Darganfod Hen Dai Cymreig
Discovering Old Welsh Houses

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Please note that these reports are being updated as part of an ongoing programme of revision. Older reports sometimes refer to the old names of the Group. Between 2005 and 2012 also known as The Snowdonia Dendrochronology Project, then the N W Wales Dendrochronology Project and then the Dating Old Welsh Houses Group.

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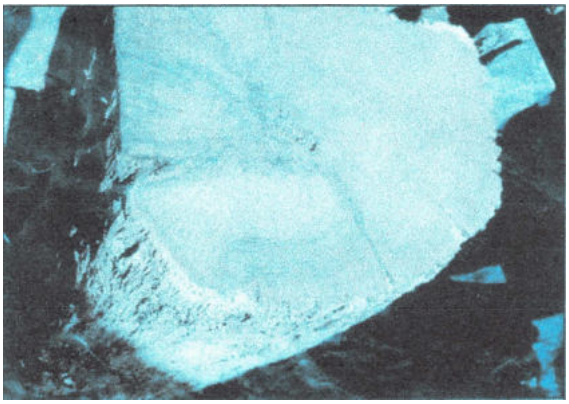
Oxford Dendrochronology Laboratory
Report 2014/18

THE TREE-RING DATING OF A FIREPLACE LINTEL FROM CWMORTHIN UCHAF FARM, TANYGRISAU, BLAENAU FFESTINIOG, GWYNEDD (SH 676 467)



Summary
A single timber was supplied to the Laboratory, labelled as having come from the fireplace lintel at Cwmorthin Uchaf farm. After preparation, a sequence of 92 rings was measured that was subsequently dated to the period 1406-97. Whilst of great interest, caution needs to be employed in interpreting much from a single timber, which itself may have been re-used or stockpiled. The fireplace may itself be a later addition to an earlier property.

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August 2014

The Tree-Ring Dating of a Fireplace Lintel from Cwmorthin Uchaf Farm, Tanygrisau, Blaenau Ffestiniog, Gwynedd (SH 68 45)

SAMPLING

The sample, in the form of a slice from the fireplace lintel, was handed over to the Laboratory on a recent trip to North Wales. It was labelled as being from a fireplace lintel from Cwmorthin Uchaf Farm,and photos were supplied of the section (one of which is used on the cover of this report). The slice was cut down to a convenient radius, running from very near the pith, to what looks like the heartwoodsapwood boundary, and indeed appears to be so from the photographs. This was 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 sample are given in Table 1. This single 92-year long sequence gave strong consistent matches against a lot of relatively local chronologies (Table 2), establishing its date range as 1406-97. Assuming that the outer ring is indeed the heartwood-sapwood boundary, this would give a likely felling date range for this single timber as 1508-38 (as indicated in Figure 1). Whilst this may be of interest - a deal of caution is necessary in interpreting this result - a single timber cannot be relied on to give the date of a whole phase of building, especially something like a fireplace lintel. It could be re-used from another site, or an earlier building on the same site, or it could be that the fireplace is itself a much later addition to the property.

ACKNOWLEDGEMENTS

This work was commissioned by Mr W. T. (Bill) Jones, and we are grateful to Margaret Dunn for transporting the section of lintel, so that it could be handed over on a recent trip to North Wales. I thank my fellow dendrochronologists for permission to use their data.

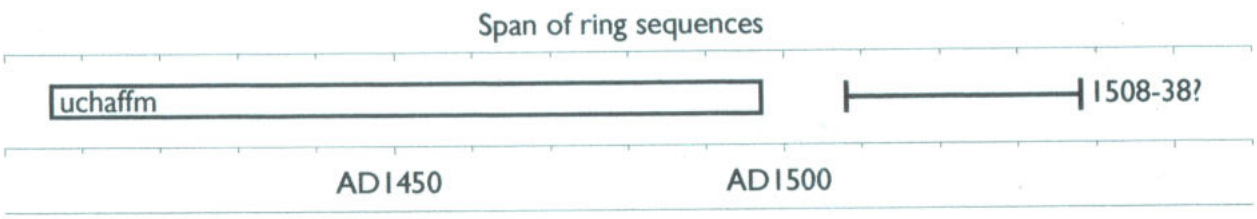


Figure 1: Bar diagram showing the span of the dated series, along with its interpreted likely felling date range, assuming the outer ring is the heartwood-sapwood boundary.

