

The contribution of dendrochronology to church archaeology

Martin Bridge

Tree-ring dating has, over the past couple of decades, become an established methodology in determining dates for phases of construction in buildings and of individual artefacts in this country. Whilst its use goes back much further, the recent increase in activity is thanks largely to the efforts of organisations such as English Heritage, who have funded much of the work undertaken, particularly on ecclesiastical sites, usually as a part of grant funding for individual projects. It has also come about from a wider knowledge of the technique and its application through television and other media coverage, encouraging people in wider study of their heritage.

Whilst it is not the intention here to go into the methodology of dendrochronology *per se*, it is probably useful to consider the different levels of interpretation that are possible as a result of the nature of the material under investigation. At present, researchers are only routinely likely to be able to date oak and some exotic softwoods imported from Scandinavia, the Baltic coastal regions, or North America. Occasionally other species, such as ash and beech have been successfully dated against oak chronologies, but these are rarely encountered in historical materials. The main limitation to whether or not a structure or artefact can be dated remains the number of rings available. Since we are basically looking at matching patterns of ring growth which reflect the unique set of conditions experienced by the trees in a period of their growth, one needs series of ring widths of sufficient length to have confidence that the patterns truly match – short series of variations can look very similar at different time periods. There is no strict rule – but generally patterns of at least 60–70 rings are preferred, and the more rings present, the better the chances of getting an acceptable match. Obvious signs of management to the trees, for example where trees are pollarded, have such a significant influence on the growth patterns, that they are undatable.

In the cases where the timber has been converted from the original tree to the extent that no traces of the outer sapwood and bark are left, it may be possible to date a sequence of rings and, making allowances for the minimum number of sapwood rings likely to have been trimmed off, give an earliest date after which the timber had been converted and used (this often being referred to as a *terminus post quem* or *tpq* date). While this is the least satisfactory positive result, it may be important in establishing whether a phase is pre- or post- Dissolution, or other such significant time.

In the cases of artefacts constructed from boards, such as coffins, doors, chests, cupboards etc., or in assemblages of building timbers where there are no traces of sapwood, it has often been found that several series end within a few years of each other. In these cases, it seems reasonable to assume that minimal amounts of the less vulnerable heartwood have been removed, and it is possible to suggest a likely period of felling of the trees involved – and this may subsequently be combined with other dating evidence to help establish a narrower likely time of use or construction.

The most satisfactory result is where a number of timbers retain the complete sapwood and the very year of felling of the trees can be determined. Indeed

in oak, the nature of the anatomy of the rings is such that the season of the year in which felling took place can often be derived. In church roofs and timber-framed structures it is not uncommon for all the timbers to have been felled in a single campaign, with the likelihood that construction followed within a very short period – ‘green’ timber being the norm in building construction throughout the medieval and early post-medieval period. In larger projects, such as cathedral roofs and large monastic buildings, it is more likely that trees were felled over a number of seasons, and the timbers stockpiled for a few years before their incorporation into the structures under study.

Much of the work undertaken broadly confirms, but refines, previous dating on stylistic grounds, and these are of course valuable in confirming such stylistically derived evidence, which can be applied in those cases where dendrochronology may not be possible. The exciting investigations are those where there are no clear indicators of age, or where one can overturn previously held ideas. An example is the dating of the tower roof at the church of St George of England in Toddington, Bedfordshire, where the timbers were found to have been most likely felled in the period 1401–1422, somewhat earlier than had been expected (Bridge 2001a). Similarly, the roof of the monastic barn at Boxley, Kent, was dated to the late 14th century, somewhat later than had been expected (Bridge 2005).

Similarities in a group of roofs in the south-west had long been thought to suggest that they had all been constructed by the same craftsmen. The roof of the Abbey Barn at Glastonbury contained some of the timbers with the most rings found in oak building timbers in the country, many having over 160 rings, including one with 211 rings (Bridge 1983; 2001b). The likely felling date range for the timbers was 1334–1344, slightly earlier than the building historians had predicted. The barn at Bradford-on-Avon had timbers most likely felled in the period 1334–1379 (Groves and Hillam 1994). The east kitchen roof at Muchelney Abbey proved to be the earliest of the group, the timbers having been felled in the period 1312–1333, and repaired around 1401 (Bridge 2002).

