TREE-RING ANALYSIS OF TIMBERS FROM SHUTES FARMHOUSE, SYMONDSBURY DORSET

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Summary

Core samples were obtained from 15 different oak timbers within Shutes Farmhouse, Symondsbury, Dorset. Analysis by dendrochronology of fourteen of these samples (one having too few rings for reliable analysis) produced two site chronologies. The first site chronology, SYMASQ01, comprises five samples, all from what appear to be primary-phase trusses 3 and 4. This site chronology has an overall length of 87 rings which can be satisfactorily dated as spanning the years 1363–1449. Interpretation of the sapwood on these five samples indicates that the timbers represented were felled in 1449.

The second site chronology, SYMASQ02, comprises three samples, all from the main beams of the ground-floor ceiling. This site chronology has an overall length of 102 rings but these cannot be dated. Despite this lack of dating, the cross-matching would suggest that the three timbers represented are contemporary with each other.

A further two samples can be dated individually. The first, SYM-A08, from a principal rafter of truss 5, indicates an estimated felling date in the range 1563–88. The second individual, SYM-A11, is from a ground-floor ceiling beam. It is estimated that this timber has a felling date in the range 1618–43.

Seven measured samples remain undated.

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Introduction

Externally, Shutes Farmhouse gives the impression of once having been a building of at least three, or more probably four, bays; there is certainly sufficient room in the building for such an arrangement (Frontispiece). Although the present much altered external stonework, and the arrangement of doors and windows, now heavily mask this possibility, the interpretation of such a division is supported by the remains of the trusses visible in the roof space (see plan, Fig 1).

Given the original scribed markings (*II* and *III,* from south to north, see Fig 2a/b) on trusses 3 and 4 towards the middle of the building, it is possible that a further truss to the south (truss *I*) has been lost (though traces of it might remain in a partition wall here), while another truss to the north (truss *IV*) may have been replaced. There was possibly an additional truss (truss *V*) further north still, at the north gable end where the building now stops (Fig 3). To the south, before where truss *I* might have been, there is a further bay which in theory might have been part of the original building, but is more likely to be a now incorporated later addition.

It is almost certain, as evidenced by the considerable amount of soot blackening to the primary timbers, that Shutes Farmhouse was originally constructed as an open hall. In such a building at least one room, the principal living and dining room, is open from the ground to the ridge, without any floors inserted between. This 'open hall' is heated by a central hearth, the smoke wafting up to the rafters (hence the blackening), and escaping through holes or, sometimes, through a louvered vent. It is possible that other parts of the original building might have had floored rooms, but there is no evidence for this. The main entrance to such a house is likely to have been towards either end of the hall, possibly with a further room or rooms off to one side (in this case, possibly towards the south end where the main front door is now, though this may have been moved slightly). It is unlikely that an open hall building such as Shutes Farmhouse was being built in this part of the country much after *c*.1500; by this time open halls were out of fashion.

The trusses

Two of the four extant trusses visible at Shutes Farmhouse, (numbered trusses 3 and 4 in the recent survey), appear virtually identical to each other, both being of arch-braced form with collars, and without tiebeams (which would give the greatest clearance to the central space in an open hall). The braces appear to be thin but deep near the collars, producing a broad arc which left little, if any, space in the spandrel between the principal rafter, the collar and the arch-brace (Fig 4a). It would appear that the arch-braces continued, reducing in depth, down the principal rafters to the wall posts (Fig 4b).

The trusses appear to have supported double purlins to each slope of the roof, the purlins being trenched into the backs of the principal rafters (there is no evidence that there were ever braces from the principal rafters to the purlins (nor is there any evidence for a ridge-beam)). The purlins in turn would have supported a number of common rafters to each bay.

Both trusses are decorated, suggesting, in keeping with the design of an open hall, that the timbers were objects of fashion and were meant to be seen. This decoration generally takes the form of simple chamfering with stops to the lower arrises of the principal rafters, both above and below the collars, and, it would seem, along the arch-braces as well. The chamfer of the arch braces runs into that of the collar where it continues to a central raised point in the form of a return chamfer (Fig 5). The decoration section of the collar is, however, integral to the timber rather than, as is often the case, being an applied piece.

The next truss along, truss 5, to the north of trusses 3 and 4, appears to be quite different. It comprises only principal rafters and a collar, there being no arch braces from below. The timbers are plain and undecorated and are completely clean and free from any smoke blackening.

