

Ancient Monuments Laboratory  
Report 106/91

TREE-RING ANALYSIS OF OAK TIMBERS  
FROM THE CHURCH ALE HOUSE, COLWALL,  
HEREFORD AND WORCESTER

Miss Jennifer Hillam

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Summary

Three out of the five samples submitted for analysis were dated. The southwest corner post was felled in the wintre of AD1530/1531 and the other two dated timbers, which had no sapwood, could also be contemporary. The analysis indicated that the timbers were not from the same woodland.

Author's address :-

Miss Jennifer Hillam

Department of Archaeology & Prehistory  
Sheffield University  
Clarke House Lane  
Sheffield, South Yorkshire  
S10 2TN

## TREE-RING ANALYSIS OF OAK TIMBERS FROM THE CHURCH ALE HOUSE, COLWALL, HEREFORD AND WORCESTER

Five oak samples from the Church Ale House at Colwall were submitted for tree-ring dating. The samples which were complete cross-sections were removed during renovation of the building. Samples 1-3 were examined at Sheffield in July 1990 whilst 4 and 5 were analysed in July 1991.

### Methods

The cross-sections were polished using an electric drill with a sander attachment. The final surface was achieved by hand polishing. The samples, with the exception of 4 which was split and sawn, were too large to fit on the existing measuring equipment. The ring widths of these samples were therefore measured using a x10 hand lens containing a scale accurate to 0.1mm. The data were then typed into the computer and multiplied by 10 so as to be compatible with the data from sample 4.

The ring widths of sample 4 were measured to an accuracy of 0.01mm on a travelling stage built in the Department of Geography, City of London Polytechnic. The stage is connected to an Atari microcomputer which uses a suite of dendrochronology programs written by Ian Tyers (pers comm 1990). The measured ring sequences were plotted as graphs either by hand or using a graphing program on the Prime mainframe (Okasha 1987). The graphs were then compared with each other on a light box to check for any similarities between the ring patterns which might indicate contemporaneity. The Atari is also used to aid the crossmatching process, although it is the quality of the visual matching which dictates whether or not a match is accepted. The crossmatching routines are based on the Belfast CROS program (Baillie & Pilcher 1973; Munro 1984), and all the *t* values quoted in this report are identical to those produced by the first CROS program (Baillie & Pilcher 1973). Generally *t* values of 3.5 or above indicate a match provided that the

visual match between the tree-ring graphs is acceptable (Baillie 1982, 82-5).

Dating is achieved by crossmatching ring sequences within a site or structure, combining the matching sequences into a site master, and then testing that master for similarity against dated reference chronologies (eg Hillam 1985). A site master is used for dating whenever possible because it enhances the general climatic signal at the expense of the background noise from the growth characteristics of the individual samples. Any unmatched sequences are tested individually against the reference chronologies.

If a sample has bark or bark edge, the date of the last measured ring is the date in which the tree was felled. A complete outer ring indicates that the tree was felled during its dormant period in winter or early spring. This is referred to as "winter felled". If the ring is incomplete, felling took place during the growing season in late spring or summer (referred to as "summer felled"). In the absence of bark edge, felling dates are calculated using the sapwood estimate of 10-55 rings. This is the range of the 95% confidence limits for the number of sapwood rings in British oak trees over 30 years old (Hillam et al 1987). Where sapwood is absent, felling dates are given as *termini post quem* by adding 10 years, the minimum number of missing sapwood rings, to the date of the last measured heartwood ring. The actual felling date could be much later depending on how many heartwood rings have been removed.

### Results

The timbers were relatively large in cross-section and had been shaped from quartered tree trunks (Table 1). Sample 3, the soleplate from the internal cross wall between bays 2 and 3, was rejected because it had less than 50 rings and was knotty. The remainder had 72-121 rings. The east wall soleplate (2) had two sapwood rings whilst bark edge was present on 5, the

southwest corner post. The outer sapwood rings of the latter were too worm-eaten to be measured accurately but it was possible to count the unmeasured rings. A ring sequence of 100 rings was used for crossmatching purposes and 21 rings were counted between the last measured ring and the bark edge. The outer sapwood ring was complete indicating that the timber was felled in winter or early spring.