Many phases of work were dated at Muchelney with several felling date ranges, but the degree of matching between all these phases suggested a long-term single source of supply, or at least a limited geographical source area for the timbers. Sites such as Boxley, Glastonbury and Muchelney also highlight



Fig 1
The timber tower, Blackmore, Essex
(photo: Martin Bridge)

another factor noticed by several workers at various ecclesiastical sites – the tree ring patterns from such sites often match those from other ecclesiastical sites at some distance more strongly than they do secular sites close by. This suggests different resources from the timbers used in domestic buildings and is an interesting area that may one day be looked into more closely.

The dating of the wooden tower at Blackmore, Essex (Miles *et al* 2005; Fig 1) also showed this interesting phenomenon of matching strongly against other ecclesiastical sites at some distance and less well against more local secular sites. However, the evidence did not suggest that the timbers had been imported to the area from afar. It also established a date for an

important structure. Almost every publication that refers to the tower mentions the quote from Pevsner (1954) that, ‘Blackmore possesses one of the most impressive, if not the most impressive, of all timber towers of England’ (1954; Bettley and Pevsner 2007, 141). The tower is also discussed in several of Cecil Hewett’s works (e.g. 1962; 1980). Hewett suggested that it represents the most advanced carpentry in a group of timber towers in the area, and a likely date of c1480, whilst others had suggested a pre-Black Death date. Three of the six dated timbers retained complete sapwood and were found to have been felled in three successive winters in 1397/98, 1398/99 and 1399/1400, suggesting construction in 1400 or within a year or two after this date.

Sometimes it is possible to assign a date to other features once the woodwork has been dated. At St Andrew’s Church in Ford, West Sussex, a ‘Doom’ painting has its composition dictated by the crown-post roof in close proximity to it, and is generally thought to date to just after the construction of this roof. Three phases were dated in the roof (Bridge 2000), including the crown-post, which dated to c1512. It had also been previously stated that the timbers in the nave roof were chestnut, but only oak timbers were found in this study. Another important footnote in other subject areas derives from the use of Arabic numbers in the eastern chapel roofs of Salisbury Cathedral built in 1222 (Miles 2002).

These only became commonly used amongst Oxford college academics in the 14th century, and then not for practical matters such as drawing up accounts, so finding them here, and in a small cluster of other buildings at around the same date, tells us something of the education and possible travelling history of the master carpenter at this time.

Having a more narrowly defined date for a building phase makes it easier for historians to narrow their searches of documents for evidence of those responsible for the original work. At the Priory Barn in Little Wymondley, Hertfordshire, several re-used timbers from the period 1373–1395 almost certainly date the original construction of the barn (Fig 2). However, the major structural timbers of the present barn were felled in the winter of 1540/41 (Bridge 2001c), which led to finding documentation showing that the barn had been rebuilt by James Nedeham, Surveyor of the King’s Works, who had been granted the site following the Dissolution.

It is always satisfying when the documentation can confirm an independently derived tree-ring date. At Cratfield in Suffolk, the bell-frame was recently found to contain timbers felled between the summer of 1639 and summer 1640 (Bridge 2008). The churchwardens’ accounts for this church were published some years ago (Botelho 1999) and they reveal extensive ‘worke about the frame and the bells’ paid for in October 1640. Indeed, bell-frames are an area where stylistic dating has not been so well developed as in some other areas, and dendrochronology may well form an important research tool in the coming years. A recent study at Olney in Buckinghamshire (unpublished) established the date of the original extant bell-frame to around 1626 (a single timber retaining complete sapwood was felled in spring 1626) where there was little indication of date previously. An older study of the bell-frame at Cranfield, Bedfordshire (Bridge 1998), found a batch of timbers felled in the period 1497–1507 identifying a previously undated phase of construction, along with timbers previously thought to have been part of a major rebuilding phase which had been stylistically dated to about 1600. Whilst not answering all the questions, these results give impetus to a major re-assessment of the fabric.

