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# College House, College Lane, Masham, North Yorkshire

## Dendrochronological Analysis of Oak Timbers

Ian Tyers

Discovery, Innovation and Science in the Historic Environment

Research Report Series no. 21-2015

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# DENDROCHRONOLOGICAL ANALYSIS OF OAK TIMBERS

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NGR: SE 2241 8081



ISSN 2059-4453 (Online)

## SUMMARY

A tree-ring dating programme was commissioned on oak timbers from College House. This building is believed to be the court house of the Peculiar of Masham, held by one of the canons of York Minster. The results identified that the oak timbers from the ground-floor ceiling and the roof of the building were not datable by tree-ring dating techniques. This report archives the dendrochronological sampling and analysis.

## CONTRIBUTORS

Ian Tyers

## ACKNOWLEDGEMENTS

The sampling and analysis of timbers at College House was funded by English Heritage (EH). Practical help and valuable discussions were provided by Jen Deadman (EH Historic Buildings Surveyor), Lynne Walker (EH Historic Buildings Officer), and Adam Menuge (EH Senior Investigator, Assessment Team North). Jen Deadman kindly supplied the drawing used for Figure 2. Cathy Tyers (EH Scientific Dating Team) discussed the results.

## ARCHIVE LOCATION

North Yorkshire County Council HER
Historic Environment Team
Waste and Countryside Services
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## DATE OF INVESTIGATION

2010

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# CONTENTS

## INTRODUCTION

This document is a technical archive report on the tree-ring analysis of oak timbers from College House, College Lane, Masham. It is beyond the dendrochronological brief to describe the building in detail or to undertake the production of detailed drawings. Elements of this report may be combined with detailed descriptions, drawings, and other technical reports at some point in the future to form either a comprehensive publication or an archive deposition on the building.

College House is thought to have its origins in the fifteenth century, although it was substantially rebuilt in the late-eighteenth century. Masham is *c* 15km north-west of Ripon and the building stands in the west side of College Lane (Fig 1). The building is aligned east-west, fronting onto the lane, with a later building to the north and an extension to the west. The timbers of interest in the building comprise two roof trusses, and a series of very degraded timbers forming the ground-floor ceiling (Figs 2 and 3). At the time of sampling the building was Grade II listed and was being considered for a potential listing upgrade following identification of hitherto concealed historic masonry during refurbishment of the building.

## METHODOLOGY

Tree-ring dating employs the patterns of tree-growth to determine the calendar dates for the period during which the sampled trees were alive. The amount of wood laid down in any one year by most trees is determined by the climate and other environmental factors. Trees over relatively wide geographical areas can exhibit similar patterns of growth, and this enables dendrochronologists to assign dates to some samples by matching the growth pattern with other ring-sequences that have already been linked together to form reference chronologies.

The building was visited in October 2010 in company with Jen Deadman and Lynne Walker. An assessment of the dendrochronological potential of the timbers had been requested by Adam Menuge (EH Senior Investigator, Assessment Team North). This assessment aimed to identify whether oak timbers with sufficient numbers of rings for analysis existed in any part of the building. This assessment concluded that timbers in the ceiling and roof (Figs 2 and 3) contained some suitable oak material, although the material was in poor condition and the dendrochronological potential was not high. However, following discussions, it was decided to proceed with sampling.

Dendrochronological analysis was undertaken in order to inform advice during the refurbishment and enhance the understanding of this important building. The sampling took place on the same visit. The selected timbers were sampled using a 15mm diameter corer attached to an electric drill. The cores were taken as closely as possible along the radius of the timbers so that the maximum number of rings could be obtained for subsequent analysis. The ring sequences in the cores were revealed by sanding.

This preparation revealed the width of each successive annual tree ring. Each prepared sample could then be accurately assessed for the number of rings it contained, and at this stage it was also possible to determine whether the sequence of ring widths within it could be reliably resolved. Dendrochronological samples need to be free of aberrant anatomical features, such as those caused by physical damage to the tree, which may prevent or significantly reduce the chances of successful dating.

