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ST ANDREW'S CHURCH, CHEDDAR, SOMERSET
TREE-RING ANALYSIS OF FURTHER TIMBERS FROM THE NAVE ROOF AND CEILING

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Dr Martin Bridge

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NGR ST 4595 5302

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SUMMARY

A number of wallplates had previously yielded reasonably long tree-ring series which did not date. Access to the upper part of the roof allowed sampling of additional elements of the roof, along with three boards and a beam from the ceiling. Sequences from two ceiling boards were found to match a series from the wallplates, and a new 188-year site chronology was formed, but neither this, nor any of the other sequences from this or the previous study yielded dates.

CONTRIBUTORS

Dr Martin Bridge

ACKNOWLEDGEMENTS

This work was commissioned by Peter Marshall of the Scientific Dating Service, English Heritage. I would like to thank the Reverend Daley for allowing access to the site, Cathy Tyers (Sheffield University) and John Meadows for their useful comments on an earlier draft of this report.

ARCHIVE LOCATION

Somerset Historic Environment Record
Somerset County Council
Taunton Castle
Taunton
TA1 4AA

DATE OF INVESTIGATION

2003–8

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INTRODUCTION

St Andrew's Church (NGR ST 4595 5302; Fig 1) is a grade I listed parish church. It was mostly built in the fourteenth and fifteenth centuries and was restored by William Butterfield in AD 1873. The nave ceiling is thought to be fourteenth-century and was coloured and guilded in the Butterfield restoration (Fig 2). An opportunity arose to sample the ceiling and wallplates of the roof in October 2003, but on that occasion, no ceiling timbers could be sampled, and none of the wallplates yielded any dates (Bridge 2004). Following this study, access to the roof timbers in the space over the ceiling was arranged, and a follow up investigation undertaken.