An investigation of the south porch roof at the parish church in Cleobury Mortimer, Shropshire (Bridge and Miles 2007; Fig 3), revealed that the trees used had been felled in the period 1212–1242, making

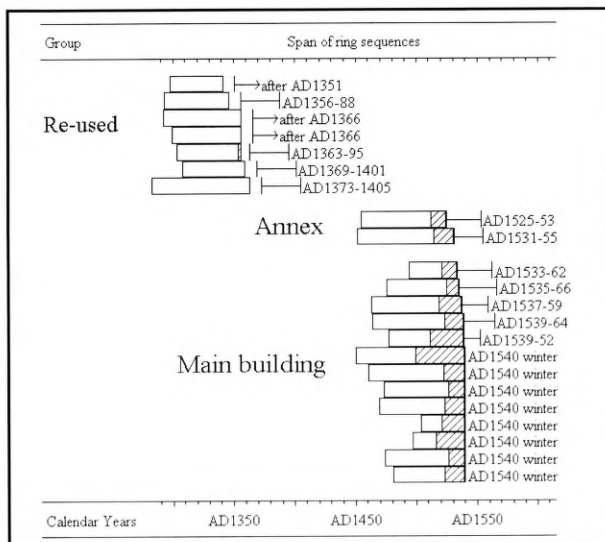


Fig 2
Bar diagram of the dates found for individual timbers at Priory Barn, Little Wymondley, Hertfordshire, with their actual or interpreted felling dates

Fig 3
Truss of the south porch at Cleobury Mortimer church
(Henry Hind)

this one of the earliest extant roofs in the county. The unusual rafter couple roof with butt-jointed soulace/ashlar pieces and a T-shaped central wallplate was thought to be 13th century, but this date was earlier than expected. It also shows an early use of curved timbers which Hewett suggests were not used in Essex churches until the late 13th century and did not become common until the 14th century. This again underlines the importance of this roof in a national context and helps us research the times of innovation for various styles in more detail.

Apart from the major structures themselves, it is often possible to date coffin boards, doors and chests associated with church buildings. The coffin detailed by Rodwell (2006) from the nave of Lichfield Cathedral yielded exceptionally long ring sequences, and dated the find to soon after 1317. The matches obtained strongly suggest that the timber was of local origin, and this is itself interesting as such old trees are rarely found in this period. A study of a number of coffin boards excavated at Barton on Humber (Tyers 2001) showed that those early 12th century timbers also came from very old trees, perhaps showing us that older trees were around, but chosen for particular uses, and only rarely found in what survives today.

A very old tree was used to make the north door at Hadstock church in Essex, a door still in daily use (Fig 4). With no sapwood on the boards, the door was tree-ring dated to after 1034, with other evidence from the stonework of the doorway itself strongly suggesting a date in the 1060s. The so called 'Pyx Door' at Westminster Abbey (Fig 5), long thought to



Fig 4
The north door, Hadstock Church, Essex
(photo: Martin Bridge)

be a very old door, was finally proved to be of great age when its tree rings and surviving sapwood produced a felling period of 1032–1064, with evidence from the building strongly suggesting a 1050s date for it (Miles and Bridge 2005).

Dendroprovenancing, suggesting where the trees grew by investigating where their ring sequences match most closely to, has shown us much about trade over the centuries. Studies of boards from the nave roof at Peterborough Cathedral (Tyers and Tyers 2007) and of doors and chests at Westminster Abbey (Miles and Bridge 2005; 2008) have shown a tendency for boards to be of English origin up until the early 13th century, then to have been imported from the region of modern Germany in the early to mid 13th century, giving way to imports from what is now Poland in the late 13th and throughout the 14th century.

