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Ancient Monuments Laboratory
Report 24/96

THE TREE-RING DATING OF THE OLD MANSION, ST MARY'S STREET, SHREWSBURY, SHROPSHIRE

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Summary

Twelve samples were taken from twelve timbers from The Old Mansion, St Mary's Street, Shrewsbury (SJ 493126). Seven of the timbers sampled were from the first phase of the building (Building A), an open hall comprising bays A - C, whilst the remainder were taken from the twin gable end of Building C to the south west. Four timbers from the first phase dated, one with a precise felling date of summer/autumn AD 1366. One timber from Building C dated, producing a felling date range of AD 1615-1649.

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Table 1: THE OLD MANSION, SHREWSBURY - SUMMARY OF TREE-RING DATING

Sample number		Timber and position	Dates AD spanning	H/S bdry	Sap-wood	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges
BUILDING A: Crown post roof NE Range										
om1	c	S rafter 3rd from E (Truss A)	-		16½C	39	2.66	1.24	0.191	
* *om2*	c	S rafter 4th from E (Truss A)	1322-1365	1349	16½C	44	1.83	0.71	0.178	summer/autumn 1366
om3	c	N rafter 9th from E (Truss A)	-		12½C	33	3.93	1.48	0.318	
* *om4*	c	N rafter Truss C	1324-1359	1353	6	36	2.50	0.59	0.167	1364-1398
* *om5*	c	Principal post South Truss B	1299-1355	1355	H/S	57	3.49	1.07	0.179	1366-1400
om6	c	Stud S wall bay A-B	-		-	30	4.77	0.86	0.169	
* *om7*	c	Corner post North Truss A	1306-1353	1353	H/S	48	3.30	1.55	0.241	1364-1398
om24		Intermediate site master of *om2+om4*	1322-1366			45	2.03	0.64	0.180	
om57		Intermediate site master of *om5+om7*	1299-1355			57	3.39	0.80	0.190	
= *OLDMANS1* site master			**1299-1365**			**67**	**2.78**	**1.00**	**0.191**	
BUILDING C: SW Range										
om11	c	'Cruck' principal rafter	-		13¼C	49	3.34	1.76	0.179	
om12	c	Purlin	-		37C	122	1.01	0.66	0.223	
om13	c	Stud	-		14C	38	2.57	0.82	0.229	
om14	c	Centre post	1514-1606	1604	2	93	1.91	1.64	0.226	1615-1649
om15	c	Centre tiebeam	-		H/S	117	1.90	0.59	0.216	

Key: * = sample included in site-master; **c** = core;
¼,½,C = bark edge present, partial or complete ring: ¼ = spring,
½ = summer/autumn, or C = winter felling;
H/S bdry = heartwood/sapwood boundary - last heartwood ring date;
std devn = standard deviation; **mean sens** = mean sensitivity

THE TREE-RING DATING OF THE OLD MANSION, ST MARY'S STREET, SHREWSBURY, SHROPSHIRE

1. Introduction and objectives

The Old Mansion is a II* listed house hidden away in a courtyard within Shrewsbury town centre (SJ 493126). The original part of the complex (Building A) is situated to the NE corner of the block (Figure 1) and consists of two complete bays of an open hall, with evidence for a further bay to the west separated by remains of an original smoke-blackened daub partition. The original roof structure remains in the eastern two bays and is complete above collar level but for one rafter couple which is truncated. Three crown-posts were found, with down-braces to the tiebeam, the line of these braces is followed beneath by the braces from the tie to the principal posts, creating an overall ogee effect (Figure 3). Evidence for up-braces to a collar purlin was noted, but only one section of collar purlin survives *in situ* at truss A. One soulace was found, again *in situ*, in truss B, with evidence of others in all the other common rafter couples. Some first floor framing survives to the rear (south) wall, including a window opening. No original framing was visible at ground-floor level. A mid-fourteenth century date has been suggested for this primary phase on archaeological grounds.

The hall range was later extended to the south by Building D, as well as with an in-line extension to the west (Building B), incorporating the remains of the third bay from phase 1. Both Buildings B and D are likely to be early post-medieval in date. Building C, to the south of Building B and to the west of Building D, consists of a pair of timber-framed gables facing south, and houses the main staircase as well as subsidiary rooms. The wall-frame is close studded, with straight up-braces and 'V' struts over the gable windows. The design of the staircase and the timber framing would suggest a early to mid seventeenth-century date.

It is thought that the Old Mansion might be the property known as 'Jones' Mansion', owned from the end of the sixteenth century by the Jones family. In the early seventeenth century Jones' Mansion was owned by Thomas Jones, an influential individual who served from 1601 as Bailiff, was appointed Sheriff in AD 1624, and was Mayor in AD 1638. An eighteenth-century plaque hanging in the present stairhall commemorates these appointments, and this plaque was described by the antiquary H Owen in AD 1808 as hanging in the old hall of Jones' Mansion. However, there is some question as to which of the group of buildings about Church Street was actually Jones' Mansion. Nevertheless, it is listed in the 1920's directories as the Old Mansion with 'Jones' Mansion' after it in brackets. From the early 1940's it had been used by the WRVS as an office and store, and by a firm of solicitors. Now unoccupied, a substantial course of repairs is proposed, and in association with this, a thorough analysis of the building was carried out by Richard K Morriss, with a preliminary report produced in April 1995 (Morriss 1995).

The main objectives of the dendrochronological study are to confirm or refute the fourteenth-century date for the important roof structure of Building A, and by dating Building C, to provide an end date for the sequence of buildings on the site.