Standard dendrochronological analysis methods (see eg English Heritage 1998) were applied to each suitable sample. The complete sequence of the annual growth rings in the suitable samples was measured to an accuracy of 0.01mm using a micro-computer based travelling stage. The sequence of ring widths was then plotted onto semi-log graph paper to enable visual comparisons to be made between sequences. In addition, cross-correlation algorithms (eg Baillie and Pilcher 1973) were employed to search for positions where the ring sequences were highly correlated. Highly correlated positions were checked using the graphs and, if any of these were satisfactory, new composite sequences were constructed from the synchronised sequences. Any *t*-values reported below were derived from the original CROS algorithm (Baillie and Pilcher 1973). A *t*-value of 3.5 or over is usually indicative of a good match, although this is with the proviso that high *t*-values at the same relative or absolute position need to have been obtained from a range of independent sequences, and that these positions are supported by satisfactory visual matching.

Not every tree can be correlated by the statistical tools or the visual examination of the graphs. There are thought to be a number of reasons for this: genetic variations; site-specific issues (for example a tree growing in a stream bed will be less responsive to rainfall); or some traumatic experience in the tree's lifetime, such as injury by pollarding, defoliation events by caterpillars, or similar. These could each produce a sequence dominated by a non-climatic signal. Experimental work with modern trees shows that 5–20% of all oak trees cannot be reliably cross-matched, even when enough rings are obtained.

Converting the date obtained for a tree-ring sequence into a useful date requires a record of the nature of the outermost rings of the sample. If bark or bark-edge survives, a felling date precise to the year or season can be obtained. If no sapwood survives, the date obtained from the sample gives a *terminus post quem* for its use. If some sapwood survives, an estimate for the number of missing rings can be applied to the end-date of the heartwood. This estimate is quite broad and varies by region. This report uses a minimum of 10 rings and a maximum of 46 rings as a sapwood estimate (see eg English Heritage 1998, 10–11).

Where bark-edge or bark survives, the season of felling can be determined by examining the completeness or otherwise of the terminal ring lying directly under the bark. Complete material can be divided into three major categories:

- 'early spring', where only the initial cells of the new growth have begun - this is equivalent to a period in March/April, when the oaks begin leaf-bud formation;
- 'later spring/summer' where the early wood is evidently complete but the late wood is evidently incomplete, which is equivalent to May-through-September of a normal year, and
- 'winter' where the latewood is evidently complete and this is roughly equivalent to September-to-March (of the following year) since the tree is dormant throughout this period and there is no additional growth put on the trunk.

These categories can overlap as, for example, not all oaks simultaneously initiate leaf-bud formation. It should also be noted that slow growing or compressed material cannot always be safely categorised.

Timber technology studies demonstrate that many of the tool marks recorded on ancient timbers can only have been done on green timber. There is little evidence for long-term storage of timber or of widespread use of seasoned, rather than green, timber in the medieval period (see eg English Heritage 1998, 11–12).

Reused timbers can only provide tree-ring dates for the original usage date, not their reuse. Identifying reused timbers requires careful timber recording which notes the presence of features which are not functional in the structure. It is always possible that some timbers exhibit no evidence of earlier usage, and are thus 'hidden reused' timbers. The dendrochronological impact of this problem is particularly acute where only single timbers have been dated from a structure.

The analysis may highlight potential same-tree identifications if two or more tree-ring sequences are obtained that are exceptionally highly correlated. Such pairs, or sometimes more, are then used as a same-tree group and each can be given the interpreted date of the most complete of the samples. They are most useful where several timbers date but only one has any sapwood or where same-tree identifications yield linkages between different areas.

## RESULTS

In 2010, 10 timbers from the building were cored, these cores were labelled 1–10 inclusive, and the interim results were released verbally by EH following initial analysis. The locations of the samples in College House are shown in Figures 2 and 3. In total five samples were obtained from the ground-floor ceiling and five from the roof trusses.

Each sample was assessed for the wood type, the number of rings it contained, and whether the sequence of ring widths could be reliably resolved. This assessment confirmed that all the sampled timbers were oak (*Quercus* spp) and that four of the cores were suitable for dendrochronological analysis. The exceptions either had too few rings for analysis or had fragmented badly during sampling. The unsuitable cores comprised four of the floor timbers and two of the roof timbers. There was very poor survival of sapwood in all timbers. No samples were obtained with bark-edge surviving. The details of the samples are provided in Table 1.