Truss 2, to the south end of the building appears to be a very simple, light-weight structure, comprising principal rafters and a collar. The timbers, probably of elm, are only lightly trimmed and show little evidence of conversion or carpentry. The timbers of truss 1 are now lost in the roof space.

It has not been possible to make any observations about the possible framing of the lower walls of the building, nor about the existence of any internal partition walls that might have existed at either end. All the walls are now all of stone, and any timber that might once have existed here may now be either lost or is buried and hidden. If at any time, perhaps during conservation works, further timbers become visible it might well repay making brief notes about any joints, peg-holes, or mortices that might exist. The wall plates, if they still survive for example, might give some indication about the original framing of the front or rear elevations, and about the positions of any doorways.

Some of the timbers, particularly those of truss 3 and 4, show evidence of their conversion from raw trees, particularly saw and adze marks, or evidence of their carpentry, such as scribed making-out lines for some of the joints. There are also a series of assembly marks. These certainly run from '*II*' to '*III*' from south to north (the front of the building is taken to be facing east on to the lane), see Figure 6a–c. The timbers of truss 5 appear to be very square and cleanly cut, and to have only saw-marks on them with no evidence of chopping or adzing. There are no apparent carpenter's or assembly marks on the timbers of this fifth truss.

On the basis its layout and form, and on the minimal stylistic evidence of the moulding, it would seem that Shutes Farmhouse is typical of many slightly more well-to-do buildings seen throughout England from perhaps the late-fourteenth century up to the early-sixteenth century, being the homes of reasonably prosperous farmers.

Sampling

Sampling and analysis by tree-ring dating of timbers within Shutes Farmhouse, in conjunction with survey and drawing by Laurence Keen, were commissioned by Anthony Jaggard FSA of John Stark & Crickmay Partnership, Architects, of Dorchester. This was done on behalf of the estate management company, Symondsbury Farms Limited, as part of a study into the background history and development of the site necessary to a programme of conservation and repair. It was hoped that tree-ring analysis might indicate the dates at which certain timbers had been felled and, if possible, establish a likely primary construction date for the building as a whole.

Thus, from the suitable timbers available a total of 15 core samples was obtained. Each sample was given the code SYM-A (for Symondsbury, site "A") and numbered 01–15, its position, and other relevant information about the timber, being carefully recorded at the time of sampling.

Seven of these samples, SYM-A01–A07, were obtained from what appeared to be primary and original timbers of trusses 3 and 4. Although there is some evidence in the roof space for alterations and additions, the primary timbers can be clearly identified and show no evidence of disturbance or repair. The roof timbers, furthermore, contained beams which appeared to be more suitable for tree-ring analysis in having sufficient rings for reliable analysis and in having timbers which retained complete sapwood; such timbers, it was hoped, would demonstrate a precise year of felling.

Two further samples, SYM-A08 and A09, were obtained from the principal rafters of truss 5. There is some uncertainly as to whether truss 5 also represents the primary phase of construction or whether represents a later alteration or addition phase. The difference in its decorative treatment and carpentry, and the fact that it is not smoke blackened, may be due to its position within the building. It was hoped that sampling this truss would demonstrate its relationship with other timbers.

Finally, six samples, SYM-A10–A15, were obtained from the main beams of the ground- floor ceiling. It was hoped that sampling these timbers would indicate the date at which this floor was inserted.

The position of these samples were marked on sketch plans made at the time of sampling, which were later worked-up to those reproduced here as Figures 7a-e. Details of the samples are given in Table 1. For the purposes of this report, the trusses have been numbered from site south to site north following the schema in the preliminary drawings provided by John Stark & Crickmay Partnership, Architects. Individual timbers are identified on an east – west basis as appropriate.

The Nottingham Tree-ring Dating Laboratory would like to take this opportunity to thank Sir John Colfox and Mr Philip Colfox for taking such an interest in their buildings, and Mr Andrew Dyke and Symondsbury Farms Limited for generously funding the tree-ring dating. We would also like to thank Anthony Jaggard for commissioning the work and for the on-site tour and discussion. The Laboratory would also like to thank Mr Laurence Keen for his comments and observations about the building which helped with the introduction above.

Tree-ring dating

Tree-ring dating relies on a few simple, but quite fundamental, principles. Firstly, as is commonly known, trees (particularly oak trees, the most frequently used building timber in England) grow by adding one, and only one, growth-ring to their circumference each, and every, year. Each new annual growth-ring is added to the outside of the previous year's growth just below the bark. The width of this annual growth-ring is largely, though not exclusively, determined by the weather conditions during the growth period (roughly March–September). In general, good conditions produce wider rings and poor conditions produce narrower rings. Thus, over the lifetime of a tree, the annual growth-rings display a climatically influenced pattern. Furthermore, and importantly, all trees growing in the same area at the same time will be influenced by the same growing conditions and the annual growth-rings of all of them will respond in a similar, though not identical, way.