No similarities were found between the measured ring sequences when the graphs were compared nor did the computer comparisons indicate any crossmatching. The sequences were therefore tested individually against dated reference chronologies for the period AD400 to the present day. No reliable matching was found for sample 4, the east wall soleplate, and it remains undated. Strong matches were found for 2, the soleplate to the west external wall, and 5, the southwest corner post, over the periods 1354-1435 and 1410-1509 respectively. Sample 1, the intermediate cross member to the west external wall, gave a much weaker match over the period 1401-1482.

Sample 2 shows most similarity with chronologies from local sites or buildings such as the Commandery which used to stand in Worcester, whilst sample 5 tends to give higher  $t$  values with chronologies from northern England (Table 2). The match for sample 1 is too weak to draw any conclusions about provenance.

A site master was not constructed because of the poor matching between the three sequences but the individual ring width data are given in Table 3.

### Interpretation

The outer rings of 1 and 2 date to 1482 and 1435 and since neither had sapwood, they were felled some time after 1492 and 1445 respectively. A more precise date, however, can be obtained for 5 since it had bark edge. The date of the last measured ring is 1509 which, allowing for the 21 unmeasured rings between it and the bark edge, gives a felling date of winter 1530/1531 for the

southwest corner post. Although the tree-ring evidence cannot confirm it, the other two dated timbers could be contemporary with this date.

The lack of matching between the three dated ring sequences indicates that the timber did not come from the same woodland. The fact that they also tend to match different reference chronologies may indicate that the timbers came from quite diverse sources.

#### Acknowledgements

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Table 1: Details of the tree-ring samples. Sketches are not to scale; shading on sketches indicates sapwood.

| no | timber                                                     | total no<br>of rings | sapwood<br>rings | average ring<br>width (mm) | sketch                                                                              | dimensions<br>(mm) | comments                                                |
|----|------------------------------------------------------------|----------------------|------------------|----------------------------|-------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------|
| 1  | intermediate crossmember to<br>west external wall          | 82                   | -                | 2.4                        |   | 275x120            | 1401-1482<br>felled after 1492                          |
| 2  | soleplate to west external<br>wall                         | 82                   | -                | 2.5                        |   | 210x165            | 1354-1435<br>felled after 1445                          |
| 3  | soleplate from internal cross<br>wall between bays 2 and 3 | 43                   | -                | -                          | -                                                                                   | -                  | rejected                                                |
| 4  | east wall soleplate                                        | 72                   | 2                | 2.7                        |   | 185x170            | undated                                                 |
| 5  | southwest corner post                                      | 100+                 | 11+              | 2.5                        |  | 260x250            | 1410-1509 + 21<br>unmeasured rings;<br>felled 1530/1531 |

Table 2: t values between the dated Colwall sequences and some of the reference chronologies with which they match. All the reference data are independent of each other. t values less than 3.0 are not given.

| chronology                                        | 1   | 2   | 5   |
|---------------------------------------------------|-----|-----|-----|
| Belfast (Baillie 1977a)                           | 3.8 | 5.5 | -   |
| Bishops House, Sheffield (Morgan 1977)            | -   | -   | 6.2 |
| Bucknell Barn, Shropshire (Leggett 1980)          | -   | -   | 5.9 |
| Calverley Hall, W Yorks (Hillam 1982)             | -   | 4.7 | 5.2 |
| East Midlands (Laxton & Litton 1988)              | 3.3 | 6.4 | 3.8 |
| Exeter, Bowhill House (Hillam 1991)               | 3.0 | 7.5 | 3.8 |
| Exeter medieval, EXMED (Mills 1988)               | 3.7 | -   | -   |
| Manchester, Peel Hall I (Leggett 1980)            | 4.0 | -   | 5.8 |
| Scotland (Baillie 1977b)                          | 3.6 | 4.8 | -   |
| Welsh/English border (Siebenlist-Kerner 1978)     | 3.1 | 5.1 | 5.3 |
| Wick, St Cuthberts (Bridge 1983)                  | -   | 5.5 | 5.8 |
| Worcester, Commandery (Pilcher pers comm)         | -   | 6.0 | -   |
| Yorkshire buildings, YORKMED (Hillam 1979 unpubl) | 3.3 | 3.2 | 3.8 |

Table 3: The ring width data in units of 0.01mm.