The four suitable oak samples from the building were prepared for analysis, measured, and the resultant ring series were initially compared with other material from the building. An interim composite grouping was made of two sample sequences (samples 7 and 8, both roof yoke timbers, *t*-value of 9.89) during this process. The interim composite and the individual sample series were compared with reference series of medieval and later oak tree-ring data from throughout Britain. These results were reviewed. Neither the composite sequence nor the four individual samples were found to exhibit good external cross-matching with reference data. A summary of the individual samples is provided in Table 1.

The measurement data for all the measured samples are listed in Appendix 1.

## DISCUSSION

No dating information was obtained, which, since there are several relevant reference sequences from this part of North Yorkshire, was perhaps an unexpected outcome. The samples, derived from two areas of the building, are dominated by short-lived material; are of poor quality and may potentially represent a number of different periods. The matching of the two yoke timbers suggests that they were derived from a single tree. No other useful interpretative data was obtained.

## BIBLIOGRAPHY

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# FIGURES

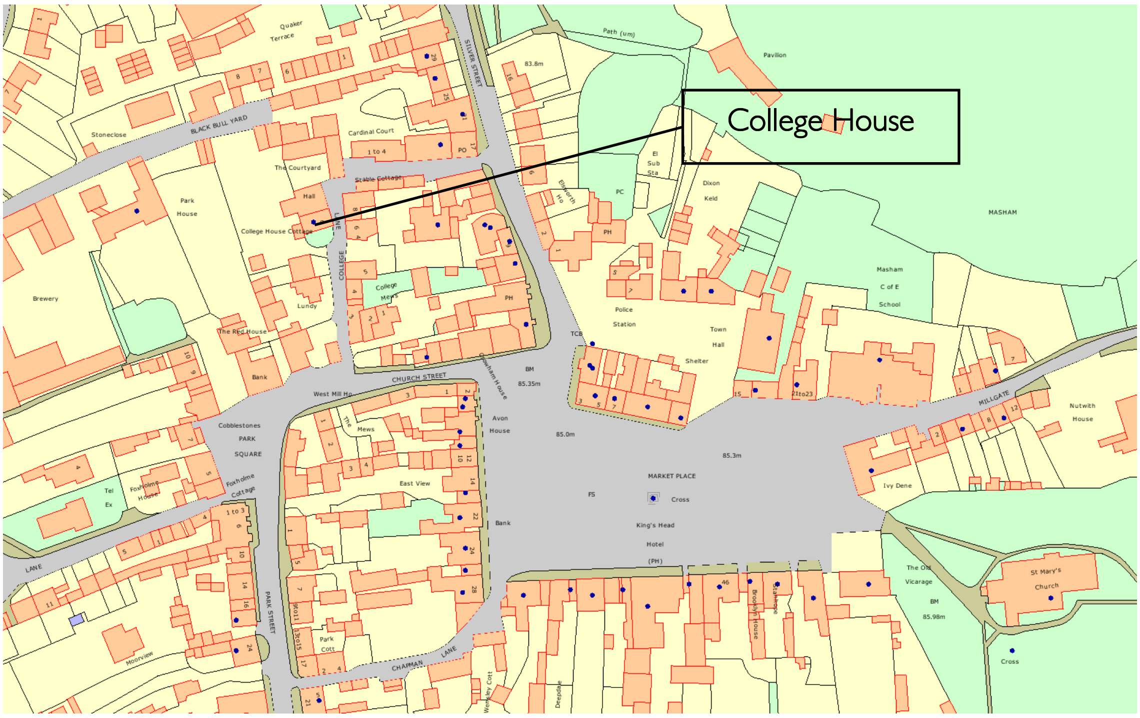



*Figure 1: Location of College House, Masham. © Crown Copyright and database right 2015. All rights reserved. Ordnance Survey Licence number 100024900*

