Oxford Dendrochronology Laboratory
Report 2016/30

DENDROCHRONOLOGICAL INVESTIGATIONS AT 'TYMPERLEYS' (No 8) & No 7 TRINITY STREET, COLCHESTER, ESSEX (TL 9960 2507)

Summary

The timbers in the main range of Tymperleys, currently used as the tea shop, were found to have too few rings for dating. A single timber, in No 7 Trinity St (the bookshop), yielded a 97 year sequence which was subsequently dated to the period 1290–1386. The outer ring was thought to be very close to the heartwood-sapwood (H/S) boundary although not the actual boundary. The likely felling date range is therefore given as *c* 1396–1428 as it is not possible to be more accurate than this without a certain H/S boundary.

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Dendrochronological Investigations at Tymperleys, including 7 Trinity Street, Colchester, Essex (TL 9960 2507)

BACKGROUND TO DENDROCHRONOLOGY

The basis of dendrochronological dating is that trees of the same species, growing at the same time, in similar habitats, produce similar ring-width patterns. These patterns of varying ring-widths are unique to the period of growth. Each tree naturally has its own pattern superimposed on the basic 'signal', resulting from genetic variations in the response to external stimuli, the changing competitive regime between trees, damage, disease, management etc.

In much of Britain the major influence on the growth of a species like oak is, however, the weather conditions experienced from season to season. By taking several contemporaneous samples from a building or other timber structure, it is often possible to cross-match the ring-width patterns, and by averaging the values for the sequences, maximise the common signal between trees. The resulting 'site chronology' may then be compared with existing 'master' or 'reference' chronologies. These include chronologies made by colleagues in other countries, most notably areas such as modern Poland, which have proved to be the source of many boards used in the construction of doors and chests, and for oil paintings before the widespread use of canvas.

This process can be done by a trained dendrochronologist using plots of the ring-widths and comparing them visually, which also serves as a check on measuring procedures. It is essentially a statistical process, and therefore requires sufficiently long sequences for one to be confident in the results. There is no defined minimum length of a tree-ring series that can be confidently cross-matched, but as a working hypothesis most dendrochronologists use series longer than at least fifty years.

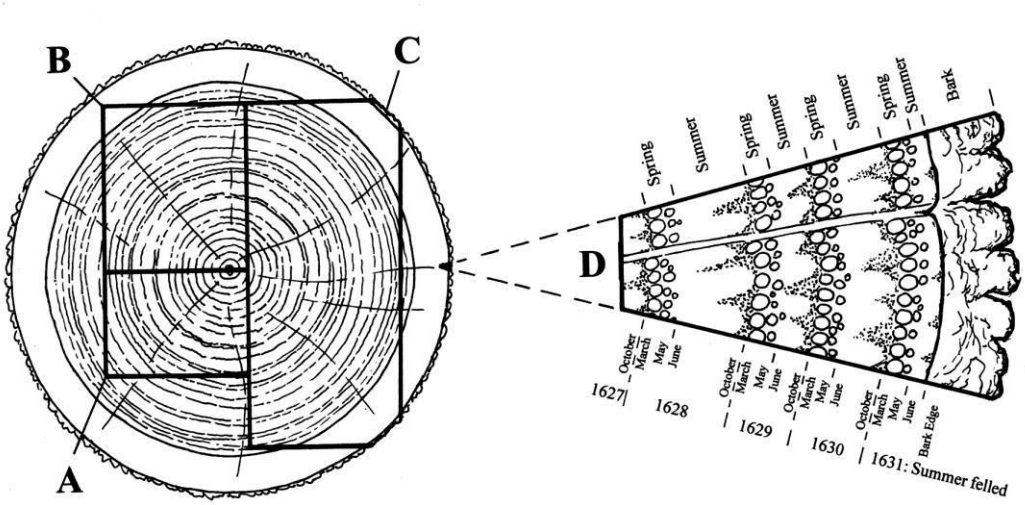
The dendrochronologist also uses objective statistical comparison techniques, these having the same constraints. The statistical comparison is based on programs by Baillie & Pilcher (1973, 1984) and uses the Student's *t*-test. The *t*-test compares the actual difference between two means in relation to the variation in the data, and is an established statistical technique for looking at the significance of matching between two datasets that has been adopted by dendrochronologists. The values of '*t*' which give an acceptable match have been the subject of some debate; originally values above 3.5 being regarded as acceptable (given at least 100 years of overlapping rings) but now 4.0 is often taken as the base value in oak studies. Higher values are usually found with matching pine sequences. It is possible for a random set of numbers to give an apparently acceptable statistical match against a single reference curve – although the visual analysis of plots of the two series usually shows the trained eye the reality of this match. When a series of ring-widths gives strong statistical matches in the same position against a number of independent chronologies the series becomes dated with an extremely high level of confidence.

One can develop long reference chronologies by cross-matching the innermost rings of modern timbers with the outermost rings of older timbers successively back in time, adding data from numerous sites. Data now exist covering many thousands of years and it is, in theory, possible to match a sequence of unknown date to this reference material.

It follows from what has been stated above that the chances of matching a single sequence are not as great as for matching a tree-ring series derived from many individuals, since the process of aggregating individual series will remove variation unique to an individual tree, and reinforce the common signal resulting from widespread influences such as the weather. However, a single sequence can be successfully dated, particularly if it has a long ring sequence.

Growth characteristics vary over space and time, trees in south-eastern England generally growing comparatively quickly and with less year-to-year variation than in many other regions (Bridge, 1988). This means that even comparatively large timbers in this region often exhibit few annual rings and are less useful for dating by this technique.

