Darganfod Hen Dai Cymreig
Discovering Old Welsh Houses

Reports: Welcome to the many Discovering Old Welsh Houses Reports which are available here on our website. All the reports - House Histories, Building Reports and Tree-ring Dating reports - can be accessed - *here*

Discovering Old Welsh Houses studies and celebrates the traditional houses of North Wales and the lives of the people who lived in them.

If you find the content useful, please consider becoming a *Member* to access the many benefits available.

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.

New reports will be added from time to time. Keep an eye on our website for updates.

DYDDIO HEN DAI CYMREIG | DATING OLD WELSH HOUSES

PROSIECT DENDROCRONOLEG GOGLEDD ORLLEWIN CYMRU | NORTH WEST WALES DENDROCHRONOLOGY PROJECT

Oxford Dendrochronology Laboratory
Report 2010/45

THE TREE-RING DATING OF CREIGIR ISAF, LLANENGAN, Nr ABERSOCH, GWYNEDD (NGR SH 304 282)

Summary

Limited sampling was undertaken at this property, with just four timbers being sampled. A single timber dated, a ground floor ceiling beam on the west side of the entrance hall. The series dated to the period 1412–1488, and included the heartwood sapwood boundary, giving a likely felling date range of **1499–1531**. The other three samples did not match this series, nor did they date independently. Caution needs to be taken in interpreting a whole phase on the basis of single timber, but this strongly suggests a construction date in the early 16th century.

Author: Dr M. C. Bridge FSA
Oxford Dendrochronology Laboratory
Mill Farm
Mapledurham
Oxfordshire
RG4 7TX

September 2010

The Tree-Ring Dating of Creigir Isaf, Llanengan, nr Abersoch (NGR SH 304 282)

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.

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. 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).

CREIGIR ISAF

This relatively simple 3-bay cottage (later extended to the west) with a central entrance retains a plank and muntin screen on the east side of the entrance hall.

SAMPLING

Sampling took place in August 2010. All the samples were of oak (*Quercus* spp.). Core samples were extracted using a 15mm diameter borer attached to an electric drill. They were numbered using the prefix **cia**. The samples were removed for further preparation and analysis. Cores were mounted on wooden laths and then these were polished using 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 and their locations are given in Table 1. The trusses generally contained relatively fast-grown timbers, as illustrated by the best candidate being sampled and only yielding 48 rings. The samples did not match each other, but attempts to date them independently showed very strong matches for one series, **cia02,** from the ground floor ceiling beam on the west side of the entrance hall. This series dated to the period 1412–1488, the strongest matches being shown in Table 2. The heartwood-sapwood boundary was retained on this sample, giving a most likely felling date range of **1499–1531**. Obviously, great caution needs to be taken in interpreting the date of the whole construction on the basis of a single timber, but this does suggest an early 16th century date for the property.

ACKNOWLEDGEMENTS

Margaret Dunn provided assistance on site and provided background information on the building. The owners were very kind in allowing sampling in their absence. I would also thank my fellow dendrochronologists for permission to use their data.

This study was funded by the North-West Wales Dendrochronology Project, co-ordinated by Margaret Dunn, with support by the Royal Commission on Ancient and Historic Monuments of Wales.

Table 1: Details of samples taken from Creigir Isaf, Llanengan, nr Abersoch.

Sample number	Timber and position	Dates AD spanning	H/S bdry	Sapwood complement	No of rings	Mean width mm	Std devn mm	Mean sens	Felling seasons and dates/date ranges (AD)
cia01	Top rail of plank and muntin screen	undated	-	10	37	2.20	0.51	0.24	unknown
cia02	West ceiling beam, W entrance hall	1412-1488	1488	H/S	77	1.42	0.59	0.29	1499–1531
cia03	Fireplace lintel	undated	-	10	75	2.65	0.97	0.21	unknown
cia04	N principal rafter, T2	undated	-	15	48	2.97	0.88	0.27	unknown

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

Table 2. Dating evidence for the series **cia02,** AD 1412–1488 against individual site chronologies, and regional chronologies (shown in **BOLD)**

County or region:	*Chronology name:*	*Short publication reference:*	*File name:*	*Spanning:*	*Overlap (yrs):*	*t-value:*
Wales	Newton Nottage Church	(Miles *et al* 2004)	NWTNNTTG	1362–1535	77	7.3
Wales	Bwthyn Cae-glas, Llanfrothen	(Miles *et al* 2006)	BDGLRT7	1386–1547	77	7.1
Wales	Welsh Master Chronology	(Miles 1997b)	**WALES97**	404–1981	77	7.0
Wales	Clenennau, Dolbenmaen	(Miles *et al* 2006)	BDGLRT10	1406–1570	77	6.9
Wales	Pengwern Old Hall	(Miles *et al* 2003)	PENGWERN	1353–1521	77	6.9
Wales	Rose and Crown, Gwydwn	(Miles and Worthington 2000)	GWYDWN	1411–1571	77	6.8
Wales	Gelli, Llanfrothen	(Miles *et al* 2006)	BDGLRT8	1391–1662	77	6.4
Wales	Beddgelert	(Nayling pers comm)	BEDD_T6	1302–1529	77	6.4
Wales	Cefn Caer Pennel	(Miles and Worthington 1999)	CEFNCAR1	1404–1525	77	6.2
Wales	Pant-glas-uchaf, Clynnog	(Miles *et al* 2006)	BDGLRT14	1413–1573	77	6.1

REFERENCES

Baillie, M.G.L. and Pilcher, J.R. (1973) *A simple cross-dating program for tree-ring research*. **Tree Ring Bulletin**, 33, 7-14.

Bridge, M. C. (1988) The dendrochronological dating of buildings in southern England, **Medieval Archaeology**, 32, 166-174.

English Heritage (1998) *Guidelines on producing and interpreting dendrochronological dates,* **English Heritage, London.**

Miles, D. (1997a) The interpretation, presentation, and use of tree-ring dates, **Vernacular Architecture**, 28, 40-56.

Miles, D. H. (1997b) Working compilation of 58 reference chronologies centred around Wales by various researchers, unpublished computer file WALES97, Oxford Dendrochronology Laboratory.

Miles, D. H. and Worthington, M. J. (1999) Tree-ring dates, **Vernacular Architecture**, 30, 98-113.

Miles, D. H. and Worthington, M. J. (2000) Tree-ring dates, **Vernacular Architecture**, 31, 90-113.

Miles, D. H., Worthington, M. J. and Bridge, M. C. (2003) Tree-ring dates, **Vernacular Architecture**, 34, 109-113.

Miles, D. H., Worthington, M. J. and Bridge, M. C. (2004) Tree-ring dates, **Vernacular Architecture**, 35, 95-113.

Miles, D. H., Worthington, M. J. and Bridge, M. C. (2006) Tree-ring dates, **Vernacular Architecture**, 37, 118-132.

Tyers, I. (2004) *Dendro for Windows Program Guide 3rd edn*, **ARCUS Report,** 500b**.**