Figure 1: Site location plan and phasing block plan *(Morriss 1995)*

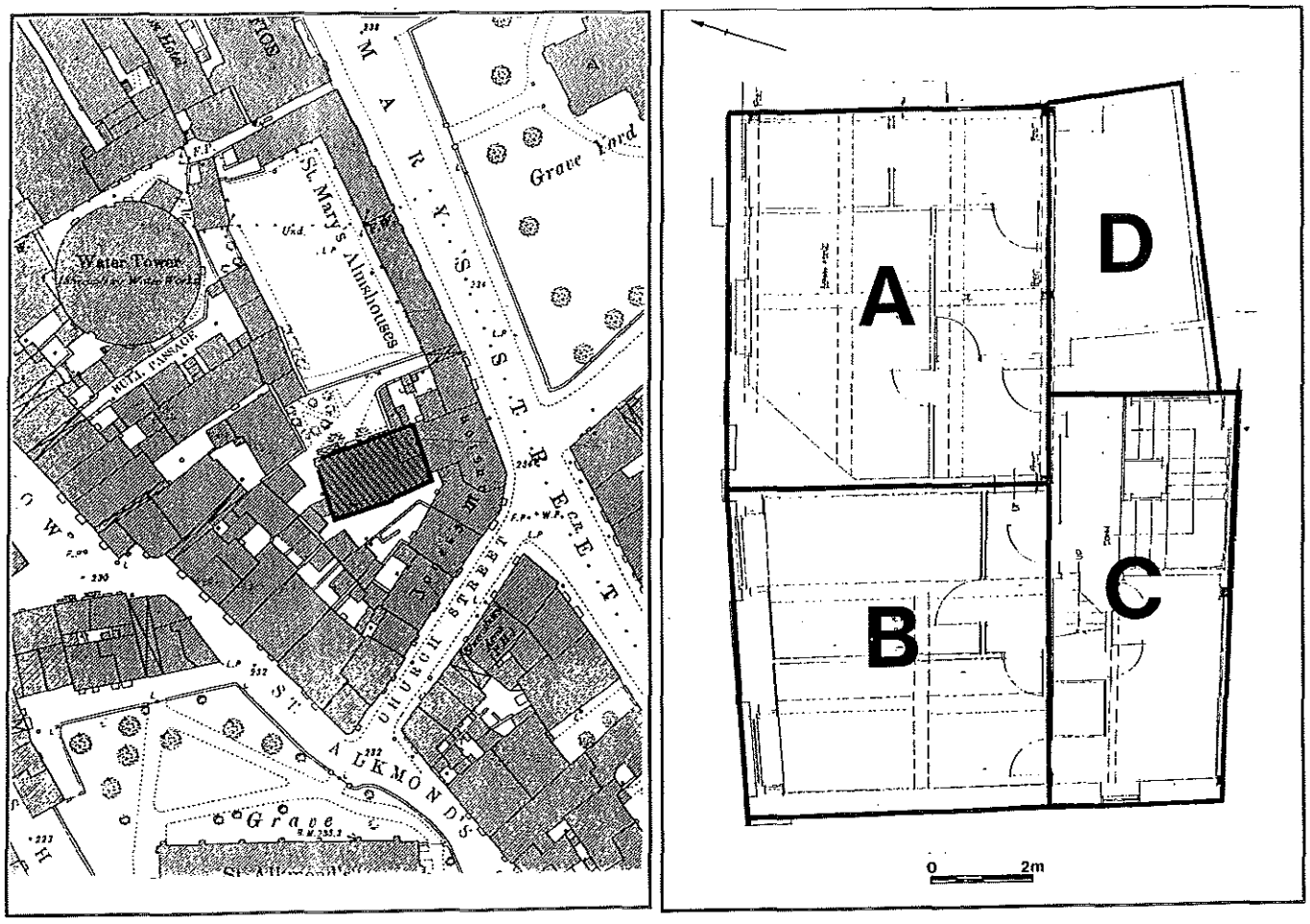


Fig.1: The location of the Old Mansion on the 1882 1:500 OS map

Figure 2: Sections through Hall trusses *(drawing by H Hand and M Moran)*

