

Tree-Ring Analysis of Timbers from the Molineux Hotel, Wolverhampton, West Midlands

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Summary

Oak timbers were sampled from two main areas of the building, the basement and the 'Rococo Room'. Only two basement timbers matched each other, of which one retained complete sapwood, and was found to have been felled in the winter of AD 1754/5. Series from four ex situ timbers from the 'Rococo Room' matched each other, and a further three floor timbers formed another group, but neither of these, nor any other timbers dated conclusively.

Keywords

Dendrochronology
Standing Building

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Introduction

The grade II* listed Molineux Hotel (NGR SO 912 989; Fig 1) was built as a house for ironmaster Benjamin Molineux around AD 1720. It has several additions from the mid-eighteenth and mid-nineteenth centuries. It is a three-storey brick building with ashlar dressings and a cellar. The property was converted to a hotel in the AD 1860s, with the grounds becoming the first public park in the town at the same time. When surveyed for listing in AD 1990, the building was noted as being derelict.

In early AD 2005 the property was undergoing major rebuilding and renovation work, and an assessment of the potential for dendrochronological work was carried out by Robert Howard of the Nottingham University Tree Ring Laboratory. In a brief visit, he noted that old timbers were to be found in parts of the basement and in the first-floor 'Rococo Room', but that everywhere else, if timbers remained, they were softwood, and most likely of twentieth-century origin. Those timbers in the Rococo Room were noted as being charred from a recent fire. The opportunity for sampling was only available within a short time period, as the timbers were being removed from the site as part of the ongoing works. Dendrochronological investigation of the remaining timbers was requested by Nick Reading of English Heritage, to inform grant-aided repairs to the building.

Methodology

The site was visited in February 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.

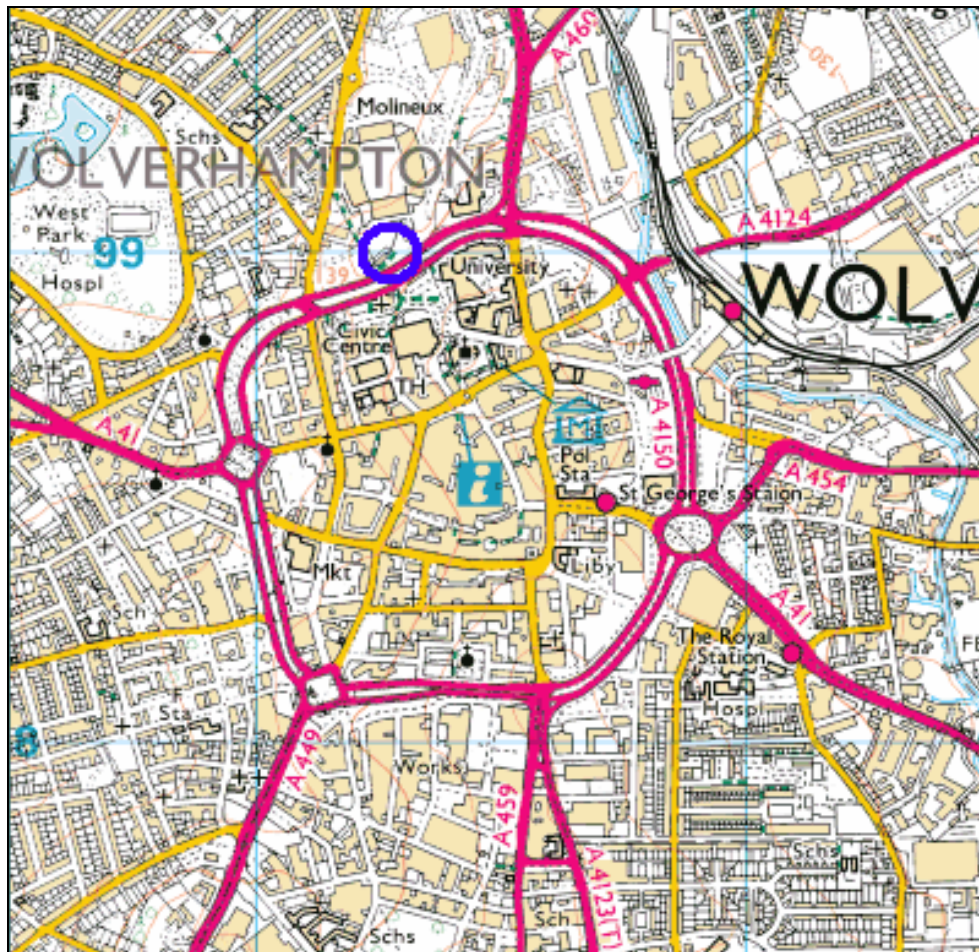


Figure 1: Map showing the location of The Molineux Hotel (circled in blue).

