

Tree-ring Dating Historic Buildings

Few historical documents survive before the 1700s and so it can be very difficult to know when historic buildings were built. As building listings were often undertaken only from the outside of a building these can be inaccurate. However, through the extraction of small pencil like cores from timbers, tree-ring analysis can often identify an exact year of construction of a building.

TREE-RING DATING

The science of tree-ring dating (or dendrochronology) began in the 1920s and it is based on the simple premise that one ring is laid down each year. Typically, in 'good' years the ring will be wide and in 'bad' years the ring will be narrow. For example, in the Great Drought of 1976, trees tended to lay down a narrow ring. Tree-ring dating does not count the rings (which would tell you how old the tree was). Rather it measures the ring width of each and every ring in series. With a series of over 60 rings, this climatically induced pattern of wide and narrow rings (much like a bar code) is unique and will match only one time in history.

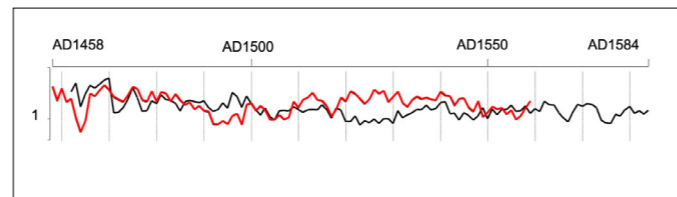
By comparing tree-ring series sampled from building timbers of unknown date against our databases of reference chronologies of known date, it is possible to identify precise calendar dates. The reference chronologies are created by matching and overlapping tree-rings, and by this process it is possible to progress them further and further back in time. Tree-ring series from live trees are overlapped with those from medieval buildings, which in turn are overlapped with archaeological timbers preserved in peat bogs. Through this process reference chronologies of known date in the UK have been extended back to before 5500 BC.

DATED BUILDINGS

Tree-ring dating identifies when trees were felled, but as most medieval woodworkers used green wood (as seasoned wood is much more difficult to work with) a felling date is generally accepted to identify the year of construction. The locations of some 2500 tree-ring dated buildings phases are freely available through



A tree-ring core and a pencil (for scale) used to date Quince Cottage in Wiltshire to 1560



A visual plot of two ring-width series showing the similarities of a match between the Quince Cottage (in red) and a previously dated reference chronology (in black)



Taking a small core from roof timbers using a 12mm hollow auger

the Building Archaeology Research Database (BARD) and are shown below.

Buildings from small private dwellings to large stately homes and castles are now routinely tree-ring dated in the UK. However, the numbers dated vary considerably from county to county. Over 200 buildings have been dated in the counties of Hampshire, Surrey and Shropshire, but under 30 buildings have been dated in Dorset and Bedfordshire. Whilst most often only the earliest phase of construction is dated, this dating technique can equally identify the complete development of a timber building. An example of this is Orleton House in Shropshire (a large multi-phase building) where the main range has been dated to 1580, a cross-wing tree-ring dated to 1593 and a rear range dated to 1628.

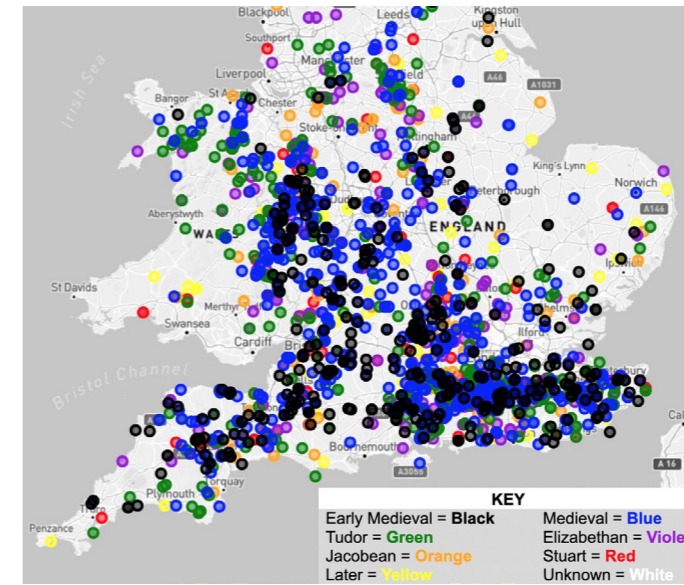
CAN YOUR BUILDING BE DATED?

It is important to realise that not all wood can be dated by tree-ring analysis. Normally an assessment of the building timbers is required to establish:

- Are the timbers of a datable species? Elm is a commonly used building timber, but generally cannot be tree-ring dated. Also, from the 1650s onwards an increasing amount of imported woods are used. In the UK native oak has the greatest potential to be tree-ring dated.
- Do the timbers contain sufficient rings to date? At least 60 rings are needed for a tree-ring series to be unique. Size of timbers is generally not a factor as large timber can contain few rings and conversely small timbers can contain many rings.



The location and period of construction of tree-ring dated buildings in Wales and the southern half of England



- Has the bark survived? An exact year of felling (sometimes even distinguishing the season of felling) can only be identified where bark (or full sapwood) survives. Where no bark survives it may be possible to establish a 30 year range for construction, using the fact that statistically oak trees in the south of England are expected to have between 9 and 41 rings of sapwood.

It is also important to bear in mind that this dating technique is not only applicable to timber-framed buildings, as it can work equally well just using roof timbers. This means that stone built buildings in the Cotswolds or Devon can also be dated.

Each year the majority of UK tree-ring dates are published in Vernacular Architecture (the annual journal of the Vernacular Architecture Group) which was established to further the historical study of traditional buildings. Through the ever increasing body of tree-ring dates, wider questions on why and when building traditions changed are starting to be answered.



Orleton House in Shropshire is a large multi-phase building with three tree-ring dated phases

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