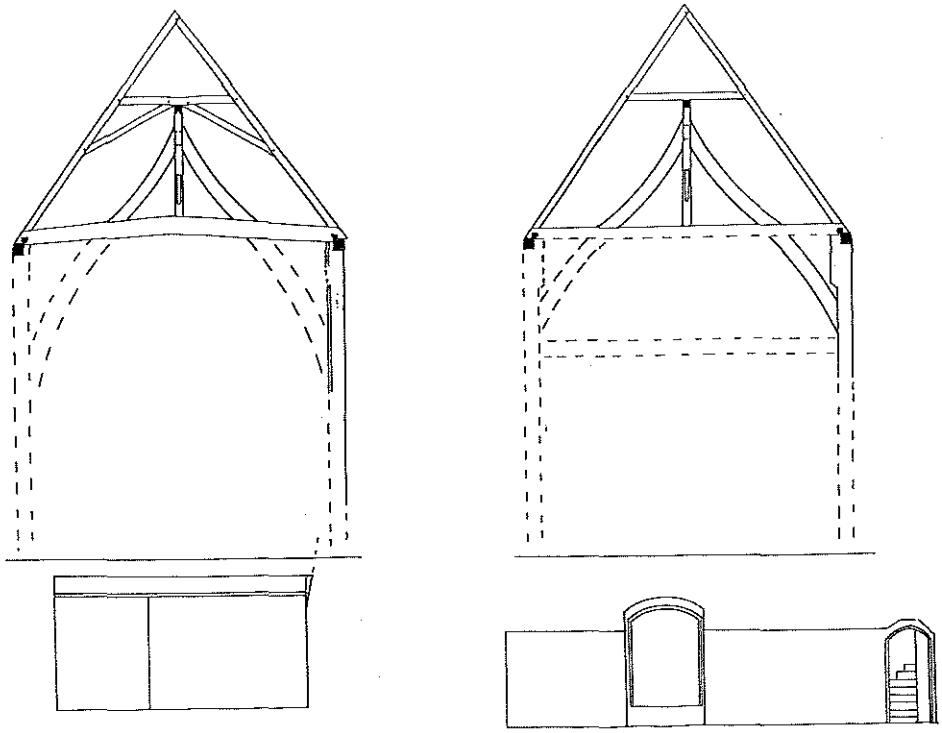


Figure 3: Longitudinal section of Building A *(Morriss 1995)*

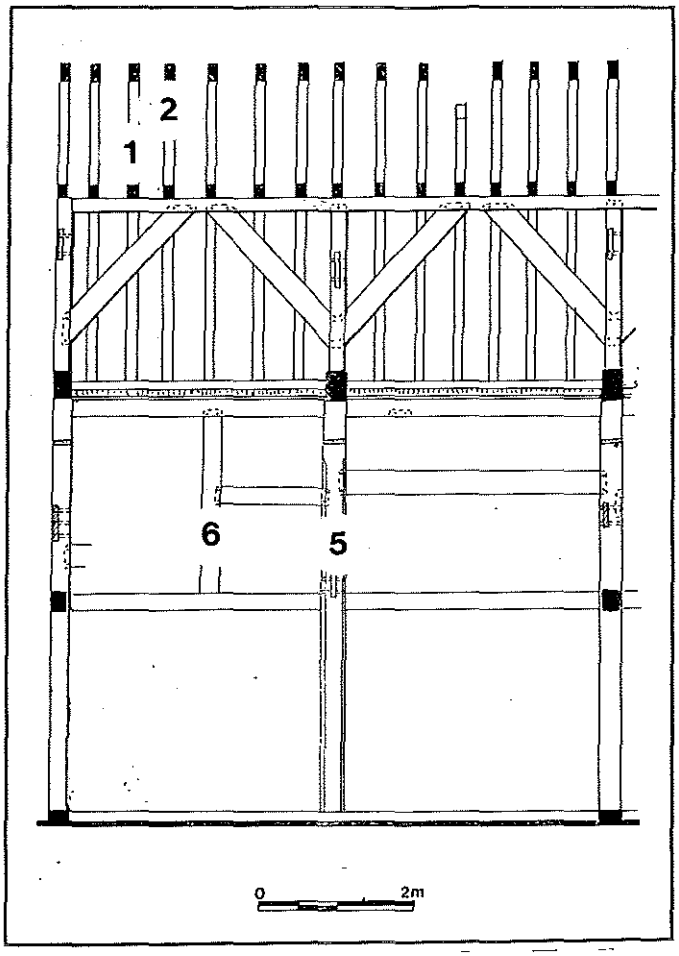
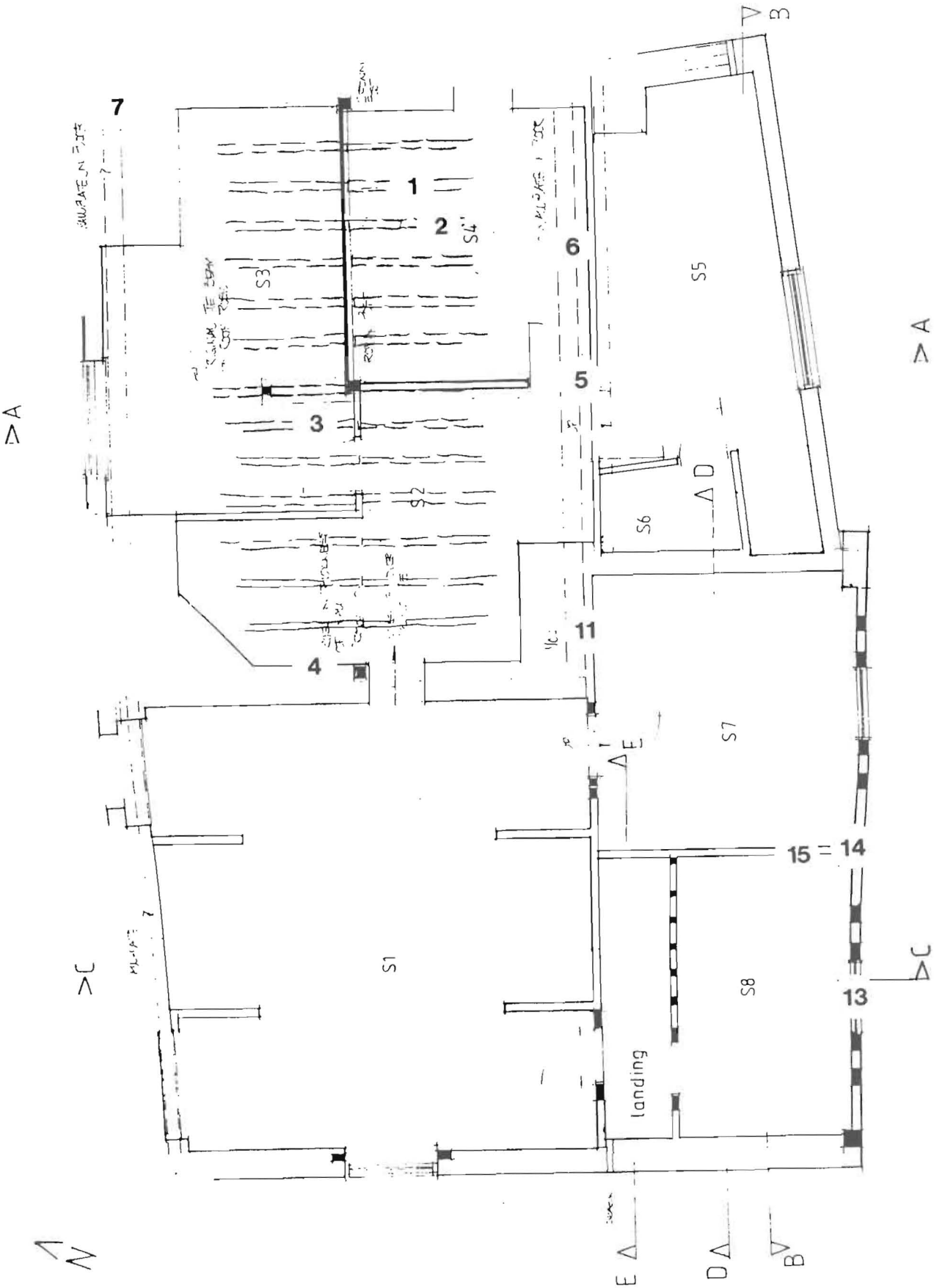