When interpreting the information derived from the dating exercise it is important to take into account such factors as the presence or absence of sapwood on the sample(s), which indicates the outer margins of the tree. Where no sapwood is present it may not be possible to determine how much wood has been removed, and one can therefore only give a date after which the original tree must have been felled. Where the bark is still present on the timber, the year, and even the time of year of felling can be determined. In the case of incomplete sapwood, one can estimate the number of rings likely to have been on the timber by relating it to populations of living and historical timbers to give a statistically valid range of years within which the tree was felled. For this region the estimate used is that 95% of oaks will have a sapwood ring number in the range 9 – 41 (Miles 1997).



Section of tree with conversion methods showing three types of sapwood retention resulting in **A** *terminus post quem*, **B** a felling date range, and **C** a precise felling date. Enlarged area **D** shows the outermost rings of the sapwood with growing seasons (Miles 1997, 42)

Tymperleys (No 8), and No 7 Trinity Street (from Colchester Historic Buildings Forum website)

Grade II*. Originally a C15-C16 building, standing in its garden back from the road and facing south reached through the archway in No 7. Much restored. 2 storeys and attics, timber-framed and plastered, the timbering exposed on the front, the roofs tiled, 3 gabled dormers, the upper storey projects on the south front. Original doorway west end in the first floor with 4 centred head, now blocked, probably once led to an external stairway. Mostly modern period fenestration. Interior has original moulded ceiling beams and C17 staircase. Plaque over gateway records this as the house of William Gilberd, MA 1544-1603 - the Father of Electrical Science.

SAMPLING

Samples were taken in August 2016. The locations of the samples are described in Table 1. Core samples were extracted using a 15mm diameter borer attached to an electric drill. They were labelled (prefix **tymp**) and were polished with progressively finer grits down to 400 to allow the measurement of ring-widths to the nearest 0.01 mm. The samples were measured under a binocular microscope on a purpose-built moving stage with a linear transducer, attached to a desktop computer. Measurements and subsequent analysis were carried out using DENDRO for WINDOWS, written by Ian Tyers (Tyers 2004).

RESULTS AND DISCUSSION

Details of the samples are given in Table 1. Although a brief assessment of the main building (No 8 Trinity Street) had suggested that there were sufficient rings in enough timbers to make sampling worthwhile, on closer inspection this proved not to be the case, as conformed by taking cores from the those timbers which looked the most useful, which turned out to have too few rings.

The tiebeam in No 7 (bookshop) was larger than many of the timbers on the rest of the site, and appeared to have a natural edge (possibly heartwood-sapwood boundary). This yielded a 97-year long sequence which was subsequently dated to the period 1290–1386 (Table 2). The sequence also matches other sites in Colchester (t = 5.1 against Rebow House cellar timbers with 70 years overlap; t = 4.8 against George Hotel cellar timbers with 84 years overlap).

The heartwood-sapwood boundary was not apparent on the core itself, and so the felling date range remains approximate, but indicates that this range, forming the front range along Trinity Street is of very late C14th or early C15th origin. It is unlikely that other timbers seen on the site would yield any sequences long enough to be datable.

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Table 1: Details of samples taken from Tymperleys and No 7 Trinity Street, Colchester.

Sample number	Timber and position	Date of series	H/S boundary date	Sapwood complement	No of rings	Mean width (mm)	Std devn (mm)	Mean sens	Felling date range
tymp01	Rear wall post, 2nd from east	-	-	H/S	33	NM	-	-	-
tymp02	Common rafter north, 9th from east	-	-	4	27	NM	-	-	-
tymp03	Tiebeam in attic	-	-	H/S	39	NM	-	-	-
tympB01	South tie in bookshop	1290–1386	*c1387*	Close to H/S	97	1.70	0.48	0.20	*c 1396–1428*
tympB02	Common rafter west, 4th from S truss	-	-	17C	45	2.27	0.56	0.20	-

Key: H/S bdry = heartwood/sapwood boundary - last heartwood ring date; C = complete sapwood present, felled the following winter; std devn = standard deviation; mean sens = mean sensitivity; NM = not measured.

Table 2: Dating evidence for the site series **tympB01 AD 1290–1386** against dated reference chronologies

County or region:	*Chronology name:*	*Reference*	*File name:*	*Spanning*	*Overlap: (yrs)*	*t-value:*
Regional Chronologies						
Southern England	Southern England Master	(Bridge 1988)	**SENGLAND**	1083–1589	97	7.1
England	Southern Central England	(Wilson *et al* 2012)	**SCENG**	663–2009	97	7.0
London	London Master Chronology	(Tyers pers comm)	**LONDON**	413–1728	97	6.1
East Anglia	East Anglia Master Chronology	(Bridge 2003a)	**ANGLIA03**	944–1789	97	6.0
Site Chronologies						
Essex	Blackmore Church	(Miles *et al* 2005)	BLCKMORE	1266–1399	97	7.1
Essex	Fyfield Hall	(Bridge 1998)	FYFIELD2	1293–1388	94	6.4
Hampshire	Tudor House, Southampton	(Miles *et al* 2009)	TUDORHS4	1289–1463	97	6.2
London	Sutton House, Hackney	(Tyers and Hibberd 1993)	SUT91	1319–1534	68	6.1
Essex	Thaxted Church Chancel	(Bridge 2005a)	THXTDCH	1212–1404	97	5.9
Essex	Upper Town Cottage, Nazeing	(Miles and Bridge 2014)	NAZEING	1323–1461	64	5.9
Essex	St Nicholas' Church, Fyfield	(Bridge 2005b)	FYFLDCH3	1226–1343	54	5.8
Essex	Coggeshall Abbey	(Arnold and Howard 2015)	COGASQ01	1225–1354	65	5.8

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