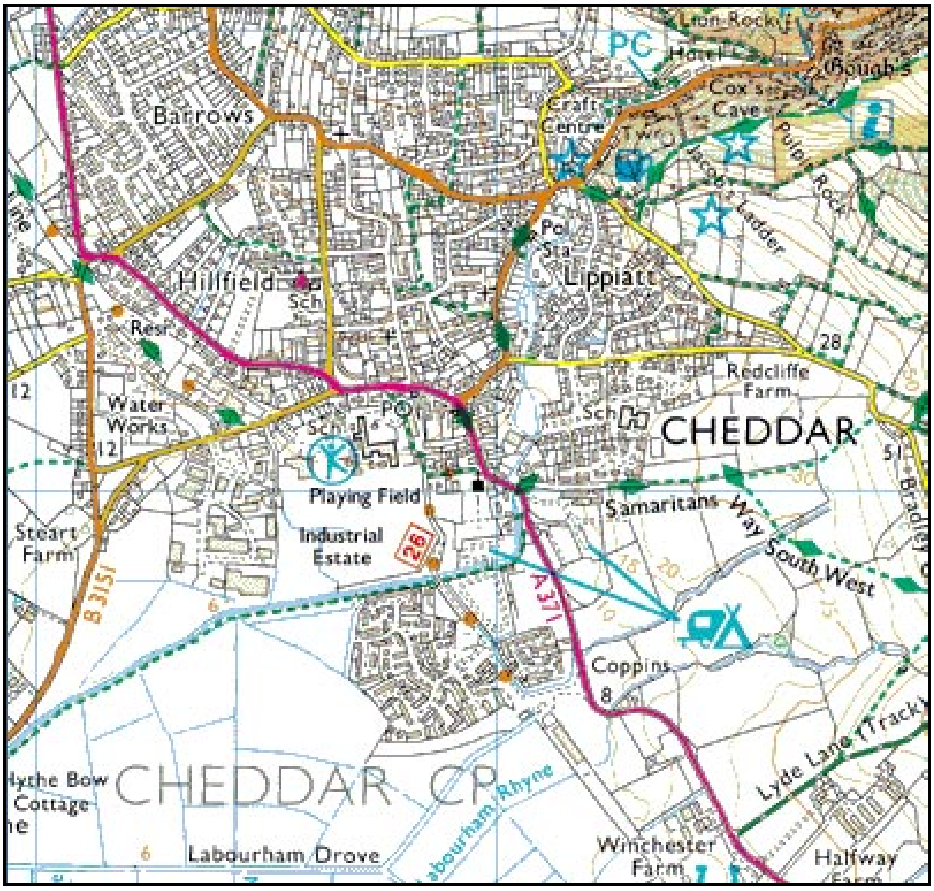

Figure 1: Map showing the location of the St Andrew's Church, Cheddar, Somerset.

METHODOLOGY

The site was re-visited in October 2004. 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. In addition, the ends of four ceiling boards had narrow cross-sections sawn off for analysis.

The cores and sections 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 (2004). 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.

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 9–41 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 reuse of timbers, construction in most historical periods took place within a very few years after felling (Salzman 1952; Hollstein 1965).

Figure 2: View of the nave ceiling looking north-west (photo Amanda Grieve)

Figure 3: Post to the second truss from the east end showing the inscription detailed in the text

Figure 4: View of the northern side of the nave roof showing its general construction and the upper side of the ceiling boards