Fig.10: Suggested reconstructed medieval cross-section of Building A

Figure 4: Elevation of Building C showing location of samples *(P Napier)*

Figure 5: Second floor plan showing location of samples *(after P Napier)*



2. Methodology

All oak timbers thought to be primary to the structures under analysis were assessed. Few had more than fifty rings, or complete sapwood. Those timbers which looked most suitable for dendrochronological purposes were sampled through coring, using a 16mm diameter hollow auger. The dry samples were sanded without pre-treatment on a linisher using 60 to 1200 grit abrasive paper to allow the ring boundaries to be clearly distinguished. They were then measured under a x10/x30 microscope using a travelling stage electronically displaying displacement to a precision of 0.001mm, rounded to the nearest 0.01mm.

After measurement, the ring-width series for each sample was plotted as a graph of width against year on log-linear graph paper. The graphs of each of the samples in the phase under study are then compared visually at the positions indicated by the computer matching and, if found satisfactory and consistent, are averaged to form a mean curve for the site or phase. This mean curve and any unmatched individual sequences are compared against dated reference chronologies to obtain an absolute calendar date for each sequence.

Here this was accomplished by using a combination of both visual matching and a process of qualified statistical comparison by computer. Because of the extremely short ring sequences, the samples were first matched visually, and then independently matched by computer. The ring-width series were compared on an IBM compatible 486SX computer for statistical cross-matching using a variant of the Belfast CROS program. Statistical comparisons were made using a maximised *t*-value, those over $t = 3.5$ being considered significant (Baillie and Pilcher 1973). Nevertheless, most dendro-chronologists prefer to see a well-replicated series of matches against local independent chronologies with at least a $t = 5$ or 6. A version of this and other programs were written in BASIC by D Haddon-Reece, late of the Ancient Monuments Laboratory and latterly re-written in Microsoft Visual Basic by M R Allwright and P A Parker. The bar diagram graphics software was written by M R Coome.

Once a tree-ring sequence has been firmly dated in time, a felling date, or date range, is ascribed where possible. With samples which have sapwood complete to the underside of or including bark, this process is relatively straight forward. Depending on the completeness of the final ring, ie if it has only the spring vessels or early wood formed, or the latewood or summer growth, a *precise felling date and season* can be given. If the sapwood is partially missing, or if only a heartwood/sapwood transition boundary survives, then an *estimated felling date range* can be given for each sample. The number of sapwood rings can be estimated by using a statistically derived sapwood estimate with a given confidence limit. Although an accepted national sapwood estimate for British oaks is given as between 10 and 55 rings with a 95% confidence range (Hillam *et al* 1987), a range of 11-45 rings has been found to be more appropriate for Shropshire (Miles forthcoming). If no sapwood or heartwood/sapwood boundary survives, then the minimum number of sapwood rings is added to the last measured ring to give a *terminus post quem.*

Some caution must be used in interpreting solitary precise felling dates. Many instances have been noted where timbers used in the same structural phase have been felled a year or two apart. Where ever possible, a *group* of precise felling dates should be used as a more reliable indication of the *construction period.* It must be emphasised that

dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure under study. However, it was common practice to build timber-framed structures with green or unseasoned timber (Charles 1984).

3. Results

Altogether, twelve samples were taken from both phases of the Old Mansion (Figs 3, 4, and 5). All were of oak and all showed evidence for subsequent shrinkage consistent with being converted prior to seasoning. These were identified by the distinctive shakes and deformed surfaces which would have been straight and true when initially cut by the saw or axe.

Building A

In the first phase, Building A, virtually all of the timbers sampled were either heart sawn (halved), or boxed heart from whole trees. The majority of the trees used to construct the main structure of the first phase hall were between 35 and 70 years old when felled.