The Chruch Ale House, Colwall #1  
Dated AD1401 to AD1482

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 300 | 220 | 280 | 320 | 400 | 270 | 190 | 310 | 350 | 240 |
| 140 | 150 | 270 | 250 | 220 | 200 | 180 | 200 | 190 | 200 |
| 170 | 190 | 250 | 260 | 270 | 210 | 250 | 300 | 340 | 210 |
| 220 | 240 | 220 | 270 | 250 | 250 | 300 | 240 | 200 | 260 |
| 220 | 220 | 320 | 330 | 250 | 280 | 380 | 260 | 230 | 250 |
| 270 | 240 | 230 | 310 | 270 | 240 | 230 | 230 | 190 | 210 |
| 190 | 180 | 230 | 230 | 210 | 190 | 280 | 240 | 230 | 320 |
| 270 | 180 | 220 | 250 | 350 | 300 | 210 | 130 | 120 | 160 |
| 140 | 150 |     |     |     |     |     |     |     |     |

The Church Ale House, Colwall #2  
Dated AD1354 to AD1435

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 150 | 190 | 250 | 350 | 310 | 350 | 210 | 230 | 300 | 320 |
| 310 | 220 | 290 | 310 | 190 | 280 | 250 | 230 | 280 | 250 |
| 290 | 220 | 230 | 210 | 260 | 300 | 270 | 220 | 240 | 170 |
| 190 | 210 | 240 | 210 | 280 | 260 | 200 | 240 | 210 | 250 |
| 220 | 230 | 320 | 210 | 230 | 270 | 300 | 280 | 220 | 250 |
| 180 | 200 | 230 | 300 | 410 | 460 | 320 | 340 | 420 | 420 |
| 330 | 310 | 230 | 250 | 360 | 220 | 280 | 360 | 260 | 280 |
| 230 | 250 | 130 | 160 | 200 | 190 | 100 | 100 | 140 | 130 |
| 120 | 180 |     |     |     |     |     |     |     |     |

The Church Ale House, Colwall #4  
Undated

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 372 | 247 | 251 | 251 | 135 | 71  | 145 | 187 | 239 | 338 |
| 608 | 339 | 286 | 145 | 99  | 173 | 295 | 327 | 241 | 357 |
| 98  | 48  | 84  | 120 | 258 | 297 | 233 | 228 | 144 | 93  |
| 82  | 85  | 71  | 88  | 135 | 299 | 166 | 194 | 185 | 243 |
| 402 | 442 | 473 | 472 | 384 | 243 | 406 | 272 | 403 | 381 |
| 410 | 330 | 316 | 293 | 319 | 232 | 377 | 373 | 393 | 331 |
| 292 | 345 | 397 | 379 | 437 | 250 | 334 | 256 | 329 | 284 |
| 251 | 233 |     |     |     |     |     |     |     |     |

The Church Ale House, Colwall #5  
Dated AD1410 to AD1509

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 320 | 340 | 430 | 320 | 360 | 360 | 340 | 440 | 550 | 140 |
| 390 | 280 | 160 | 320 | 280 | 500 | 310 | 190 | 240 | 240 |
| 360 | 340 | 470 | 300 | 290 | 410 | 300 | 280 | 260 | 180 |
| 240 | 260 | 230 | 430 | 530 | 380 | 260 | 220 | 220 | 300 |
| 230 | 360 | 380 | 260 | 300 | 210 | 250 | 350 | 380 | 430 |
| 360 | 220 | 160 | 200 | 170 | 210 | 270 | 340 | 330 | 350 |
| 250 | 240 | 170 | 200 | 210 | 290 | 210 | 160 | 170 | 200 |
| 230 | 300 | 210 | 260 | 340 | 280 | 80  | 90  | 150 | 190 |
| 180 | 140 | 60  | 80  | 70  | 90  | 90  | 50  | 60  | 80  |
| 60  | 80  | 110 | 100 | 140 | 120 | 130 | 90  | 150 | 60  |