These findings are reinforced by recent work dating Suffolk church chests (Sherlock 2008) where the Poslingford oak chest (third quarter of the 13th century) and the Little Waldingfield oak chest (third quarter of the 14th century; Fig 6) both used timber

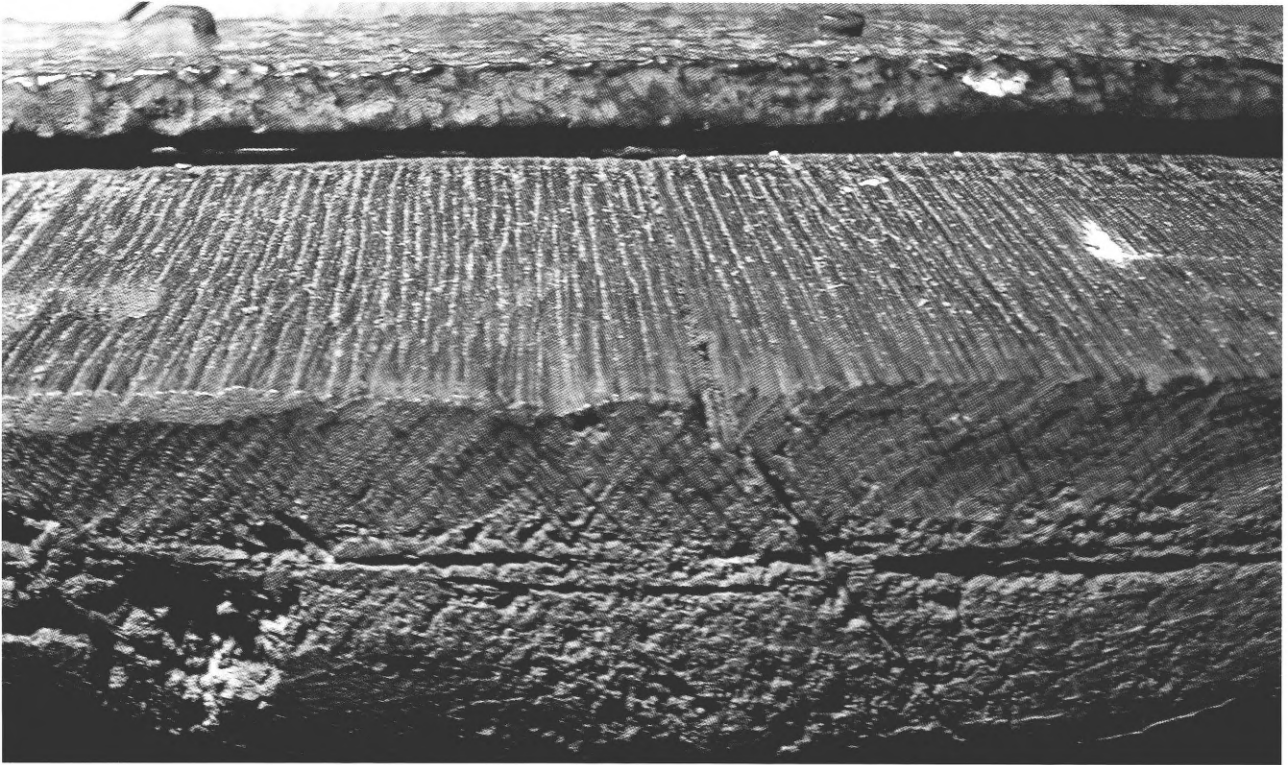


Fig 5
The boards of the door known as 'Pyx', Westminster Abbey, under investigation (photo: Martin Bridge)



Fig 6
The oak chest, Little Waldingfield, Suffolk (photo: Martin Bridge)

imported from what is now Poland. The Mendlesham pine chest, dated to the 1420s, also used wood grown in what is now Poland.

With the ever increasing number of successful dendrochronological studies that are being carried out, it is easy to forget that there are still limitations and unusual disappointments. A recent study of the fine roof at the parish church in Beeston-next-Mileham, Norfolk (Bridge 2007) resulted in a 96-year long chronology from 7 trees being made with no apparent unusual growth patterns in it, but this failed to date against all the reference data available from this country and the continent, as did a single 222-year sequence from the same roof.

Nevertheless, with the increase in dendrochronological dating of church structures and artefacts in recent years, the chances are now better than ever that new dating problems can be solved by dendrochronology. As the data accumulate, more synthesis of the results can take place, and wider questions than just the date of a particular phase or item can be addressed.