Seven samples were taken from this phase, all but one having either the heartwood/sapwood boundary or complete sapwood. The three samples with complete sapwood had most of the summer-wood formed, indicating a late summer/autumn felling period. Only one sample had over 50 rings, and four had fewer than 40 (Table 1). Usually samples with fewer than 50 rings are not considered suitable for dating (Hillam *et al* 1987) but, due to the importance of the site and the existence of strong local chronologies, it was decided to process the samples nevertheless. It was hoped that it would be possible to match these short sequences together to produce a longer site master. This was effected by visually matching samples ***om2*** and ***om4*** together to form an intermediate site mean ***om24***, this visual match was supported by a computer match of $t = 3.58$ (Fig 6). Samples ***om5*** and ***om7*** were similarly combined to form ***om57*** with a $t = 3.75$ (Fig 7). Both these intermediate site means matched the individual components of the other, as well as matching each other at $t = 5.49$ (Fig 8). Therefore, samples ***om2***, ***om4***, ***om5*** and ***om7*** were combined to form a site master ***OLDMANS1*** with 67 rings (Fig 9) . It should be stressed, however, that the t-value matches between the individual components should be treated with some caution because of the shortness of the ring sequences (Table 2).

Figure 6: Graph comparison of ***om2*** Vs ***om4*** at $t = 3.58$

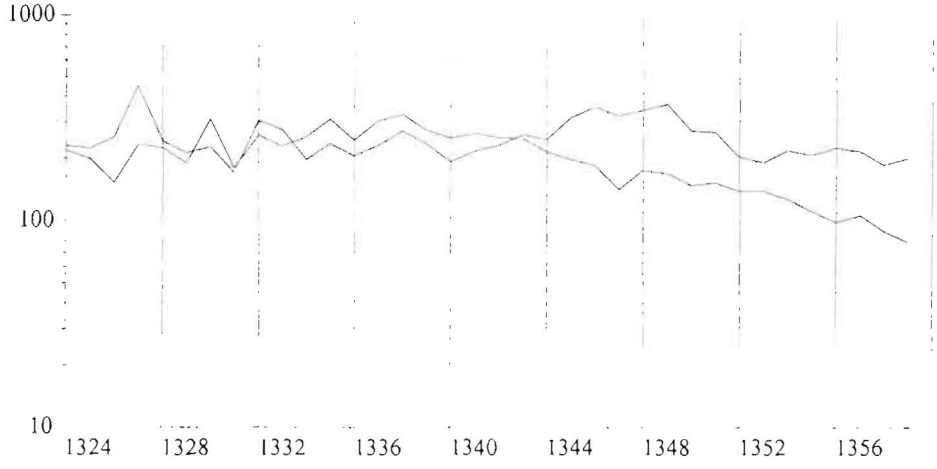


Figure 7: Graph comparison of ***om5*** Vs ***om7*** at $t = 3.75$

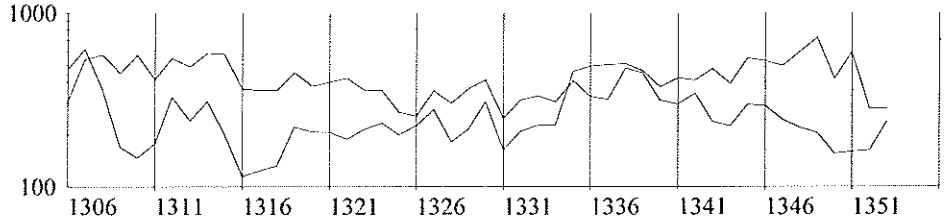


Figure 8: Graph comparison of ***om24*** Vs ***om57*** at $t = 5.49$

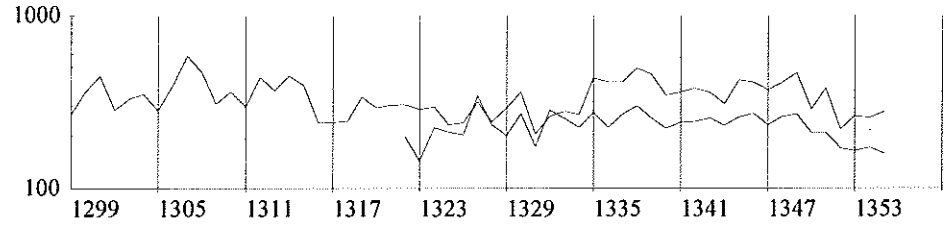


Figure 9: Bar diagram showing dated samples in chronological position

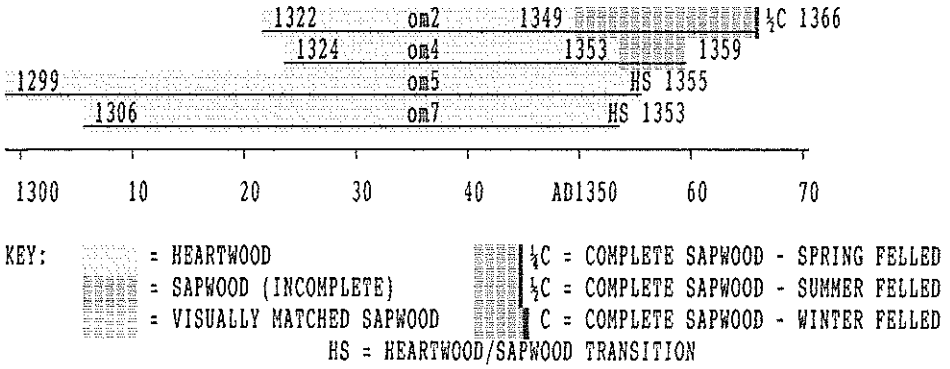


Table 2: *t*-values and overlaps for components of ***OLDMANS1***

	om4	***om5***	***om7***	***om24***	***om57***
	1359	1355	1353	1366	1355
om2	3.59	3.21	3.40	-	3.90
	36	34	32	-	34
om4		3.16	3.34	-	4.22
		32	30	-	32
om5			3.76	4.06	-
			48	34	-
om7				4.42	-
				32	-
om24					5.51
					34