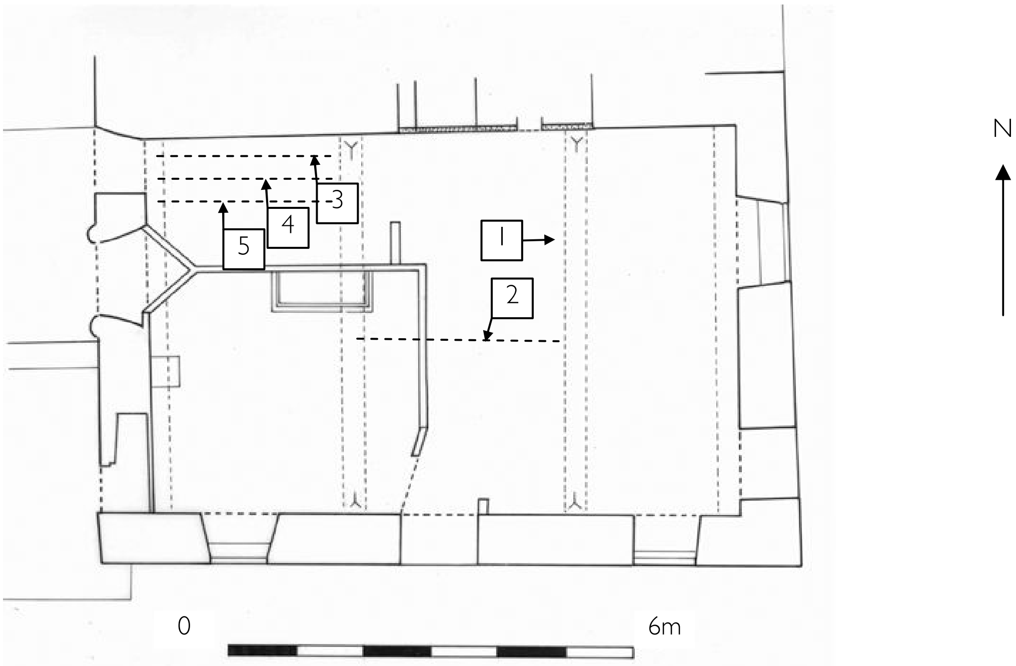



*Figure 2: College House, Masham, ground floor plan (drawing with permission Jen Deadman)*

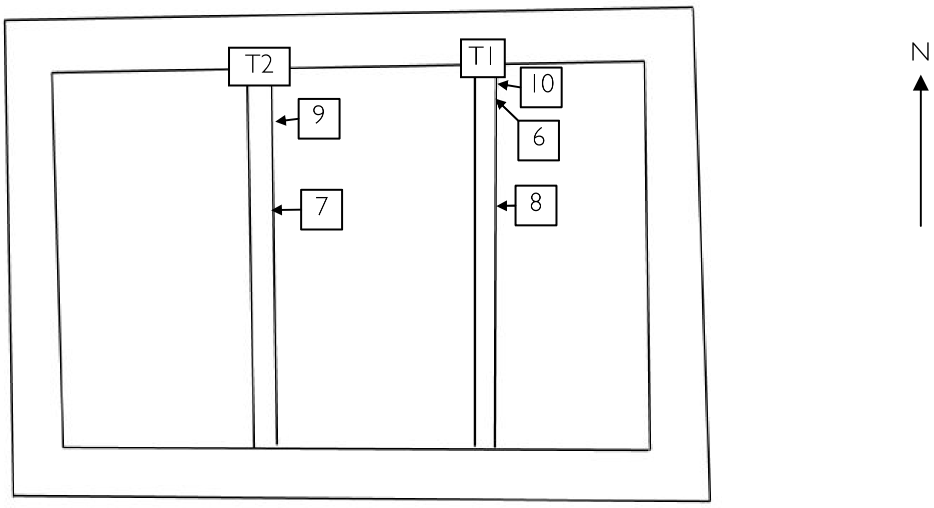



*Figure 3: College House, Masham, Roof sketch plan, scale as above*

# TABLES

*Table 1: Details of the 10 oak samples from timbers from College House, Masham*

| Sample | Location | Rings | Sap | Date of measured sequence | Interpreted result |
|---|---|---|---|---|---|
| 1 | Ground-floor ceiling beam | - | - | not measured | - |
| 2 | Ground-floor ceiling joist | - | - | not measured | - |
| 3 | Ground-floor ceiling joist | 60 | 18 | not dated | - |
| 4 | Ground-floor ceiling joist | - | - | not measured | - |
| 5 | Ground-floor ceiling joist | - | - | not measured | - |
| 6 | T1 north principal rafter | - | - | not measured | - |
| 7 | T2 yoke | 89 | - | not dated * | - |
| 8 | T1 yoke | 84 | - | not dated * | - |
| 9 | T2 tiebeam | - | - | not measured | - |
| 10 | T1 tiebeam | 47 | H/S | not dated | - |

KEY For locations see Figures 2 and 3. H/S is heartwood/sapwood edge. * these series match each other.

