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TREE-RING ANALYSIS OF THE JEW'S
HOUSE, 15 THE STRAIT /1 STEEP HILL,
LINCOLN, LINCOLNSHIRE

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Summary

The tree-ring analysis of timbers associated with
medieval alterations to The Jew's House is described. A
felling date in the early/mid fourteenth-century was
obtained for one of the lintels.

Author's address :-

Cathy Groves

Department of Archaeology & Prehistory
University of Sheffield
Sheffield
S10 2TN

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Introduction

The Jew's House, a well known Romanesque townhouse, is situated at the bottom of Steep Hill, Lincoln (SK 97647157). It is possible to date the original structure to the AD 1160s on strong stylistic evidence (Harris 1993). However, the massive wooden lintels, spanning the arcaded shop fronts at street level, are from a second phase. They appear to replace the original segmented arches, following possible structural failure, and are the only major alteration to the otherwise intact Romanesque street frontage. A thirteenth or fourteenth-century date is indicated for their insertion on stylistic grounds (Harris 1993). Dendrochronological analysis was undertaken to determine precise dates for the lintels, and hence provide more precise dating evidence for the medieval alterations.

Method

Cores were taken from the timbers using a 15mm diameter hollow borer attached to an electric drill. Each core was polished, first using an electric sander with paper of medium grit and then finished by hand using fine silicon carbide paper, so that the annual growth rings were clearly defined. Any samples unsuitable for dating purposes were rejected before measurement but, where possible, a note was made of the number of rings and the average ring width estimated. Unsuitable samples are usually those with unclear ring sequences or fewer than 50 rings. Samples with fewer than 50 rings are generally unsuitable for absolute dating as the ring sequence may not be unique (Hillam *et al* 1987).

The growth rings of sample selected for dating purposes 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 sequence was plotted as a graph, using an HI-80 Epson plotter attached to the Atari, to facilitate visual comparison with dated reference chronologies. 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, 82-85).

Dating is usually achieved by crossmatching ring sequences within a phase or building and combining the matching patterns to produce a site master curve. This master curve is then tested against reference chronologies to obtain an absolute date. 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. In this case, where only one timber was suitable for dating

purposes, it was clearly necessary to compare the individual sequence with the reference chronologies, but it is generally accepted that a single timber is far less likely to produce a date than a well replicated master curve.

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.

Results

The lintels associated with the medieval alterations to the Romanesque street frontage were all oak. They were shaped from complete trunks (Figure 1), and one had sapwood present. Cores, full details of which are given in Table 1, were removed from the three accessible lintels. It is usual to sample at least 6-10 timbers per building phase, whenever possible, as this increases the likelihood of producing a site master curve, and hence improves the chances of obtaining a date. It also reduces the interpretative difficulties that that may arise from re-use of structural timbers.

Only one sample, *01*, was considered suitable for dating purposes (Table 2). The ring sequence from sample *01* was dated to the period AD 1162-1297 by comparison with numerous reference chronologies from the British Isles (Table 3). Approximately 25-30 sapwood rings on sample *01* were counted, rather than measured, as the ring boundaries were indistinct. This timber was therefore felled after AD 1321 and probably before AD 1352. During sampling, it was noted that the outer surface may have been the bark edge, but in this instance it was impossible to be certain. If this is the case then the felling date range could be refined to AD 1321-1326.

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, the tree-ring ring results indicate that the medieval alterations were carried out in the early/mid fourteenth-century and possibly in the third decade of this century. This corresponds with the thirteenth or fourteenth-century date indicated by the architectural style *but* it should be noted that this date rests on a single timber.

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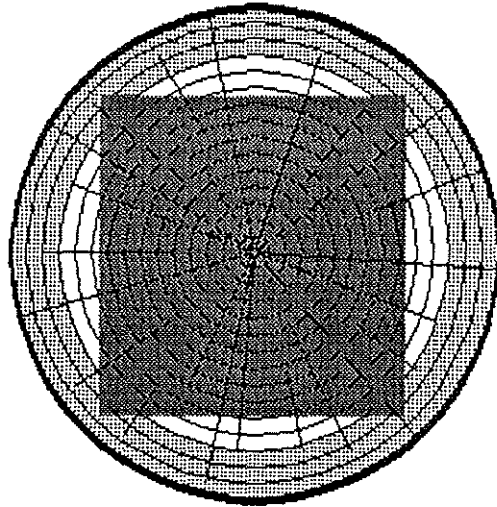
Figure 1: Diagram showing the method of conversion of the lintels.

Table 1: Details of the tree-ring samples from The Jew's House, Lincoln. hs - heartwood/sapwood transition; ARW - average ring width (mm/year).

Sample	Location	Number of rings	Sapwood	ARW	Comments	Felling date
01	inner lintel, southern section	136+	hs	1.0	measured; +25-30 sapwood rings; AD 1162-1297	AD 1321-1352
02	outer lintel, southern section	-	-	-	rejected; core fragmented during sampling	-
03	outer lintel, northern section	46	-	1.7	rejected	-

Table 2: Ring width data of sample *01* from The Jew's House, Lincoln, AD 1162-1297.

year	ring widths (0.01mm)									
AD 1162		174	240	265	246	200	144	221	190	161
	155	148	140	197	245	253	214	174	266	155
	162	209	162	158	144	132	184	78	86	91
	96	108	90	63	102	136	126	117	142	130
AD 1201	133	129	126	90	95	99	108	127	112	155
	139	134	114	97	97	102	110	87	91	76
	94	69	79	130	124	120	88	76	88	110
	112	115	77	93	109	73	119	112	89	89
	60	55	66	88	88	76	69	57	55	74
AD 1251	88	74	63	65	63	49	36	47	38	58
	62	77	64	61	58	62	60	74	63	60
	68	70	72	70	62	57	56	52	48	81
	67	65	76	53	49	65	60	56	73	79
	61	55	50	36	39	49	49			

Table 3: Dating the ring sequence from sample *01*, AD 1162-1297. *t* values with dated reference chronologies. * - indicates composite reference chronologies containing data from numerous sites. All other reference chronologies are independent.

reference chronology	*t* value
*East Midlands (Laxton and Litton 1988)	7.30
*Oxford (Haddon-Reece, Miles, Munby and Fletcher pers comm)	5.16
*Germany: West (Hollstein 1980)	4.52
Baylolls Manor, Harwell, Oxon (Haddon-Reece and Miles 1992)	4.27
Beverley: Hall Garth (Hillam 1981)	4.38
Droitwich: Upwich2 (Groves and Hillam forthcoming)	4.85
Exeter Cathedral1 (Mills 1988)	5.11
Glastonbury: Abbey Barn (Bridge 1988)	4.26
Great Oxenbold, Salop (Miles and Haddon-Reece 1993)	4.94
Grimsby: Baxtergate2 (Groves 1992)	4.53
Reading, Berks (Groves *et al* forthcoming)	5.48
Sompting Church, West Sussex (Tyers 1988)	3.79