The site master ***OLDMANS1*** was then compared with numerous reference chronologies. Consistent results were obtained when ***OLDMANS1*** spanned the period AD 1299-1365. At this date high *t*-values and good visual matches were obtained with several local reference chronologies (Figs 10 and 11; Table 3). The two intermediate site means, ***om24*** and ***om57***, and all four individual sequences were also compared with the reference chronologies. The consistent results produced were equivalent to the AD 1365 date for ***OLDMANS1***. The results are presented here in full as timbers such as these are not usually considered suitable for dating purposes. The analysis of these short sequences was only carried out as several well replicated local chronologies exist. In the absence of these dating would not have been attempted.

Table 3: Dating of intermediate site means ***om24*** and ***om57*** and site master ***OLDMANS1*** against reference chronologies

Reference chronology	**Spanning**	**t-values overlaps**		
	Vs:	***om24***	***om57***	***OLDMANS1***
	at:	**1365**	**1355**	**1365**
MASTERAL	404-1987	3.81	3.63	4.66
(Haddon-Reece and Miles 1993 unpubl)		44	57	67
* NAGSHEAD	1313-1421	3.90	3.76	4.52
(Miles and Haddon-Reece 1995)		44	43	53
* EASTHOPE	1308-1454	4.06	3.80	4.54
(Miles and Haddon-Reece 1994)		44	48	58
BOWHILL	1292-1468	3.95	4.33	4.76
(Hillam 1991)		44	57	67
* LUDLOW4	1324-1403	4.45	5.07	6.17
(Miles and Haddon-Reece 1995)		42	32	42
37BSBOAT	1313-1476	4.96	3.56	5.01
(Tyers pers comm)		44	43	53
SALOP95	881-1745	4.93	4.21	5.63
(Miles 1995 unpubl)		44	57	67
* PLOWDEN2	1330-1453	4.85	3.79	6.07
(Haddon-Reece and Miles 1992)		36	26	36
* CONDOVER	1318-1444	4.77	3.04	4.83
(Miles and Haddon-Reece 1994)		44	38	48
* MWNLOCK4	1315-1415	4.81	1.74	4.02
(Miles and Haddon-Reece 1993)		44	41	51
EASTMID	882-1981	4.94	3.84	5.14
(Laxton and Litton 1988)		44	57	67
* UPWICH2	946-1415	6.08	3.81	5.29
(Groves and Hillam forthcoming)		44	57	67
LLANSHAY	1319-1432	6.29	4.95	6.59
(Miles and Haddon-Reece forthcoming)		44	37	47

* indicates components of SALOP95

Figure 10: Graph comparison of ***OLDMANS1*** Vs ***EASTMID*** at $t = 5.14$

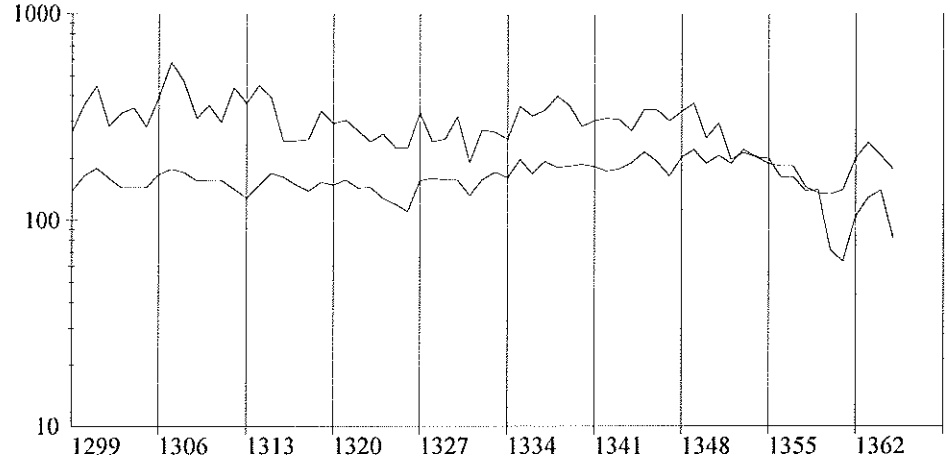
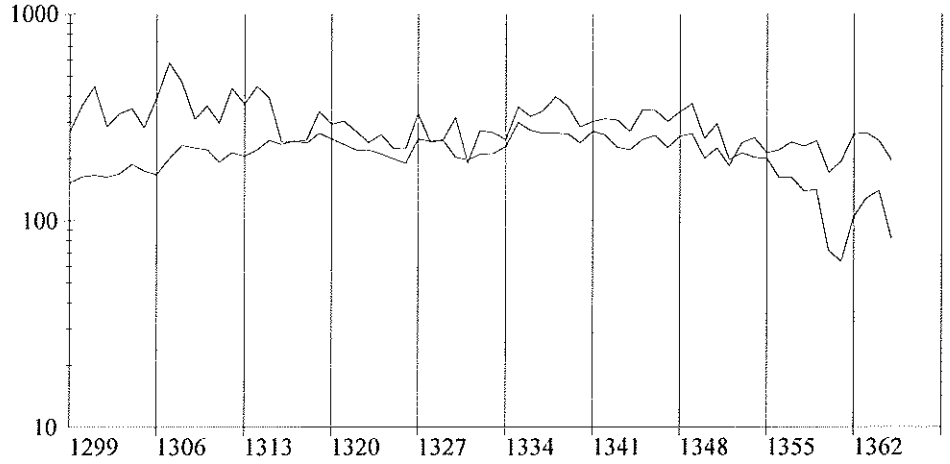


Figure 11: Graph comparison of ***OLDMANS1*** Vs ***SALOP95*** at $t = 5.63$



The other three samples were then compared against ***OLDMANS1***, but none matched conclusively, therefore these remain undated.

