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THE TREE-RING DATING OF THE CHURCH OF ST MARY MAGDALENE, LITTLE HEREFORD, HEREFORD AND WORCESTER

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Summary

Three slices were taken from solepieces discarded during recent restoration work to the nave roof of the Church of St Mary Magdalene, Little Hereford, (SO 554 680). Despite two samples matching together to form a mean chronology of 71 rings, no dates were produced. Only the collars, soulaces, and the underside of the rafters were still visible in situ, but appeared to be of boxed-heart converted timbers with few growth rings, and therefore unsuitable for dendrochronology

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THE TREE-RING DATING OF
THE CHURCH OF ST MARY MAGDALENE,
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1. INTRODUCTION AND OBJECTIVES

The Church of St Mary Magdalene (SO 554 680; Fig 1) is built mainly of local sandstone rubble and consists of a nave, chancel, and sturdy west tower. There are no aisles or side chapels. The western 5m or so of the north nave wall is of Norman date, but most of the rest of what is a very wide nave appears to be of thirteenth-century date, as does the tower. The nave is just over 18m long and 11m wide overall (Fig 2). The roof structure consists of 29 rafter-couples consisting of upper and lower collars, the lower collars are braced with straight soulaces and supported at the feet by ashlars tenoned into inner wallplates and the outer end of the rafters morticed into solepieces which are morticed into the back of the ashlars and are halved over an outer plate. There were originally three tiebeams, of which the centre one still remains (Fig 3). Further details of the roof may be found in Morriss (1996).

The object of the dendrochronological survey was to date the roof structure of the nave, and thereby date another example of an arch-braced rafter-coupled or barrel-vaulted roof. Such roofs are very common from the fourteenth century through to the sixteenth century, and identifying and dating typological examples would help in developing a chronological framework which would be of value in dating other comparable roofs. Examples of other such roofs which have been dated through dendrochronology include:

Lydiard Millicent, Wilts -	1341	(Miles in prep)
Hardham, West Sussex -	1357	(Laxton *et al* 1996)
Latton, Wilts -	1465	(Miles in prep)
Mottisfont Abbey, Hants -	1539	(Miles 1996)

Undated examples include:

Frome St Quinton, Dorset	(Miles 1994)

Recent repair works to the nave roof during 1995/6 produced a number of discarded solepieces which were badly infested with death-watch beetles. One of these (***lhc1***) was in the possession of Richard Morriss, and the other two (***lhc2*** and ***lhc3***) were among half a dozen fragments retained in the church tower. The other samples had too few rings to be suitable for dating.

2. METHODOLOGY

All samples taken were from what appeared to be primary first-use oak (*Quercus* spp.) timbers with more than 50 rings. These were obtained by sawing sections from solepieces replaced during repair works. None of the timbers retained any sapwood, but did appear to retain evidence for heartwood/sapwood boundaries (Fig 4).

The dry samples were sanded on a linisher using 60 to 1200 grit abrasive paper, and were cleaned with compressed air, 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 0.01mm. After measurement, the ring-width series for each sample are 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. 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 (Baillie and Pilcher 1973). A version of this and other programmes were written in BASIC by D Haddon-Reece, and latterly re-written in Microsoft Visual Basic by M R Allwright and P A Parker.

3. RESULTS

Three samples were obtained from the solepieces of the nave roof and were designated ***lhc1***, ***lhc2***, etc. The precise locations of the solepieces removed from within the nave were not recorded during the repair works. Details of each sample, including locations, date ranges, sapwood, number of rings, and other characteristics are summarised in Table 1.

Two radii were measured from first timber, with ***lhc1a*** having 61 rings, and ***lhc1b***, of 33 rings which was thought might further extend the sequence. These matched with a *t*-value of 2.64 with 25 years overlap, which was confirmed by the visual comparisons of the graphs. These were combined to form a 69-ring mean chronology ***lhc1***.

Similarly, two radii were measured from the second timber, ***lhc2a***, with 69 rings, and ***lhc2b*** of 39 rings. These matched with a *t*-value of 4.18 with an overlap of 39 rings, with ***b*** finishing 5 years behind ***a***. These were combined to form a 69-ring mean chronology ***lhc2***.