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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 11–41 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).

Results

The basement gave access to six large floor beams, some 13" x 11½" (approximately 330 x 290 mm), of which five were sampled. Two smaller joists were also sampled (Fig 2). The most useful timbers from the Rococo Room (Fig 3) had already been removed, and were identified by the contractors, and sampled *ex situ* before being removed from the property. Details of the samples are given in Table 1.

Cross-matching between the samples revealed a good match between samples **wmh02** and **wmh06** ($t = 7.9$, 75 years overlap) and these were combined to make a new series, **WMH26m**. Four other series matched each other well (Table 2; Fig 4) and were combined to produce a second new series, **WMHMEAN1**, 104 years long. A third series, **WMHMEAN2** was formed from three further timbers (Table 3; Fig 5). The remaining series did not match either of these three new series, nor did they show consistent cross-matching amongst themselves.

The three new series and the remaining individual series were compared with the reference chronology database. **WMH26m** gave consistent matches which dated the series to AD 1639–1754, the best matches being given in Table 4. The relative positions of overlap of the two series are shown in Figure 6. The data for this series are presented in Table 5. No other series gave acceptable consistent matches, and they therefore remain undated.

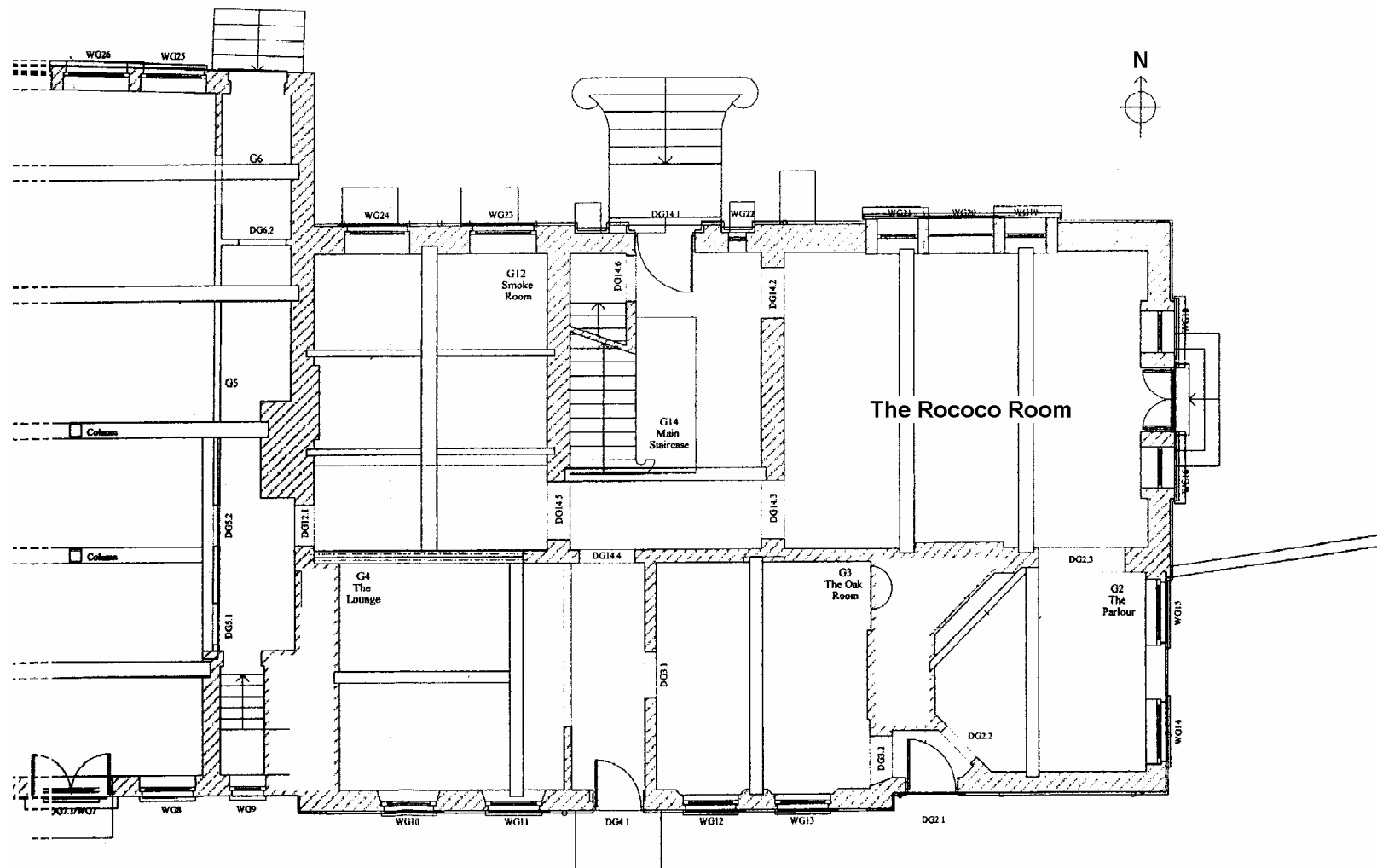


Figure 3: Ground-floor plan of the east end of the Molineux Hotel, showing first-floor structure and the position of the Rococo Room from which *ex situ* timbers were sampled