Of the four samples which dated, only sample ***om2*** had bark edge present. As the final ring of sapwood had the spring growth as well as much of the summer-wood formed, a felling season of late summer/autumn of the following year, AD 1366 is given. Felling date ranges were calculated for the other three dated samples (Table 1) using the local sapwood estimate of 11-45 rings for Shropshire (Miles forthcoming). These dates would confirm the proposed construction of the open hall based on architectural details.

Building C

Of the five samples taken from Building C, three had more than 80 rings, and three samples had complete sapwood, although two of these were less than 50 rings. Both samples ***om12*** and ***om13*** had the final ring complete, ie both spring-wood and summer-wood had been fully formed, which indicated that the trees were felled during the winter, from about the October of the last measured ring to about March of the following year. Sample ***om11*** had only the spring vessels formed in the final ring, indicating a felling season of about May or June of the following year (Baillie 1982). However, no intra-site matching was found between any of the samples. Therefore, all but the shortest samples were individually compared against the reference chronologies with sample ***om14***, with 93 rings, dating. Its ring sequence was dated to the period AD 1514-1606 (Table 4). As ***om14*** has 2 rings of sapwood, a felling date range of AD 1615-1649 is obtained, again based on the 95% probability of sapwood rings of between 11-45 for Shropshire. This suggests an early to mid seventeenth-century date for this phase of construction although it should be noted that this date has been produced by only a single timber. Again, this date range would fit well with the estimated date of the timber framing and staircase based on stylistic evidence.

Table 4: Dating of ***om14*** against reference chronologies at AD 1606

Reference chronology	Spanning	Overlap	t-value
SALOP95 *(Miles 1995 unpubl)*	881-1745	93	4.25
* UPWICH3 *(Groves and Hillam forthcoming)*	1454-1651	93	4.43
* HGROVNR9 *(Miles and Haddon-Reece 1994)*	1442-1590	77	4.79
* OLDFIELD *(Miles and Haddon-Reece 1994)*	1404-1572	59	4.87
* LANGLEY *(Hillam and Groves 1993)*	1491-1600	87	4.95
OLDHLLFM *(Miles and Haddon-Reece forthcoming)*	1379-1630	89	5.10
MASTERAL *(Haddon-Reece and Miles 1993 unpubl)*	404-1987	93	5.39

* indicates components of SALOP95

Table 5: Ring-width data of the site master curve

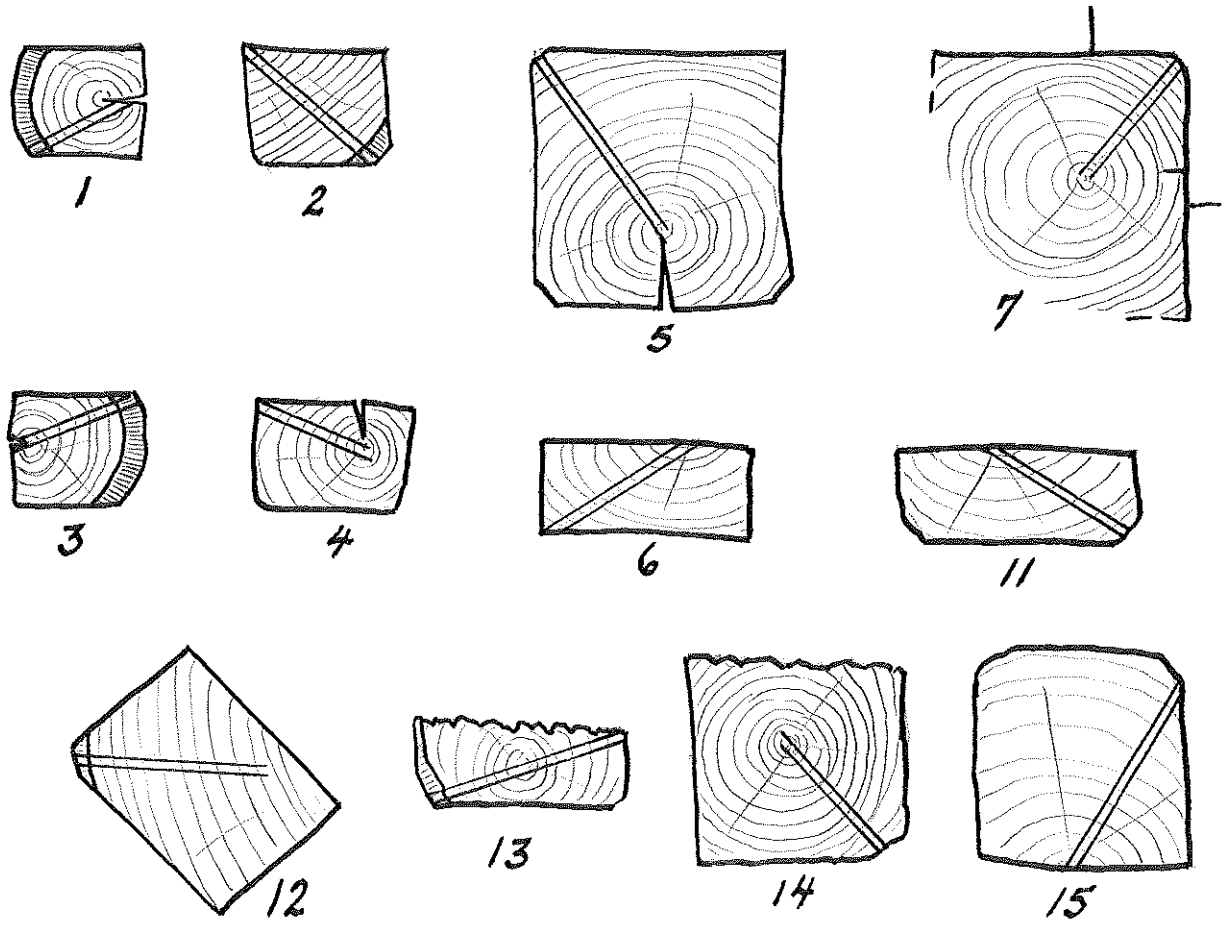
OLDMANS1 AD 1299-1365 The Old Mansion, Shrewsbury, Salop 2+4+5+7