Secondly, because the weather over any number of consecutive years is unique, so too is the growth-ring pattern of the tree. The pattern of a short period of growth, 20, 30 or even 40 consecutive years, might conceivably be repeated two or even three times in the last one thousand years. A short pattern might also be repeated at different time periods in different parts of the country because of differences in regional micro-climates. It is less likely, however, that such problems would occur with the pattern of a longer period of growth, that is, anything in excess of 54 years or so. In essence, a short period of growth, anything less than 54 rings, is not reliable, and the longer the period of time under comparison the better.

The third principal of tree-ring dating is that, until the early- to mid-nineteenth century, builders of timber-framed houses usually obtained all the wood needed for a given structure by felling the necessary trees in a single operation from one patch of woodland, or from closely adjacent woods. Furthermore, and contrary to popular belief, the timber was used "green" and without seasoning, and there was very little long-term storage as in timber-yards of today. This fact has been well established from a number of studies where tree-ring dating has been undertaken in conjunction with documentary studies. Thus, establishing the felling date for a group of timbers gives a very precise indication of the date of their use in a building.

Tree-ring dating relies on obtaining the growth pattern of trees from sample timbers of unknown date by measuring the width of the annual growth-rings. This is done to a tolerance of 1/100 of a millimeter. The growth patterns of these samples of unknown date are then compared with a series of reference patterns or chronologies, the date of each ring of which *is* known. When the growth-ring sequence of a sample "cross-matches" repeatedly at the same date span against a series of different relevant reference chronologies the sample can be said to be dated. The degree of cross-matching, that is the measure of similarity between sample and reference, is denoted by a "*t*-value"; the higher the value the greater the similarity. The greater the similarity the greater is the probability that the patterns of samples and references have been produced by growing under the same conditions *at the same time*. The statistically accepted fully reliable minimum *t*-value is 3.5.

However, rather than attempt to date each sample individually it is usual to first compare all the samples from a single building, or phase of a building, with one another, and attempt to cross-match each one with all the others from the same phase or building. When samples from the same phase do cross-match with each other they are combined at their matching positions to form what is known as a "site chronology". As with any set of data, this has the effect of reducing the anomalies of any one individual (brought about in the case of tree-rings by some non-climatic influence) and enhances the overall climatic signal. As stated above, it is the climate that gives the growth pattern its distinctive pattern. The greater the number of samples in a site chronology the greater is the climatic signal of the group and the weaker is the non-climatic input of any one individual.

Furthermore, combining samples in this way to make a site chronology usually has the effect of increasing the time-span that is under comparison. As also mentioned above, the longer the period of growth under consideration, the greater the certainty of the cross-match. Any site chronology with less than about 55 rings is generally too short for satisfactory analysis.

Analysis

Each of the 15 samples obtained from Shutes Farmhouse was prepared by sanding and polishing. It was seen at this time that one sample, SYM-A09, from the west principal rafter of truss 5, had very few rings and it was rejected from this programme of analysis. The annual growth-ring widths of the remaining 14 samples were, however, measured and then compared with each. At a minimum value of t=3.8 two groups of cross-matching samples could be formed. The first group, all from the timbers of trusses 3 and 4, cross-match with each other at the relative positions shown in the bar diagram, Figure 8.

The five cross-matching samples of this first group were combined at these off-set positions to form site chronology SYMASQ01, this having an overall length of 87 rings. Site chronology SYMASQ01 was then satisfactorily dated by repeated and consistent cross-matching with a number of relevant reference chronologies for oak as spanning the years 1363 to 1449. The evidence for this dating is given in the t-values of Table 2.

The second site chronology, SYMASQ02, comprises three samples, all from the beams of the ground-floor ceiling, the samples cross-matching with each other as shown in the bar diagram, Figure 9. These three cross-matching samples were combined at these off-set positions to form site chronology SYMASQ02, this having an overall length of 102 rings. Site chronology SYMASQ02 was then compared to a large number of oak reference chronologies, but there was no cross-matching at any position. These samples must, therefore, remain undated.

Site chronologies SYMASQ01 and SQ02 were then compared with the six remaining measured but ungrouped samples but there was no further satisfactory cross-matching. The six remaining ungrouped samples were then compared individually to the full range of reference chronologies for oak, this indicating possible dates for a further two samples.

