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Ancient Monuments Laboratory
Report 33/93

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Summary

The dendrochronological study of medieval timbers from The Old Crown, Deritend, is described. No tree-ring dates were obtained for the construction of the building or the later insertion of a floor.

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Tree-ring analysis of oak timbers from The Old Crown, Deritend, Birmingham, 1992

Introduction

The Old Crown (NGR SP080864), Deritend, now in a state of disrepair, has recently undergone a survey commissioned by English Heritage. The constructional style suggests a late 15th century date for the original erection of the building, although a later inserted floor is present between trusses 6 and 7 (Molyneux pers comm). Tree-ring analysis was undertaken in late 1992 to determine precise dates for the timbers, and hence provide more precise dating evidence for the construction of the building and the insertion of the floor.

Method

All timbers were briefly assessed and those which looked most suitable for dendrochronological analysis were selected for study and sampled. The samples were obtained by use of a corer attached to an electric drill which leaves a hole of approximately 15mm diameter. The location of each sample is shown on Figure 1. Each core was polished with an electric sander and then 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 a note was made of the number of rings and the average growth rate. Unsuitable samples are usually those with unclear ring sequences or less than 50 rings. Ring patterns with fewer than 50 rings are generally unsuitable for absolute dating as they may not be unique (Hillam *et al* 1987).

The growth rings of the samples 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 1992). The ring sequences 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 of crossmatching is aided by the use of programs on the Atari microcomputer. The crossdating routines are based on versions of CROS (Baillie & 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 & 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. All previously unmatched ring sequences from the site are compared with this master curve and if any additional patterns are found to crossmatch these are incorporated into the 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.

Results

During the initial assessment it was noted that the major structural timbers were probably all oak and were generally shaped from complete trunks, apart from the rafters which appeared to be thick tangential planks (Figures 2 and 3). Sapwood was definitely present on only one of the timbers sampled but it was too friable to survive coring. The method of conversion suggests that many of the other timbers may only have sapwood and a few heartwood rings missing. The majority of accessible timbers contained less than 50 growth rings and were therefore rejected prior to sampling. Most of those sampled were considered borderline as far as the likely number of rings present. Details of these samples are given in Table 1. The majority of timbers thought to be associated with the initial building phase probably originated from trees under approximately 80 years old when felled. By contrast timber 9 from the inserted floor is likely to have been derived from a tree over 100 years old.

Only two samples (2, 9) were considered suitable for further analysis (Tables 2 and 3). Their ring sequences did not crossmatch so both were compared with numerous dated reference chronologies from the British Isles spanning the medieval period to present day. No reliable results were obtained for either sequence so the timbers remain undated.

Discussion

The inability to date the timbers from The Old Crown highlights two different but common problems associated with tree-ring analysis.

Firstly The Old Crown is mostly constructed of timber which has insufficient rings to be considered suitable for dendro-chronological analysis. The timbers were very wide ringed (ie from fast grown trees) and were probably derived from trees found in a relatively open environment rather than dense woodland where competition would have been more severe resulting in a slower growth rate. The use of such young, fast grown trees in the construction of timber-framed buildings is a recurrent problem which precludes the use of dendrochronology for providing precise dating evidence.

Secondly there are many difficulties associated with the dating of single timbers. It is generally accepted that the more suitable samples there are from a single phase or structure, the greater the prospects of obtaining a date. It is usual to take 6-10 samples per phase in a standing building with the aim of obtaining at least 4 or 5 which are suitable for dating purposes. The production of a phase/site master curve from a number of individual timbers maximises the dating potential (see above). A master sequence of as little as 60 rings may be datable, assuming that there are appropriate reference chronologies available, whereas a single sequence of 80 or even 100 rings may not (see for example Hillam *et al* 1987). In this instance lack of reference material is unlikely to be a problem as there are many chronologies from this region spanning the medieval period, but the relative shortness of the two measured ring sequences must be a major contributory reason for not obtaining a dendrochronological date for The Old Crown.

Acknowledgements

The Sheffield Dendrochronology Laboratory is funded by English Heritage. We are grateful to Nick Molyneux for information about the building. We would also like to thank Ian Tyers for providing unpublished tree-ring software.

References

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Table 1: Details of the tree-ring samples from The Old Crown, Deritend, Birmingham. G - more than 10 rings to the pith; F - less than 10 rings to the pith; V - less than 5 rings to the pith; hs - heartwood/sapwood transition.

Sample number	Location	Total no of rings	Sapwood rings	Pith	Average growth rate (mm/year)	Comment
1	Truss 6; south post; first floor	46	-	V	3.2	-
2	Truss 5/6; west post of porch; first floor	60	?hs	V	1.8	-
3	Truss 4; south post; first floor	43	-	V	3.4	+20mm of sapwood lost during coring
4	Truss 2; west post; first floor	45	-	F	2.9	-
5	Truss 2; east post; first floor	22	-	V	5.9	abuts truss 4
6	Truss 9; east post; first floor	-	-	-	>5.0	abandoned as core fragmented
7	Truss 8; east post; first floor	34	-	F	3.5	-
8	Truss 7; wallplate/ tiebeam; first floor	25	-	V	2.8	-
9	Truss 6/7; inserted floor joist; ground floor	88	-	G	2.4	-

Table 2: Ring width data of The Old Crown sample 2.

year	ring widths (0.01mm)									
1	211	342	195	216	226	270	208	218	222	200
	210	220	257	294	226	394	286	345	259	246
	218	224	301	249	260	83	102	131	144	139
	150	164	120	156	145	116	160	146	126	206
	171	146	219	176	175	164	162	205	187	174
51	167	181	129	72	93	97	82	64	85	131