# APPENDIX 1

mch03

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 293 | 176 | 267 | 266 | 319 | 342 | 262 | 225 | 272 | 281 |
| 272 | 269 | 340 | 343 | 431 | 422 | 238 | 178 | 270 | 337 |
| 268 | 234 | 270 | 293 | 224 | 194 | 174 | 228 | 205 | 180 |
| 104 | 156 | 184 | 186 | 173 | 184 | 128 | 71 | 58 | 86 |
| 85 | 100 | 112 | 120 | 122 | 112 | 67 | 65 | 66 | 104 |
| 116 | 101 | 107 | 82 | 87 | 82 | 75 | 87 | 77 | 63 |

mch07

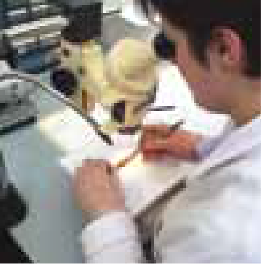
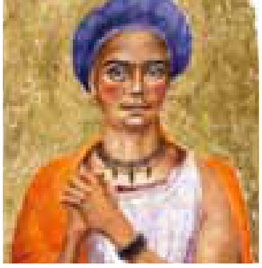
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 377 | 373 | 423 | 387 | 386 | 395 | 417 | 356 | 316 | 332 |
| 336 | 340 | 335 | 282 | 329 | 400 | 318 | 411 | 427 | 553 |
| 387 | 331 | 273 | 365 | 316 | 262 | 300 | 278 | 310 | 261 |
| 329 | 260 | 230 | 277 | 227 | 230 | 265 | 225 | 223 | 239 |
| 187 | 271 | 201 | 223 | 260 | 233 | 248 | 208 | 197 | 270 |
| 341 | 362 | 344 | 338 | 336 | 311 | 329 | 250 | 240 | 355 |
| 265 | 271 | 374 | 398 | 353 | 256 | 281 | 242 | 271 | 278 |
| 217 | 222 | 250 | 310 | 230 | 230 | 279 | 362 | 281 | 255 |
| 304 | 268 | 287 | 299 | 244 | 286 | 344 | 308 | 255 | |

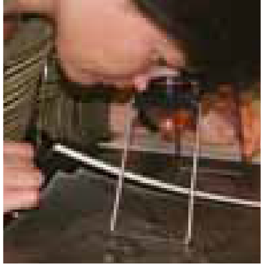
mch08

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 435 | 476 | 374 | 413 | 327 | 318 | 348 | 459 | 337 | 309 |
| 309 | 423 | 296 | 373 | 326 | 514 | 390 | 401 | 248 | 309 |
| 329 | 280 | 338 | 296 | 346 | 228 | 346 | 337 | 320 | 340 |
| 260 | 276 | 339 | 283 | 295 | 294 | 231 | 339 | 256 | 263 |
| 312 | 230 | 274 | 205 | 236 | 319 | 372 | 333 | 424 | 393 |
| 345 | 327 | 469 | 242 | 235 | 290 | 258 | 270 | 364 | 468 |
| 340 | 241 | 262 | 264 | 277 | 285 | 250 | 244 | 252 | 293 |
| 223 | 267 | 285 | 323 | 308 | 287 | 357 | 287 | 318 | 282 |
| 242 | 285 | 348 | 349 | | | | | | |

mch10

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 191 | 358 | 345 | 244 | 361 | 316 | 252 | 394 | 485 | 424 |
| 561 | 462 | 432 | 539 | 587 | 485 | 476 | 450 | 421 | 375 |
| 528 | 557 | 374 | 428 | 292 | 343 | 296 | 311 | 382 | 367 |
| 442 | 464 | 432 | 387 | 255 | 386 | 465 | 336 | 387 | 311 |
| 251 | 317 | 270 | 308 | 336 | 275 | 371 | | | |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ISSN 2059-4453 (Online)