The first of these, SYM-A08, is from the east principal rater of truss 2. The cross-matching of this sample indicates a first ring date of 1497 and a last ring date of 1558. The evidence for this dating is given in the t-values of Table 3. The second sample, SYM-A11, from a ground-floor ceiling beam, indicates a first ring date of, 1545 and a last ring date of 1611. The evidence for this dating is given in the t-values of Table 4

Interpretation

Analysis by dendrochronology of 14 out of 15 samples from Shutes Farmhouse has produced two site chronologies. The first site chronology, SYMASQ01, comprises 5 samples, all from trusses 3 and 4, its 87 rings dated as spanning the years 1363 to 1449. One sample in this site chronology, SYM-A02, from the east principal rafters of truss 3, retains complete sapwood, denoted by 'C' in Table 1 and the bar diagram. This means that it has the last growth-ring produced by the tree represented before it was felled. This last complete sapwood ring, and thus the felling, is dated to 1449. The relative positions of the heartwood/sapwood boundaries on the other four samples in this site chronology (which are missing only their outer sapwood rings), would suggest that they too represent timbers which were felled in 1449.

The second site chronology, SYMASQ02, comprises three samples from the ground-floor ceiling beams. This site chronology has 102 rings. Despite being compared to a very large number of reference chronologies there was no cross-matching and the samples must, therefore, remain undated. The cross-matching between the composite samples, however, would suggest that the three timbers represented are all contemporary with each other.

Two further samples were dated individually. The first of these, SYM-A08, is from the east principal rater of truss 2. This sample does not have complete sapwood and it is thus not possible to be precise as to its felling date. It does, however, have some sapwood and given that the heartwood/sapwood boundary is dated to 1548, and allowing for 15 to 40 sapwood rings that the tree might have had, it is estimated that the timber represented has a felling date in the range 1563–88.

The second individually dated sample, SYM-A11, is from a ground-floor ceiling beam. Again, this sample does not have complete sapwood but does have the heartwood/sapwood boundary. Given that this boundary is dated to 1603, and again allowing for 15 to 40 sapwood rings, it is estimated that this timber has a felling date in the range 1618–43.

This analysis would strongly suggest, therefore, that the timbers for the primary element of Shutes Farmhouse, represented by trusses 3 and 4, was constructed of timber felled in 1449; the form of the framing, the stylistic features such as the moulding on the braces, and its form as an open hall would certainly be in keeping with such a date. It would further appear possible that the timbers of truss 5 may represent a later phase, the timbers for truss 5 being felled, possibly in the late-sixteenth century. It would appear possible that at least one of the ground-floor ceiling beams is made of timber felled in the early-seventeenth century.

Judging by the values of the cross-match, t=7.0, between two of the samples, SYM-A02 and A03, from truss 3, it is likely that the two trees represented were growing reasonably close to each other, though perhaps not adjacent, in the same copse or stand of woodland. The trees represented by the other samples were probably from slightly different parts of the same wood.

Where the source woodland for these timbers was located cannot be deduced precisely from tree-ring analysis. It will be seen from Tables 2-4, which shows the best cross-matches between site chronology SYMASQ01, and samples SYM-A08 and A11, and the reference material, that there is quite a wide geographic distribution of matches. It will be seen that though some of the reference data is made up of material from Hampshire, Wiltshire and Gloucestershire, cross-matches are found with references made up of material from as far away as Nottinghamshire. This variation is possibly due in part to the almost complete lack of reference chronology available for Dorset, a shortage which the material from Shutes Farmhouse will go a little way to redress. Indeed, as will be seen from Table 1, five samples from the ground-floor ceiling beams remain undated despite having ring numbers in excess of the usual minimum, 54, required for satisfactory dating.

In total some seven measured samples remain undated despite most of them having sufficient rings for reliable analysis. It is possible that some of these samples represent timbers from different sources and, or, with different felling dates. Such circumstances would in effect make the samples ‘singletons’ which are often more difficult, though, as seen here, not impossible, to date than well replicated groups of samples such as site chronology SYMASQ01. Furthermore, as intimated above, Dorset, is not yet especially well represented in the corpus of available dendrochronological material. It is possible, therefore that the non-dating is caused by the lack of reference data against which the samples can be ‘cross-matched’, a situation which, in due course, with further tree-ring sampling in the region, may be resolved.