One radius from sample ***lhc3*** was measured and comprised 70 rings.

Sample ***lhc1*** was found to match ***lhc3*** with a *t*-value of 8.82, and were combined to form the mean ***lhc13*** of 71 rings (Table 2). Sample ***lhc2*** did not match very well against either ***lhc1*** or ***lhc3*** individually (Table 3), but an improved match was found with the mean of the two, ***lhc13***, with a *t*-value of 4.71. All three samples were combined to form ***lherefd***, again of 71 rings.

Both the means ***lhc13*** and ***lherefd*** were compared against the reference chronologies, but no conclusive dating was obtained. The three individual samples were also compared against the reference chronologies, but again no positive matches were produced.

4. CONCLUSION

Despite two of three samples matching together well to form a site chronology of 71 rings, and with the third sample matching this mean, no conclusive dating was found against the reference chronologies. The boxed-heart method of conversion combined with wide ring widths common in the other roof timbers gives little hope in obtaining long ring sequences which would be needed to date the structure. However, should other repairs involve access to other solepieces or wall-plates, at present concealed behind plasterwork, then it might be possible to date the structure if other similar or longer sequences can be obtained.

5. ACKNOWLEDGEMENTS

The author is grateful for the assistance of Mr Richard Morriss, Upper Bromlow, Shropshire for the recording of the roof, retaining offcuts for tree-ring analysis, and for arranging the site visit. Mr Michael Worthington assisted in the laboratory. Acknowledgements are also given to the Ancient Monuments Laboratory and Sheffield Dendrochronology Laboratory for both published and unpublished data.

6. REFERENCES

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Table 1: Summary of tree-ring dating

Sample number		Timber and position	Dates AD spanning	H/S bdry	Sapwood	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges
CHURCH OF ST MARY MAGDALENE, LITTLE HEREFORD										
* *lhc1a*	s	Sole piece	-			61	1.79	0.74	0.235	
b	s	ditto	-			33	2.30	0.58	0.170	
lhc1		Mean of *lhc1a* + *lhc1b*	-			69	1.85	0.73	0.219	
lhc2a	s	Sole piece	-			69	2.01	0.77	0.159	
b	s	ditto	-			39	1.98	0.39	0.145	
lhc2		Mean of *lhc2a* + *lhc2b*	-			69	2.12	0.71	0.144	
* *lhc3*	s	Sole piece	-			70	2.19	0.58	0.199	
*=*lhc13*		Mean of *lhc1* + *lhc3*	-			71	2.04	0.56	0.197	
*=*lherefd Site Master*			-			71	2.08	0.50	0.169	

Key: * = sample included in site-master; s = slice; = pith included in sample; = within 10 rings of centre;
H/S bdry = heartwood/sapwoodboundary - last heartwood ring date; std devn = standard deviation; mean sens = mean sensitivity

Table 2: Ring-width data for site master curves

lhc13 Little Hereford Church - nave solepieces - *lhc1+lhc3*
71 rings

ring widths (0.01mm)	number of samples in master
264 215 273 267 162 214 110 114 126 254	1 2 2 2 2 2 2 2 2 2
215 180 99 168 229 252 229 164 156 196	2 2 2 2 2 2 2 2 2 2
130 201 159 115 124 117 129 152 119 125	2 2 2 2 2 2 2 2 2 2
157 180 167 209 264 210 229 187 168 196	2 2 2 2 2 2 2 2 2 2
198 155 171 196 234 227 174 182 188 236	2 2 2 2 2 2 2 2 2 2
264 295 243 259 204 256 267 328 281 273	2 2 2 2 2 2 2 2 2 2
231 217 279 255 244 184 156 231 227 352	2 2 2 2 2 2 2 2 2 1
272	1