Table 1: Details of oak (*Quercus* spp.) timbers sampled from The Molineux Hotel, Wolverhampton

Sample Number	Timber and position	No of rings	Mean width (mm)	Mean sens (mm)	Dates AD Spanning	H/S bdry AD	Sapwood complement	Felling seasons and dates/date ranges (AD)
Basement timbers								
WMH01	Floor beam, 4 th from east end	86	1.22	0.24	unknown	-	32C	unknown
WMH02	Floor beam, east end	86	1.89	0.20	1639–1724	-	-	after 1735
WMH03	Floor beam, 2 nd from east end	85	1.82	0.25	unknown	-	H/S	unknown
WMH04	Floor beam, 5 th from east end	50	2.47	0.22	unknown	-	1	unknown
WMH05	Floor beam, 6 th from east end	91	1.22	0.27	unknown	-	1	unknown
WMH06	Joist, 4 th from south	105	1.18	0.21	1650–1754	1732	22C	winter 1754/5
WMH08	Joist, 2 nd from south	50	2.05	0.23	unknown	-	H/S?	unknown
<i>Ex situ</i> Rococo Room timbers								
WMH07	<i>ex situ</i> joist	69	1.89	0.31	unknown	-	H/S	unknown
WMH09	Floor beam	66	2.15	0.26	unknown	-	4	unknown
WMH10	Main axial floor beam	68	2.42	0.20	unknown	-	-	unknown
WMH11	Joist	104	1.68	0.24	unknown	-	-	unknown
WMH12	Joist	76	1.58	0.30	unknown	-	H/S	unknown

Key: h/s bdry = heartwood/sapwood boundary - last heartwood ring date; NM = not measured; mean sens = mean sensitivity; C = complete sapwood. Sapwood estimate of 11–41 used (Miles 1997)

Table 2: Cross-matching between some sample series from Rococo Room timbers

Sample	<i>t</i> - values		
	WMH09	WMH11	WMH12
WMH07	4.4	9.7	6.5
WMH09		5.3	5.0
WMH11			9.3

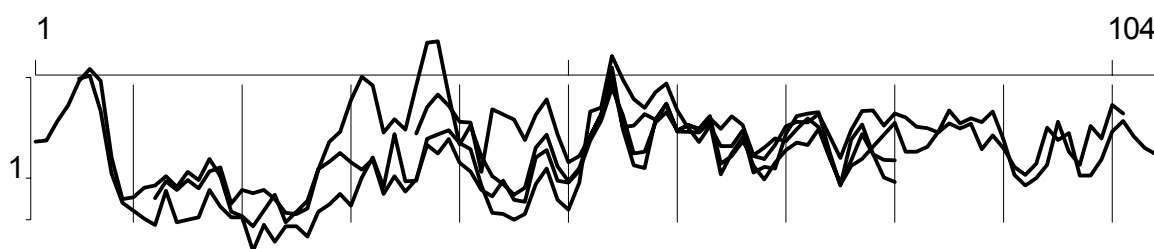


Figure 4: Plots of the series WMH 07, 09, 11, and 12. The y-axis is the width of the ring in mm on a logarithmic scale

Table 3: Cross-matching between some sample floor timbers

Sample	<i>t</i> - values	
	WMH05	WMH10
WMH03	5.4	5.6
WMH05		5.1

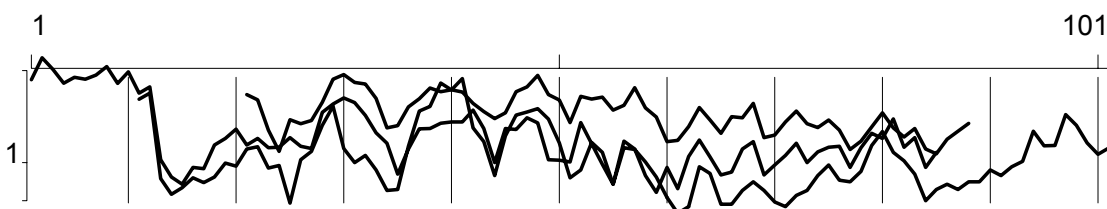


Figure 5: Plots of the series WMH 03, 05, and 10. The y-axis is the width of the ring in mm on a logarithmic scale