Table 3: Ring width data of The Old Crown sample 9.

year	ring widths (0.01mm)									
1	372	416	255	397	420	401	393	240	244	282
	321	215	194	226	258	254	296	334	271	247
	201	284	260	160	161	200	124	98	117	79
	160	235	403	421	480	232	170	156	136	189
	208	257	296	197	135	195	221	227	156	129
51	141	140	148	140	245	260	368	439	392	209
	174	130	143	117	120	147	238	156	141	263
	178	227	204	322	330	331	211	324	447	283
	127	195	175	292	187	194	319	317		

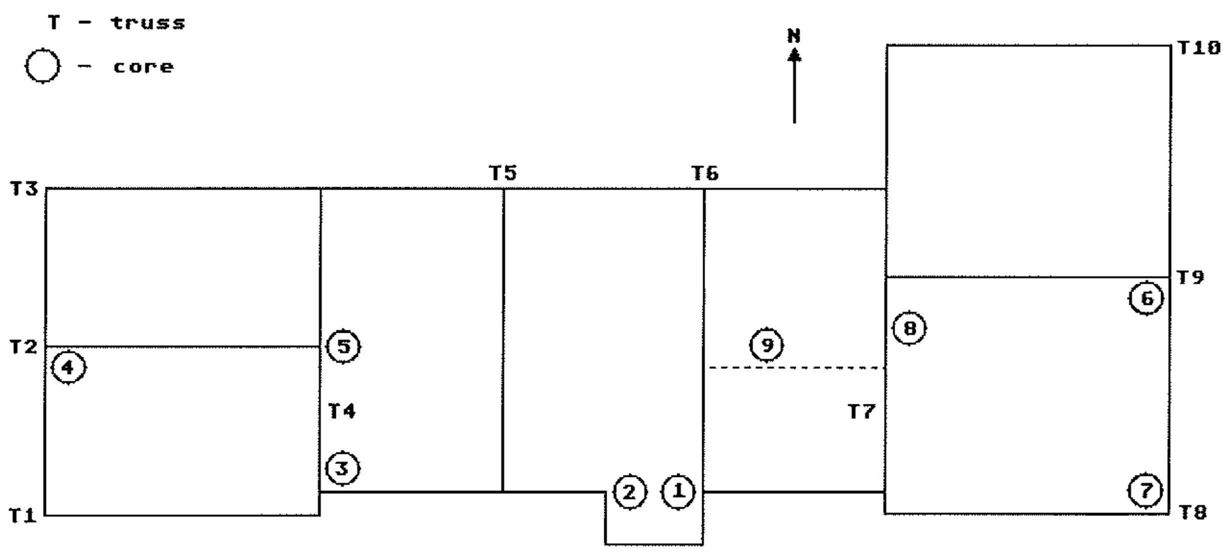

Figure 1: Schematic plan of The Old Crown, Deritend, Birmingham.

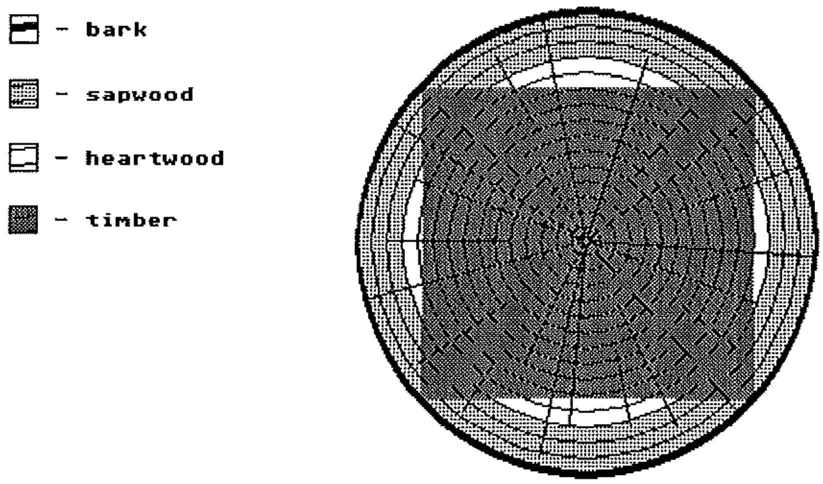

Figure 2: Diagram showing the method of conversion of the majority of the major structural timbers.

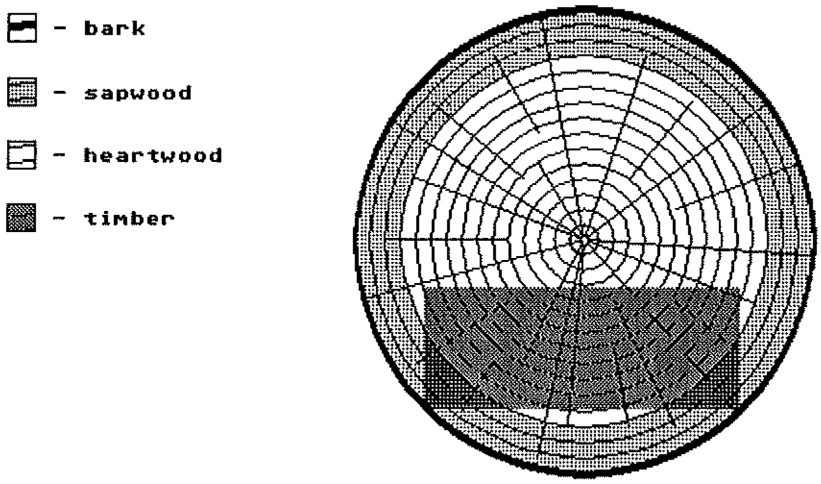

Figure 3: Diagram showing the method of conversion of the rafters.