Table 3: *t*-values and overlaps for components of *lherefd*

Sample:	*lhc2*	*lhc3*
dated at:	69	71
lhc1	3.96	8.82
	69	68
lhc2		4.13
		68

Figure 1: Location plan

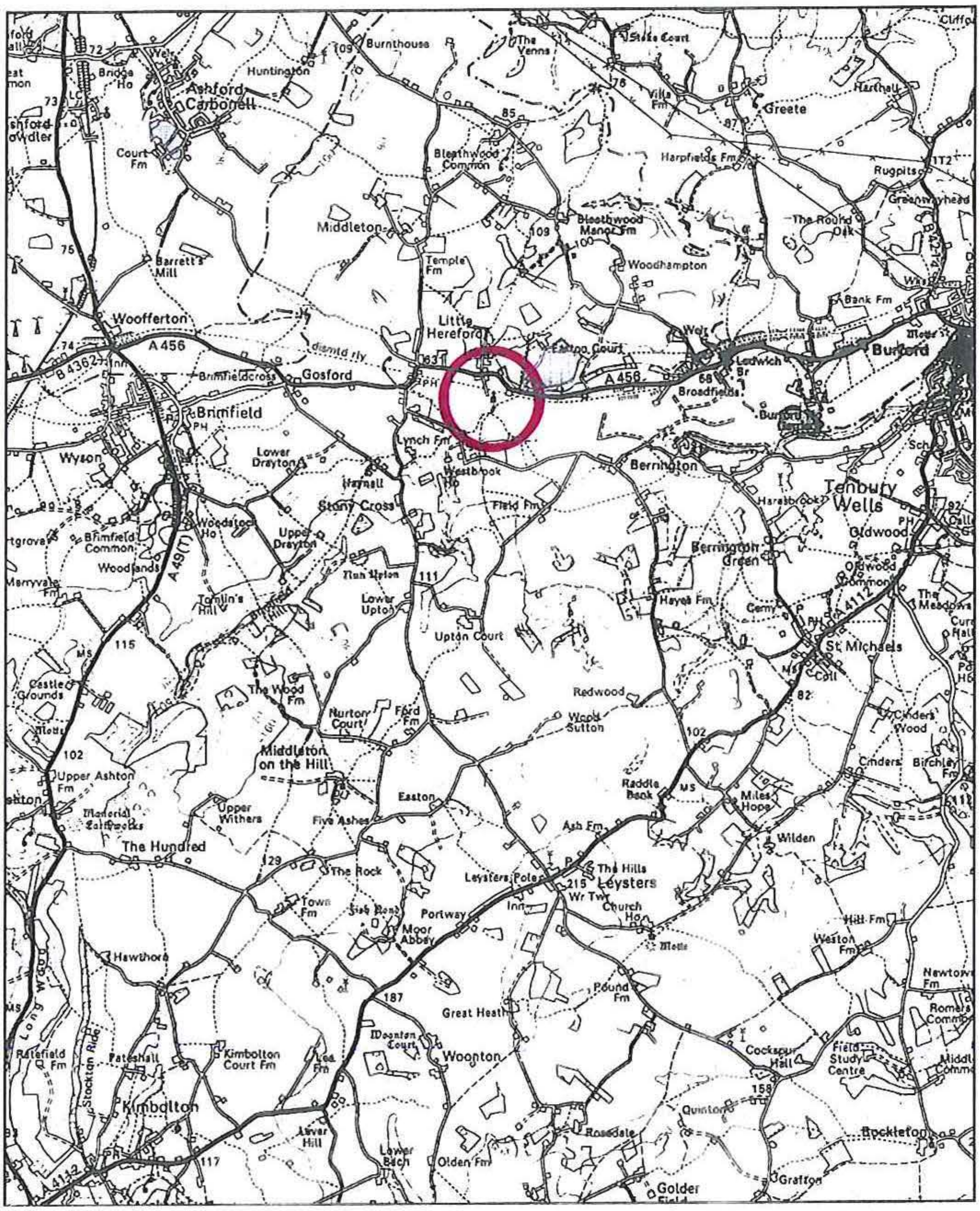


Figure 2: Plan of Church *(after John Wheatley)*

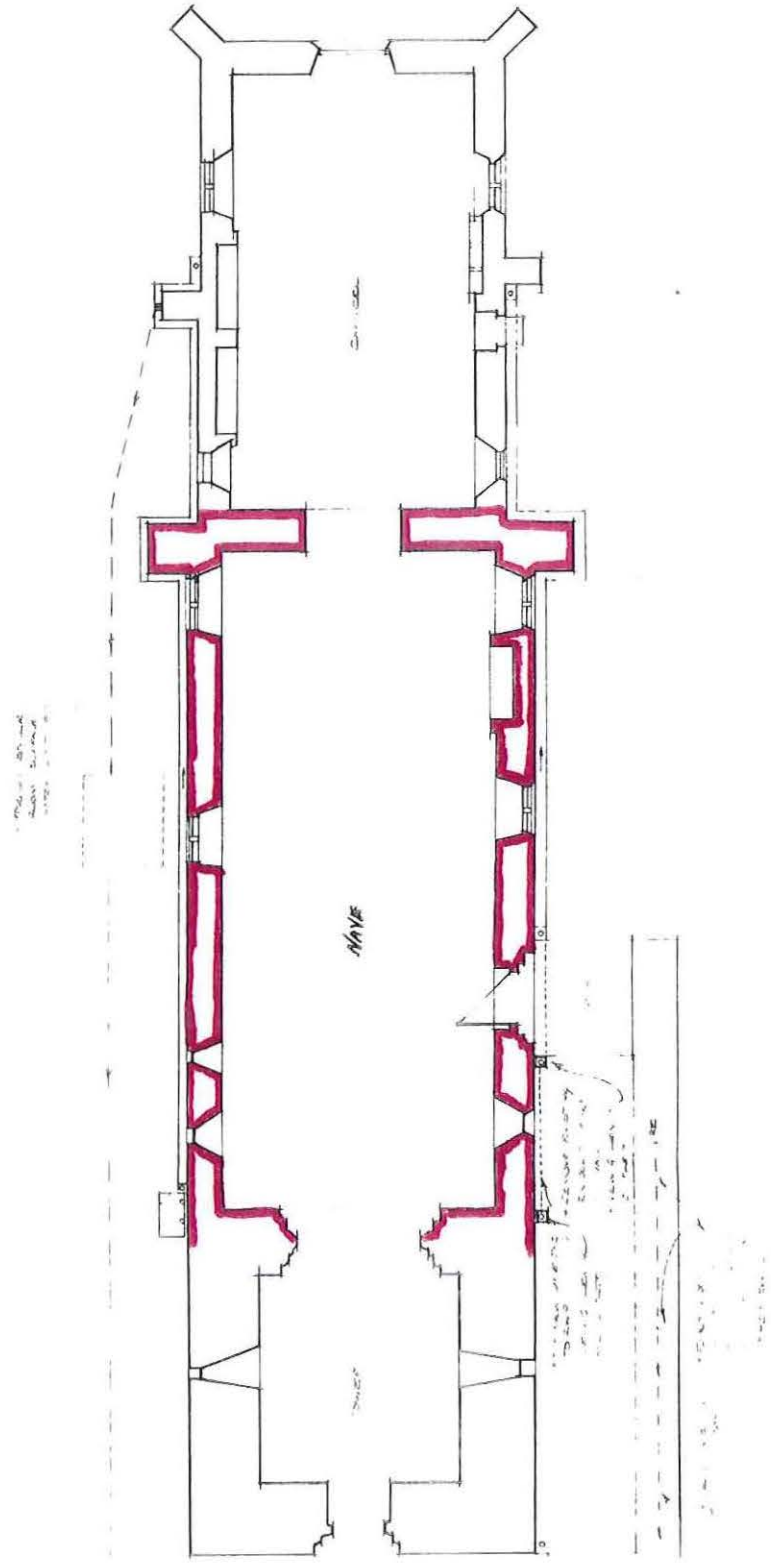


Figure 3: Diagrammatic sketch of roof trusses *(after John Wheatley)*

