Tree-ring analysis of timbers from Apethorn Fold Farmhouse, Greater Manchester*, Anc Mon Lab Rep

Tyers, I, and Hibberd, H, 1993 *Dendrochronology, wood identification, and wattle analysis for the Fleet Valley developers report*, MoLAS Dendro Rep, **03/93**

Figure 1

- a) Bar diagram showing the chronological positions of the five early dated timbers forming the site master Lathomt5. As neither sapwood nor the heartwood/sapwood boundary was identified on any of these samples, all felling dates given are *termini post quem*.



- b) Bar diagram showing the chronological positions of the six later dated timbers forming the site master Lathomt6. The probable felling period for each sequence is also shown.

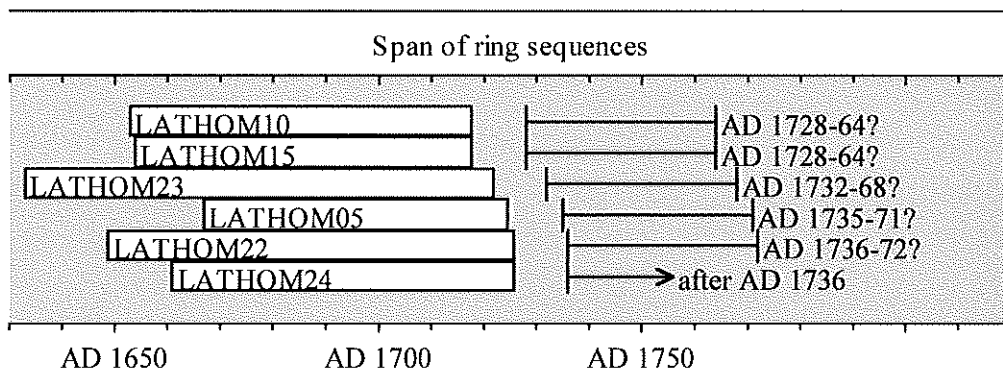


Table 1 List of oak (*Quercus spp.*) samples. Samples 08, 11, 13, 27, 28, 29, and 30 were conifer samples and have been retained by the Sheffield Dendrochronology Laboratory for future analysis

Core No	Original use of timber	Cross-section size (mm)	Cross-section of tree	Total rings	Sapwood rings	ARW mm/year	Date of sequence	Felling period
01	Floor joist reused as purlin	210 x 210	Quarter	65	h/s?	3.21	Undated	
02	Floor joist - no reuse	300 x 205	Half	58	h/s?	2.63	Undated	
03	Collar?	150 x 120	Quarter	79	-	2.97	AD 1387-AD 1465	after AD 1475
04	Joist	230 x 230	Whole	78	-	1.64	AD 1369-AD 1446	after AD 1456
05	Collar	160 x 150	Quarter	59	h/s?	1.85	AD 1667-AD 1725	AD 1735-71?
06	Joist	150 x 120	Half	75	h/s?	1.54	Undated	
07	Joist	215 x 195	Whole	70	-	1.67	Undated	
09	Unknown	160 x 140	Quarter	74	-	1.81	AD 1380-AD 1453	after AD 1463
10	Joist or roof truss (principal after?)	250 x 250	Whole	66	h/s?	2.32	AD 1653-AD 1718	AD 1728-64?
12	Rail?	170 x 155	Quarter	65	h/s?	2.39	Undated	
14	Purlin?	210 x 210	Whole	c.45	h/s?	-	Unmeasured	
15	Floor joist or roof truss?	200 x 120	Quarter	65	h/s?	2.63	AD 1654-AD 1718	AD 1728-64?
16	Joist with ovolo moulding	240 x 205	Whole	100	-	1.60	Undated	
17	Purlin?	240 x 195	Quarter	66	-	3.20	AD 1398-AD 1463	after AD 1473
18	Collar?	230 x 135	Half	c.45	h/s?	-	Unmeasured	
19	Joist	215 x 185	Quarter	66	-	3.00	AD 1394-AD 1459	after AD 1469
20	Joist	225 x 90	Half	59	-	2.65	Undated	
21	Purlin	230 x 215	Whole	64	h/s?	1.92	Undated	
22	Purlin	240 x 205	Whole	78	h/s?	1.83	AD 1649-AD 1726	AD 1736-72?
23	Purlin	245 x 220	Whole	90	h/s?	1.86	AD 1633-AD 1722	AD 1732-68?
24	Rail	150 x 140	Quarter	66	-	2.83	AD 1661-AD 1726	after AD 1736
25	Joist	160 x 120	Quarter	c.40	-	-	Unmeasured	
26	Purlin?	195 x 180	Radial	56	--	3.45	Undated	

Total rings = all measured rings, +value means additional rings were only counted, 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. Note that the cross-section dimensions given are for the samples rather than the parent timbers.

Table 2

a) *t*-value matrix for the timbers forming the chronology Lathomt5 KEY: - = *t*-values under 3.0, \ = no overlap

Sample	04	09	17	19
03	3.70	9.04	5.74	5.01
04	*	4.62	4.81	3.37
09		*	5.23	5.46
17		*	*	3.74

b) *t*-value matrix for the timbers forming the chronology Lathomt6 KEY: - = *t*-values under 3.0, \ = no overlap

Sample	10	15	22	23	24
05	6.69	6.06	3.26	3.85	5.26
10	*	16.65	5.65	4.69	7.12
15	*	*	5.36	4.95	6.09
22	*	*	*	3.09	-
23	*	*	*	*	4.92

Table 3

a) Dating the mean sequence Lathomt5, AD 1369-1465 inclusive. *t*-values with independent reference chronologies

<u>Area</u>	<u>Reference chronology</u>	<u><i>t</i>-values</u>
Cheshire	Old Abbey Farm Bridge, Risley 4 timber (Nayling 1998a)	6.93
Devon	Devon project phase 1 (Groves forthcoming)	7.43
Greater Manchester	Apethorn Fold Farmhouse (Tyers forthcoming)	6.54
Greater Manchester	Hurstwood Great Barn (Nayling 1998b)	6.14
Greater Manchester	Peel Hall (Leggett 1980)	6.07
Greater Manchester	Stayley Hall; (Nayling forthcoming)	8.11
Herefordshire	St Bartholomew's Church, Lower Sapey (Tyers 1995)	6.49
Lancashire	Lightshaw Hall, Golborne (Groves 1998)	5.25
Yorkshire	Elland Old Hall (Hillam 1984)	6.58

c) Dating the mean sequence Lathomt6, AD 1633-1726 inclusive. *T*-values with independent reference chronologies.

<u>Area</u>	<u>Reference chronology</u>	<u><i>t</i>-values</u>
Derbyshire	Bretby Hall (Howard <i>et al</i> 1999)	4.97
Cheshire	Old Abbey Farm, Risley Phase 5 (Nayling 1998a)	6.35
Devon	Buckland Yelverton (Morgan pers comm)	4.46
Hampshire	Hampshire/Winchester modern (Barefoot 1975)	4.70
Hampshire	HMS Victory (Barefoot 1975)	5.74
Herefordshire	Mamble Church phase C (Tyers 1996)	4.19
London	Fleet Valley VAL88 (E/B4.18) (Tyers and Hibberd 1993)	4.38
Oxfordshire	Mapledurham New Farm First Barn (Haddon-Reece <i>et al</i> 1987)	5.85
Oxfordshire	Mapledurham Mill Farm Barn (Haddon-Reece <i>et al</i> 1990)	4.10
Yorkshire	Cusworth Hall Doncaster (Hillam pers comm)	4.42