Table 1: Details of samples supplied to the Laboratory.

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
uchaffm	*ex situ* fireplace lintel	1406-1497	?1497	?H/S	92	1.62	0.68	0.25	?1508–38

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 sequence **UCHAFFM AD 1406–97** against dated reference chronologies

County or region:	*Chronology name:*	*Reference*	*File name:*	*Spanning*	*Overlap: (yrs)*	*t-value:*
Site Chronologies						
Wales	Plas y Dduallt, Maentwrog	(Miles *et al* 2011)	GWYNEDD5	1355–1604	92	7.4
Wales	Pengwern Old Hall	(Miles *et al* 2003)	PENGWERN	1353–1521	92	6.9
Wales	Newton Nottage Church	(Miles *et al* 2004)	NWTNNTTG	1362–1535	92	6.8
Wales	Plas ym Mhenrhos, Penrhos	(Miles *et al* 2012)	PLASMNRS	1413–1607	85	5.9
Wales	Cwm Farm, Cwm Cynfal	(Miles *et al* 2012)	CWMFM1	1364–1567	92	5.7
Wales	Beddgelert	(Nayling pers comm)	BEDD_T6	1302–1529	92	5.6
Wales	Brynmaenllwyd, Trawsfynydd	(Bridge *et al* 2013)	TRAWSFYN	1381–1587	92	5.5
Wales	Hafodysybyty, Ffestiniog	(Miles *et al* 2012)	HDYSBYTY	1374–1497	92	5.3
Herefordshire	Penrhos Court, nr Kington	(Tyers 1998)	PENRHOS2	1420–1558	78	4.7
Wales	Dylasau Isaf, Caernarfonshire	(Miles *et al* 2011)	DYLASAU1	1412–1592	86	4.6

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 these sequences,maximise the common signal between trees .The resulting 'site Chronology' may then be compared with existing 'master' or'reference'chronologies.

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.

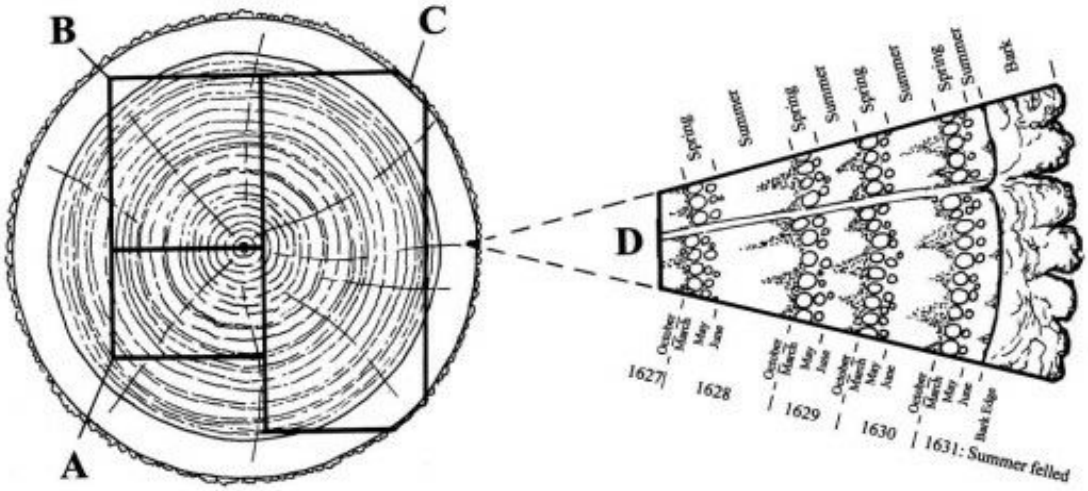
The dendrochronologist also uses objective statistical comparison techniques, these having the same constraints. The statistical comparison is based on programs by Baillie & Pilcher (1973, 1984) and uses the Student's t-test. The t-test compares the actual difference between two means in relation to the variation in the data, and is an established statistical technique for looking at the significance of Matching between two data sets 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. 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 11 – 41 (Miles 1997a).



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