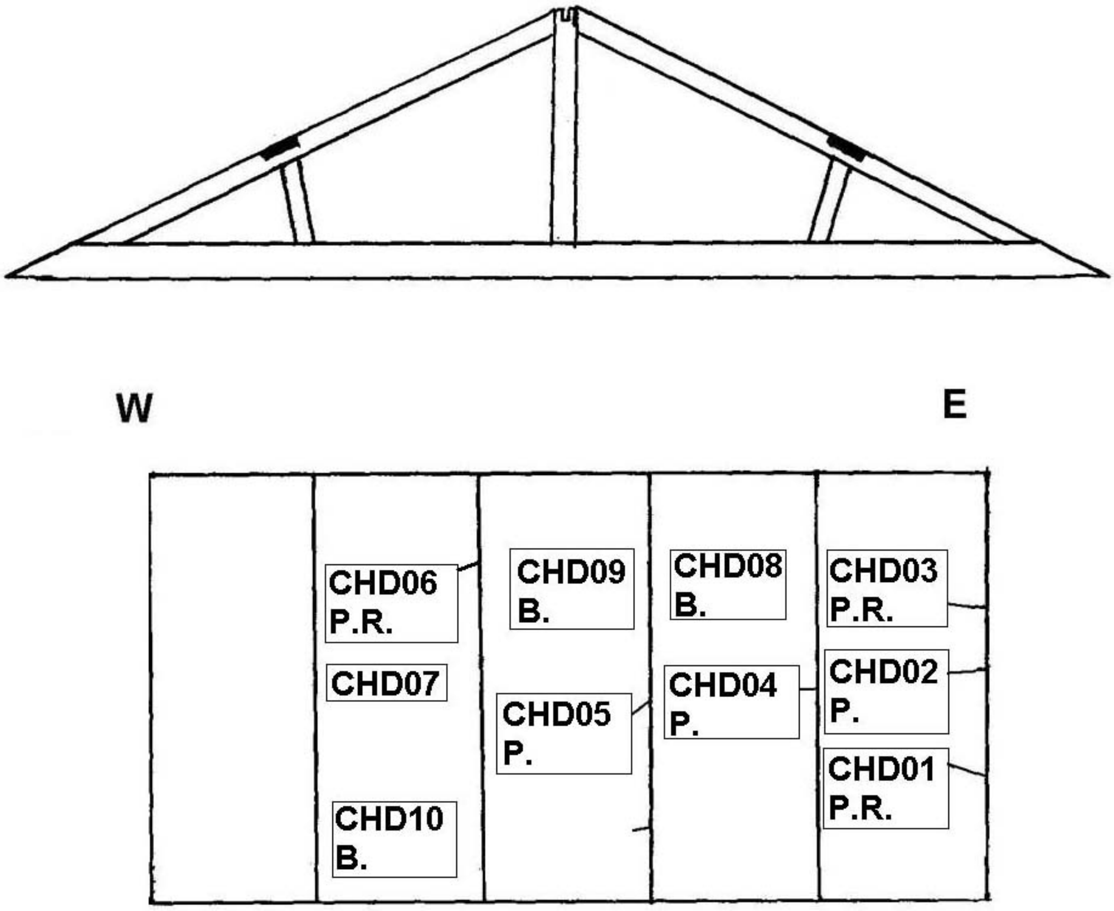

Figure 5: Sketch of truss form and plan of roof showing approximate positions of the timbers sampled. P.R. = principal rafter; P. = central post; B. = ceiling board

RESULTS AND DISCUSSION

All timbers sampled were of oak (*Quercus* spp.). Trusses were numbered from the west end in line with the system used in the previous study. Two inscriptions were found in the roof, one reading 'The roofs of this church were chemically treated, defective oak replaced and leads repaired 1948-50, John Scourse & Son Ltd' and the other, on the post to truss 5 (Fig 3) – 'The six beams from the East End Westward was [sic] crafted in 1757 bye John Score Carpenter Richard Jeffries sexton'.

It was noted that most of the timbers in the roof had had their sapwood crudely removed, probably with a small axe. This may have been carried out at the time of the chemical treatment.

Details of the positions of the samples and basic data about them are given in Table 1. The general form of the trusses is shown in Figures 4 and 5, with the approximate positions of the samples being shown in also in Figure 5. The principal rafter illustrated in Figure 4 shows the general fast-grown nature of the material. Usually, series with less than

45–50 rings are not measured, as they have little chance of obtaining suitable cross-matches, but in this case samples with more than 40 rings were measured because of the number of samples from the same site available against which they might match.

In the previous study (Bridge 2004), samples ACH02 and ACH03 were from two ends of the same wallplate, and these were matched and combined to form a single series, ACH0203m. ACH01 and ACH04 matched well and were combined to form a single series ACH0104m. One other sample, ACH05, was measured in the previous study.

Amongst the samples from the latest study, CHD08 and CHD09 (ceiling boards) matched each other very well (t = 7.0 with 91 years overlap) and these were combined into a single 127-year series CHD89m. A potential match was noted between samples CHD03 and CHD06: t = 5.2 but only 37 years of overlap. The short overlap combined with the lack of additional confirmatory evidence meant that it was difficult to assess the reliability of this potential match. In order to assist the process of seeking confirmatory evidence a combined series, CHD36m, was produced in order to see if it might match other sequences, either from within the site, or the dated reference material.

The combined sequences and remaining unmatched individual series from both studies were compared with each other. Series ACH0203m matched with CHD89m: t = 6.6 with 105 years overlap. This was confirmed by the good t-values produced by the four individual series. A new site master chronology was composed from the wallplate sampled previously, and two ceiling boards from the present study. This new site chronology, CHEDDAR, contained 188 rings (Table 2). It appears that the wallplates and ceiling boards generally have longer sequences than the other structural timbers, and they may have come from a different source, or been selected for their different properties.

Neither this, nor any of the other series from either of the studies, gave acceptable matches against dated reference material from Britain or abroad. This is somewhat disappointing, as the series do not look to have any particular evidence of external management or unusual growth patterns within them. Depending on the date of the roof and ceiling structure, it is possible that the wood used was imported, but checks against American and European oak chronologies also failed to find any matches. The matches found internally suggest that the wallplates and ceiling are contemporaneous, but it has not been possible to provide any evidence of the date of these timbers or those from the roof structure. The inscriptions however suggest that the rest of the roof structure is of eighteenth-century origin.