Table 4: Dating evidence for the site chronology **WMH26m**, AD 1639–1754
(regional multi-site chronologies have the file name in **bold**)

<i>County or region</i>	<i>Chronology name</i>	<i>Short publication reference</i>	<i>File name</i>	<i>Spanning (yrs AD)</i>	<i>Overlap (yrs)</i>	<i>t-value</i>
Oxfordshire	Ashdown House, Ashdown Park	(Miles and Worthington 2002)	ASHDOWN2	1682–1766	72	5.6
East Midlands	East Midlands Master	(Laxton and Litton 1988)	EASTMID	882–1981	116	5.4
Nottinghamshire	Askham	(Howard <i>et al</i> 2003)	ASKASQ02	1629–1724	86	5.4
Buckinghamshire	Home Farm Barn, Stowe	(Miles <i>et al</i> 2003)	STOWE7	1652–1781	103	5.3
Oxfordshire	Oxfordshire Master Chronology	(Haddon-Reece <i>et al</i> 1993)	OXON93	632–1987	116	5.1
Oxfordshire	Oriel College Tennis Court	(Miles and Haddon-Reece 1994)	ORIEL1	1534–1776	116	5.0
Buckinghamshire	Claydon House	(Tyers 1995)	CLAYDON	1613–1756	116	4.7
Essex	Ramcray	(Tyers 1996)	RAMCRAY	1639–1711	73	4.6
Somerset	St Leonard's Chapel	(Bridge 2002)	FARLEGH2	1662–1756	93	4.6

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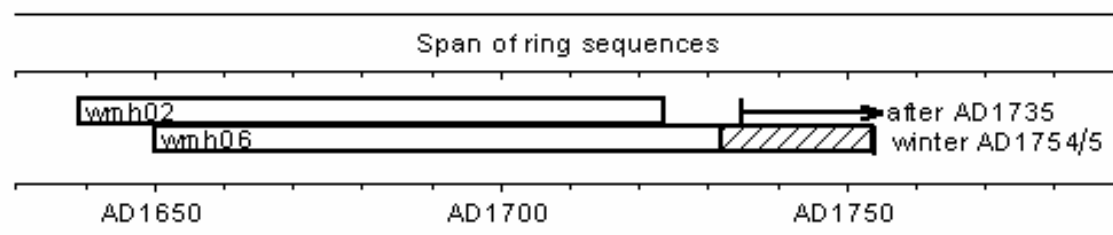


Figure 6: Bar chart showing the relative positions of overlap, and felling dates for the dated timbers

Interpretation and Discussion

Only one timber retained complete sapwood, and this was found to have been felled in the winter of AD 1754/5. It is likely that the timber was used a short time after this date, which is some 35 years after the proposed construction date of the building. This may indicate that the cellar was constructed sometime after the construction of the building, or that a repair took place, and this needs to be addressed by a building historian.

None of the timbers from the 'Rococo Room' dated, although four matched each other very well. It is possible these all came from a single tree, though the statistical matching is poor between some of them. The series are rather 'sensitive' – that is to say that they exhibit high year-to-year variation in ring-width, probably atypical of the region in which they grew. This may result from unusual micro-site conditions, disease or some form of management of the tree.

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Table 5: Ring width data for the dated sequence **WMH26m**, AD 1639–1754

Ring widths (0.01mm)										no of trees									
234	275	317	212	233	278	274	319	304	358	1	1	1	1	1	1	1	1	1	1
327	233	228	245	218	341	371	243	283	295	1	2	2	2	2	2	2	2	2	2
266	310	284	277	315	243	252	177	235	278	2	2	2	2	2	2	2	2	2	2
283	242	264	225	201	109	83	52	60	71	2	2	2	2	2	2	2	2	2	2
77	107	90	109	102	87	62	80	76	87	2	2	2	2	2	2	2	2	2	2
113	92	62	69	62	65	69	72	100	128	2	2	2	2	2	2	2	2	2	2
77	65	44	54	78	107	71	89	91	154	2	2	2	2	2	2	2	2	2	2
163	96	93	94	114	106	125	143	79	78	2	2	2	2	2	2	2	2	2	2
148	147	93	69	66	69	67	57	79	115	2	2	2	2	2	2	1	1	1	1
116	123	124	157	139	149	135	113	128	190	1	1	1	1	1	1	1	1	1	1
176	126	100	69	66	83	115	117	113	100	1	1	1	1	1	1	1	1	1	1
110	150	194	118	108	138					1	1	1	1	1	1				