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Table 1: Details of samples from Shutes Farmhouse, Symondsbury, Dorset

Sample number	Sample location	Total rings	*Sapwood rings	First measured ring date	Last heartwood ring date	Last measured ring date
	Roof timbers					
SYM-A01	West principal rafter, truss 3	69	h/s	1363	1431	1431
SYM-A02	East principal rafter, truss 3	77	17C	1373	1432	1449
SYM-A03	Collar, truss 3	55	6	1382	1430	1436
SYM-A04	East principal rafter, truss 4	60	h/s	1373	1432	1432
SYM-A05	West principal rafter, truss 4	54	h/s	1377	1430	1430
SYM-A06	Collar, truss 4	54	h/s	------	------	------
SYM-A07	West arch-brace, truss 4	50	no h/s	------	------	------
SYM-A08	East principal rafter, truss 5	62	10	1497	1548	1558
SYM-A09	West principal rafter, truss 5	nm	---	------	------	------
	Ground-floor ceiling beams					
SYM-A10	Central/north beam to dining room	97	12	------	------	------
SYM-A11	South/fireplace beam to dining room	67	8	1545	1603	1611
SYM-A12	Living room beam 1 (by doorway)	65	h/s	------	------	------
SYM-A13	Living room beam 2 (south wall)	96	h/s	------	------	------
SYM-A14	Kitchen beam	68	18	------	------	------
SYM-A15	Beam to dining room	88	h/s	------	------	------

*h/s = the last ring on the sample is at the heartwood/sapwood boundary
C = complete sapwood retained on the sample, the last measured ring date is the felling date of the timber
nm = sample not measured

Table 2: Results of the cross-matching of site chronology SYMASQ01 and relevant reference chronologies when first ring date is 1363 and last ring date is 1449

Reference chronology	Span of chronology	*t*-value	
Barbican/Gatehouse, Warwick Castle	1310 – 1503	7.8	(Howard 1995 unpubl)
Southern England	1083 – 1981	6.0	(Bridge 1988)
Mercer's Hall, Mercer's Lane, Gloucester	1289 – 1541	5.2	(Howard *et al* 1996)
Chicksands Priory, Beds	1200 – 1541	5.1	(Howard *et al* 1998)
England, London	413 – 1728	5.1	(Tyers and Groves 1999 unpubl)
East Midlands	882 – 1981	5.1	(Laxton and Litton 1988)
Hampshire chronology	443 – 1972	5.1	(Miles 2003)
Bremhill Farm, Calne, Wilts	1353 – 1484	5.0	(Alcock *et al* 1991)

Table 3: Results of the cross-matching of sample SYM-A08 and relevant reference chronologies when first ring date is 1497 and last ring date is 1558

Reference chronology	Span of chronology	*t*-value	
26 Westgate Street, Gloucester	1399 – 1622	6.5	(Howard *et al* 1998)
Manor House, Templecombe, Som	1486 – 1591	5.6	(Howard *et al* 1997)
Lower Bean Hall, Feckenham, Worcs	1419 – 1565	5.1	(Arnold and Howard 2005 unpubl)
Hampshire chronology	443 – 1972	4.9	(Miles 2003)
England, London	413 – 1728	4.7	(Tyers and Groves 1999 unpubl)
Naas House, Lydney, Glos	1360 – 1591	4.6	(Howard *et al* 1998)
South combined working mean	1458 – 1681	4.6	(Howard 2002 unpubl)
Wales and West Midlands	1341 – 1636	4.4	(Siebenlist-Kerner 1978)

Table 4: Results of the cross-matching of sample SYM-A11 and relevant reference chronologies when first ring date is 1545 and last ring date is 1611

Reference chronology	Span of chronology	*t*-value	
Old Hall Cottage, Twyford, Leics	1424 – 1654	4.8	(Arnold and Howard 2007 unpubl)
Keyworth barn, Keyworth, Notts	1465 – 1628	4.7	(Laxton *et al* 1984)
England	401 – 1981	4.5	(Baillie and Pilcher 1982 unpubl)
Sinai Farm, Burton on Trent, Staffs	1445 – 1635	4.5	(Howard 2004 unpubl)
England, London	413 – 1728	4.5	(Tyers and Groves 1999 unpubl)
36/8 Castlegate, Newark, Notts	1420 – 1656	4.5	(Arnold *et al* 2002)
Astley Castle, Warwickshire	1495 – 1627	4.3	(Howard *et a*l 1997)
Wales and West Midlands	1341 – 1636	4.3	(Siebenlist-Kerner 1978)