Darganfod Hen Dai Cymreig
Discovering Old Welsh Houses

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Oxford Dendrochronology Laboratory
Report 2018/02

THE DENDROCHRONOLOGICAL INVESTIGATION OF TIMBERS FROM MAES Y GROES, BELLAF, CILCAIN FLINTSHIRE

(SJ 1882 6332)

Summary

Seven timbers were sampled, representing timbers from the trusses and the ground floor ceiling. No consistent acceptable matching was found between the samples. None of the samples dated individually against the dated reference material despite there being some reasonably long sequences.

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A report commissioned by the Discovering Old Welsh Houses Group in collaboration with the Royal Commission on the Ancient and Historic Monuments Wales (RCAHMW)

The Dendrochronological Investigation of Timbers from Maes y Groes, Bellaf, Cilcain, Flintshire (SJ 1882 6332)

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.

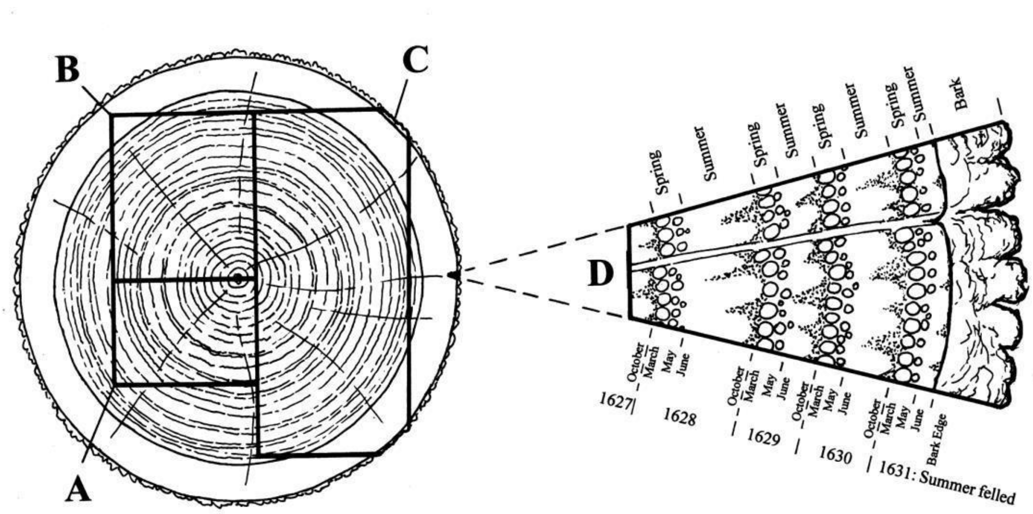
The dendrochronologist also uses objective statistical comparison techniques, these having the same constraints. The statistical comparison is based on programs by Baillie & Pilcher (1973, 1984) and uses the Student's *t*-test. The *t*-test compares the actual difference between two means in relation 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 11 – 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)

<u>Maes Y Groes</u> (based on notes by Peter Smith 1983 and Martin Cherry)

"On the face of it Maes-y-groes is a substantial two-unit type B end-entry storeyed house having hall and parlour on the ground floor and two chambers on the first floor." Early features include three tall square chimneys, three–light stone mullioned windows ovolo moulded on the outside and plain chamfered on the inside. Inside is a good post-and-panel partition. There is an ornate open truss in the chamber, with cusped braces (Smith).

It is a late- C16th or early C17th house, which may have had an open hall into which a floor was later inserted. At first-floor level there is an open arch-braced truss (west truss) without evidence of smoke blackening. It has a high-set collar with solid arch-braces and no spandrel gaps, with a quatrefoil above flanked with a trefoil either side. There are double trenched purlins and a diagonally-set ridge. The room above the parlour is separated by a timber-framed partition (east truss).

SAMPLING

Samples were taken in November 2017. Core samples were extracted using a 15mm diameter borer attached to an electric drill. They were labelled with the prefix **msyg**, with samples 1- 6 from the cruck hall, samples 11 - 19 from the western down-slope range of both later phases, and sample 20 from the fireplace lintel between the stack at the west end of the cruck hall. The samples 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

The locations and details of the samples are described in Table 1. No consistent acceptable matches were found between the sample tree-ring series. One sample (**04**) showed a number of abrupt growth changes, perhaps indicating that the parent tree had been managed in some way (Fig 1). Sample **02** only retained 30 rings to the heartwood/sapwood boundary, the complete sapwood on the timber disintegrating on coring on two attempts.

Each measured sequence was compared individually with the database of reference material from Wales and from the rest of the UK, but no acceptable consistent matches were found, and the timbers therefore remain undated. It is possible that more local material may date some of these sequences in the future.

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I also thank my fellow dendrochronologists for permission to use their data.

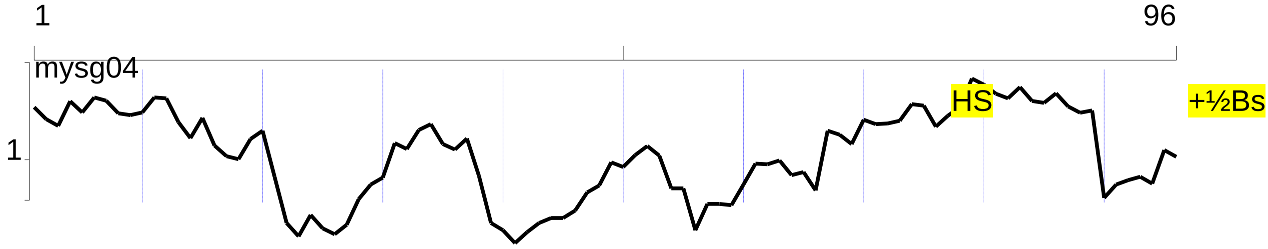

Figure 1: Plot of the ring sequence from sample msyg04. (y-axis is ring width [mm] on a logarithmic scale). A number of sudden declines in growth rate may indicate management of the parent tree.

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Table 1: Details of samples taken from Maes Y Groes, Cilcain.

Sample number	Timber and position	Sapwood complement	No of rings	Mean width (mm)	Std devn (mm)	Mean sens
First floor						
msyg01	West truss, north principal rafter	12C	47	3.01	1.07	0.26
msyg02	Collar to west truss	H/S	30	NM	-	-
msyg03	South queen strut to east truss	2	94	1.47	0.70	0.17
Ground floor						
msyg04	4th joist from west, on north side	17¼C	96	1.37	0.86	0.23
msyg05	4th joist from west, on south side	-	74	1.98	0.66	0.15
msyg06	5th joist from west, on south side	-	81	1.81	1.03	0.23
msyg07	Axial beam in east room	H/S	38	2.97	1.21	0.24

Key: H/S bdry = heartwood/sapwood boundary - last heartwood ring date;C = complete sapwood, felled the following winter; ¼ C = complete sapwood, felled the following spring; std devn = standard deviation; mean sens = mean sensitivity; NM = not measured.