ring widths (0.01mm)										number of trees per year									
268	363	446	285	330	348	282	391	580	467	1	1	1	1	1	1	1	2	2	2
309	359	296	437	366	447	392	240	241	245	2	2	2	2	2	2	2	2	2	2
337	293	303	269	239	260	223	222	329	238	2	2	2	3	3	4	4	4	4	4
246	315	190	272	266	246	353	318	339	397	4	4	4	4	4	4	4	4	4	4
356	283	301	309	306	269	341	340	301	334	4	4	4	4	4	4	4	4	4	4
366	248	294	196	212	201	198	161	161	138	4	4	4	4	4	3	3	2	2	2
140	71	63	104	128	139	82				2	1	1	1	1	1				

om14 AD 1514-1606 The Old Mansion, Shrewsbury - centre post Building C

378	400	450	275	583	654	450	643	666	417
391	374	410	441	665	493	352	499	282	243
230	307	315	410	278	290	232	176	142	260
211	222	171	192	154	149	155	221	125	109
080	068	072	059	066	082	123	117	198	130
114	105	071	059	065	066	076	067	066	056
087	115	090	067	069	073	076	090	050	071
084	088	122	102	166	086	091	108	092	108
109	097	061	042	053	043	060	055	069	061
070	045	050							

Figure 11: Sections of timbers sampled



4. Conclusion

Despite the apparent poor suitability of the samples for dendro purposes, dates nevertheless were produced for both phases. From the first phase, Building A, four samples with very short sequences matched together to produce a 67 ring sequence which dated to AD 1299-1365 against local reference chronologies. The detailed analysis showed that most of the timbers used to construct the first phase building were from trees aged between 35 and 70 years old when felled.

Although a felling date of late summer/autumn AD 1366 is given for ***om2***, it must be emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure which is being sampled. Although it was usual for construction to commence within a year or so of felling, dendrochronology has shown that in some instances several years may elapse between felling and construction (Miles and Haddon-Reece 1993; 1994; 1995). Therefore isolated felling dates should be treated with a degree of caution in interpreting a construction period.

The last phase, Building C, produced only one dated timber with an estimated felling date range of AD 1615-1649. Three other samples had complete sapwood, but none dated or matched with any of the other samples. Again, much of the timber used to construct this range was of poor quality, both structurally and from the point of view of dendrochronology, most having few rings and little sapwood.

5. Acknowledgements

The author is grateful to Mrs Madge Moran and Mr Henry Hand for site assistance and drawings, and to Mr Robert Brown for assistance in the Laboratory. Particular appreciation goes to Miss Cathy Groves of the English Heritage funded Sheffield University Dendrochronology Laboratory for independent confirmation of the dating and assistance with the production of this report. Acknowledgements are also given to the Ancient Monuments Laboratory of English Heritage, Sheffield Dendrochronology Laboratory, and I Tyers, formerly of the Museum of London Archaeology Service (MoLAS) but now at Sheffield, for both published and unpublished data.

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Table 5: Ring-width data of the site master curve

OLDMANS1 AD 1299-1365 The Old Mansion, Shrewsbury, Salop 2+4+5+7

ring widths (0.01mm)	**number of trees per year**
268 363 446 285 330 348 282 391 580 467	1 1 1 1 1 1 1 2 2 2
309 359 296 437 366 447 392 240 241 245	2 2 2 2 2 2 2 2 2 2
337 293 303 269 239 260 223 222 329 238	2 2 2 3 3 4 4 4 4 4
246 315 190 272 266 246 353 318 339 397	4 4 4 4 4 4 4 4 4 4
356 283 301 309 306 269 341 340 301 334	4 4 4 4 4 4 4 4 4 4
366 248 294 196 212 201 198 161 161 138	4 4 4 4 4 3 3 2 2 2
140 071 063 104 128 139 082	2 1 1 1 1 1

om14 AD 1514-1606 The Old Mansion, Shrewsbury - centre post Building C

378 400 450 275 583 654 450 643 666 417
391 374 410 441 665 493 352 499 282 243
230 307 315 410 278 290 232 176 142 260
211 222 171 192 154 149 155 221 125 109
080 068 072 059 066 082 123 117 198 130
114 105 071 059 065 066 076 067 066 056
087 115 090 067 069 073 076 090 050 071
084 088 122 102 166 086 091 108 092 108
109 097 061 042 053 043 060 055 069 061
070 045 050

Figure 11: Sections of timbers sampled