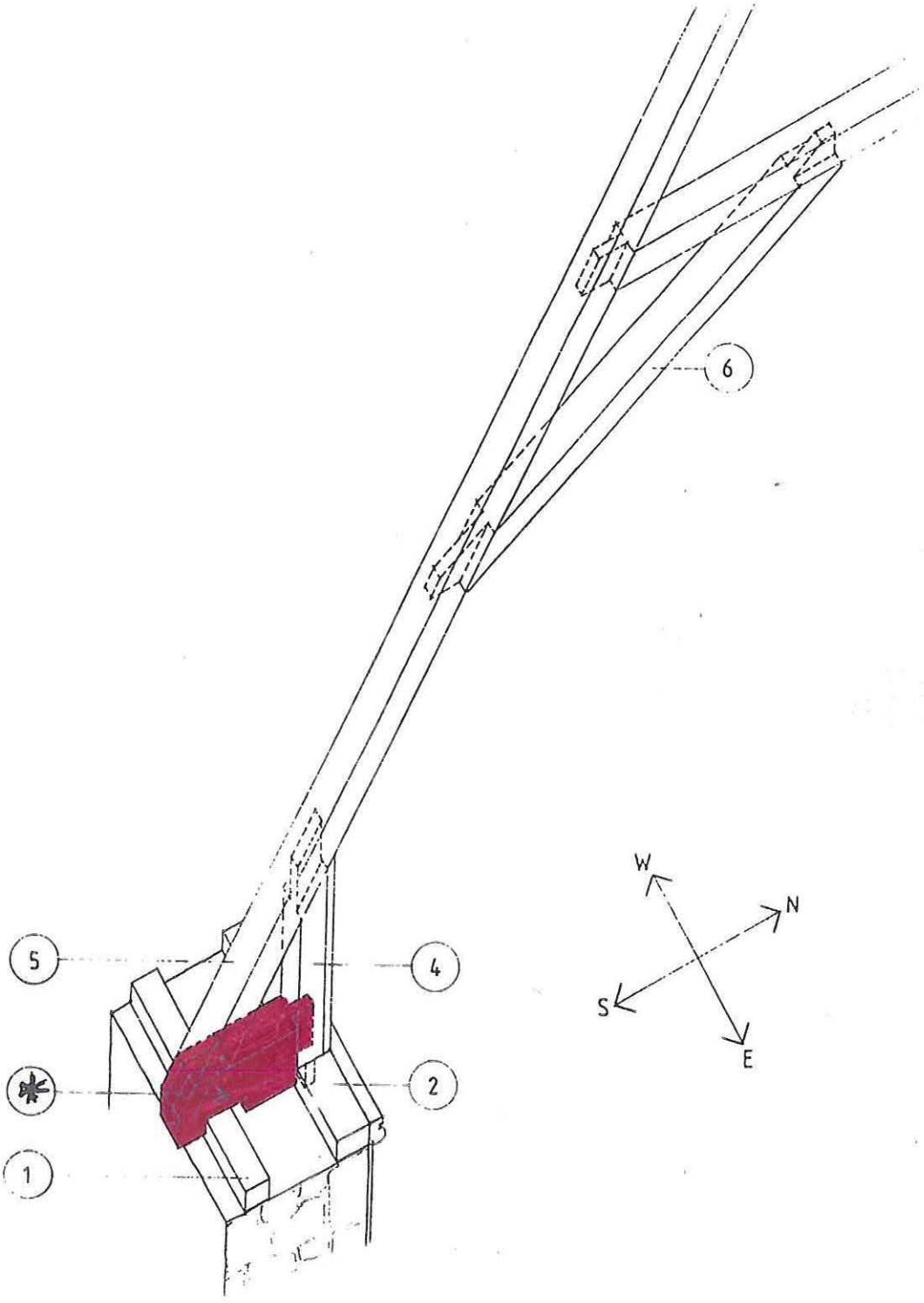
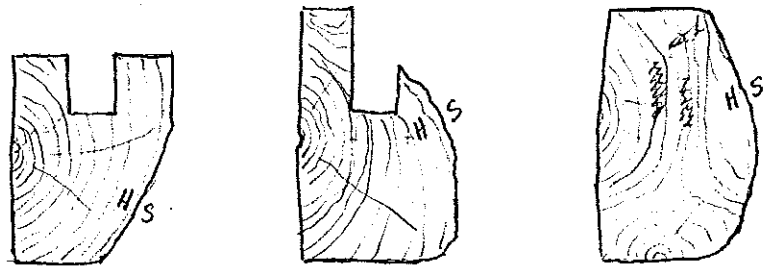


Figure 4: Sections of timbers sampled *(Scale 1:8)*



lhc1 *lhc2* *lhc3*