Martin Bridge completed a PhD in dendrochronology in 1983 and has since worked in New Zealand and Ireland, as well as carrying out projects in France, Canada and Switzerland. He is now a part-time lecturer in the Institute of Archaeology, University College London, and a freelance dendrochronologist with the Oxford Dendrochronology Laboratory.

Bibliography

- Bettley, J and Pevsner, N, 2007, *Buildings of England: Essex*, 2nd ed, London
- Botelho, LA (ed), 1999, *Churchwardens' Accounts of Cratfield 1640–1660*, Suffolk Records Society 42
- Bridge, MC, 1983, *The use of tree-ring widths as a means of dating timbers from historical sites*, unpublished PhD thesis, CNA
- Bridge, MC, 2001a, *Tree-ring analysis of timbers from the church of St George of England, Toddington, Bedfordshire*, Centre for Archaeology Report 77/2001
- Bridge, MC, 2001b, *Tree-ring analysis of timbers from the Abbey Barn, Glastonbury, Somerset*, Centre for Archaeology Report 39/2001
- Bridge, MC, 2001c, *Tree-ring analysis of timbers from Priory Barn, Little Wymondley, Hertfordshire*, Centre for Archaeology Report 18/2001
- Bridge, MC, 2002, *Tree-ring analysis of timbers from Muchelney Abbey, Muchelney, near Langport, Somerset*, Centre for Archaeology Report 114/2002
- Bridge, MC, 2005, *Tree-ring analysis of timbers from the Abbey Barn, Boxley, Kent*, Centre for Archaeology Report 13/2005
- Bridge, MC, 2007, *Tree-Ring Analysis of Timbers from the nave roof at St Mary's Church, Beeston-next-Mileham, Norfolk*, English Heritage Research Department Report Series 38/2007
- Bridge, MC, 2008, *St Mary's Church, Cratfield, Suffolk: tree-ring analysis of timbers from the bellframe and windlass*, English Heritage Research Department Report Series 30/2008
- Bridge, MC, and Miles, DHW, 2007, *Tree-ring analysis of timbers from the South Porch Roof, Church of St Mary the Virgin, Cleobury Mortimer, Shropshire*, Centre for Archaeology Report 25/2007
- Groves, C, and Hillam, J, 1994, *Tree-ring analysis of Bradford Tithe barn, Wiltshire*, 1993, Ancient Monuments Laboratory Reports, 9/94
- Hewett, CA, 1962, 'The timber belfries of Essex. Their significance in the development of English carpentry', *Archaeological Journal* 119, 225–44
- Hewett, C, 1980, *English Historic Carpentry*, Chichester
- Miles, DWH, 2002, *The Tree-Ring Dating of the Roof Carpentry of the Eastern Chapels, North Nave Triforium, and North Porch, Salisbury Cathedral, Wiltshire*, Centre for Archaeology Report 94/2002
- Miles, D, and Bridge, M, 2005, *The tree-ring dating of the early medieval doors at Westminster Abbey, London*, Centre for Archaeology Report 38/2005
- Miles, D, and Bridge, M, 2008, *Tree-ring dating of the chests and fittings, Westminster Abbey, London*, English Heritage Research Department Report Series 3/2008

Miles, DH, Worthington, MJ, and Bridge, M C, 2005, Tree-ring dates, *Vernacular Architecture* 36, 87–101.

Pevsner, N, 1954, *The Buildings of England: Essex*, London

Rodwell, W, 2006, 'Lichfield Cathedral: archaeology of the nave sanctuary', *Church Archaeology* 7/8/9, 1–6

Sherlock, D, 2008, *Suffolk Church Chests*, The Suffolk Institute of Archaeology and History

Tyers, I, 2001, *Tree-ring analysis of coffin timbers excavated at the Church of St Peter, Barton on Humber, North Lincolnshire*, Centre for Archaeology Report 48/2001

Tyers, C, and Tyers, I, 2007, *Peterborough Cathedral, City of Peterborough, Cambridgeshire: Scientific Dating Report – Tree-Ring Analysis of the Nave Ceiling*, English Heritage Research Department Report Series 4/2007