Table 1: Details of oak (Quercus spp.) timbers sampled from the roof and ceiling of St Andrew's Church, Cheddar, Somerset

Sample Number	Timber and position	No of rings	Mean width (mm)	Mean sens (mm)	Sapwood complement
Samples from previous study (Bridge 2004)					
ACH01	Wallplate, bay 2 east end	64	1.79	0.15	H/S
ACH02	Wallplate, bay 3 west end	161	1.15	0.20	1
ACH03	Wallplate, bay 3 east end	146	1.13	0.20	-
ACH04	Wallplate, bay 4 east end	102	1.79	0.19	H/S
ACH05	Wallplate, bay 5 east end	166 (+15)	1.00	0.16	H/S at end of additional unmeasured rings
ACH0203m	Wallplate bay 3	166	1.14	0.19	1
ACH0104m	Wallplates bays 2 and 4	102	1.72	0.18	H/S
Samples from present study					
CHD01	South principal rafter, truss 6	60	1.57	0.21	-
CHD02	Central post, truss 6	69	1.50	0.18	-
CHD03	North principal rafter, truss 6	49	2.40	0.22	-
CHD04	Central post, truss 5	<40	NM	-	-
CHD05	Central post, truss 4	42	2.04	0.23	-
CHD06	South principal rafter, truss 3	44	2.12	0.21	-
CHD07	Ceiling beam, bay 2-3	53	2.02	0.17	-
CHD08	Ceiling board, north, bay 4-5	127	1.48	0.17	-
CHD09	Ceiling board, north, bay 3-4	91	1.33	0.13	-
CHD10	Ceiling board, south, bay 2-3	69 (+16)	1.60	0.20	-
CHEDDAR	ACH0203m + CHD89m	188	1.29	0.16	-

H/S = heartwood/sapwood boundary, NM = not measured

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Table 2: Ring width data for the undated site master CHEDDAR

Ring widths (0.01mm)										no of trees									
136	141	135	155	168	121	168	110	129	120	1	1	1	1	1	1	1	1	1	1
168	127	174	180	165	197	243	229	144	165	1	1	1	1	1	1	1	1	1	1
198	242	200	180	132	153	165	180	191	170	1	1	2	2	2	2	2	2	2	2
152	174	192	166	154	151	141	158	139	152	2	2	2	2	2	2	3	3	3	3
129	128	155	188	151	106	128	163	146	134	3	3	3	3	3	3	3	3	3	3
126	111	116	102	105	120	103	121	121	82	3	3	3	3	3	3	3	3	3	3
118	120	126	141	131	164	152	118	143	105	3	3	3	3	3	3	3	3	3	3
141	112	122	138	129	137	124	116	100	114	3	3	3	3	3	3	3	3	3	3
127	108	138	90	142	154	176	133	134	128	3	3	3	3	3	3	3	3	3	3
118	149	143	127	127	128	135	129	96	141	3	3	3	3	3	3	3	3	3	3
133	118	123	121	119	111	110	98	109	114	3	3	3	3	3	3	3	3	3	3
108	161	151	146	129	130	135	127	130	113	3	3	3	3	3	3	3	3	3	3
105	121	94	100	142	116	125	87	111	103	3	3	3	3	3	3	3	1	1	1
102	94	123	104	148	121	168	124	82	82	1	1	1	1	1	1	1	1	1	1
119	105	123	65	69	81	87	86	109	143	1	1	1	1	1	1	1	1	1	1
112	124	96	105	121	112	109	81	120	130	1	1	1	1	1	1	1	1	1	1
137	124	112	99	124	97	129	127	120	96	1	1	1	1	1	1	1	1	1	1
89	67	106	89	50	74	104	103	111	120	1	1	1	1	1	1	1	1	1	1
108	109	150	153	138	116	166	120			1	1	1	1	1	1	1	1		