DYDDIO HEN DAI CYMREIG | DATING OLD WELSH HOUSES

PROSIECT DENDROCRONOLEG GOGLEDD ORLLEWIN CYMRU | NORTH WEST WALES DENDROCHRONOLOGY PROJECT

Oxford Dendrochronology Laboratory
Report 2010/44

THE TREE-RING DATING OF
GRONANT,

Llanfachraeth, near Holyhead,

SH 327 851
Anglesey.

1524/5

Houses Description

A large complexe of unit-system type. The earliest range is a storeyed house of hearth-passage type with post-and-panel passage partition, moulded ceiling beams, and a diagonally-set chimney. This is the only house of hearth-passage plan-type identified on the island and of interestingly early date. House II is a modernised and later storeyed house of direct-entry 'Snowdonian' type with end-chimneys. The link between these two houses probably dates from the early C19th. Partial survey in the NMRW.

Consisted of two phases of construction, one in each of two buildings later conjoined. In the first building sampled very little sapwood was available on the timbers, although many had substantial ring counts. Five timbers from the main hall range were sampled, one with over 200 rings. Three timbers from this range dated, and produced a felling date of *circa* 1618-19 or shortly thereafter. It is not possible to give a more accurate date due to the sapwood rings in the last two decades being so narrow as to be almost unmeasurable, and the readings taken were not considered to be reliable. Dendro-provenancing has shown that timbers have originated from both Wales and Ireland.

To the south-east, in the lower kitchen range of the second building, an axial beam and mantel beam were the only timbers available for sampling. The axial beam had a last measured date of 1538, which included 23 rings of sapwood. This was thought to have been complete on sampling, but inspection under the microscope revealed that most of the end surface of the core had been shaved during conversion, therefore a felling date of *circa* 1540 is give for this timber. The mantel beam had a last measured ring date of 1519, which included 9 rings of sapwood, giving a felling date range of 1524-54, which is consistent with the axial beam. These two timbers matched best with north Welsh chronologies. Detailed surveys of many of the houses sampled are available in the National Monuments Record of Wales (NMRW), the public archive of the Royal Commission.
Daniel Miles, Michael Worthington, Martin Bridge, Richard Suggett, and Margaret Dunn

Authors: Dr M. C. Bridge FSA and Dr D. W. H. Miles FSA
Oxford Dendrochronology Laboratory
Mill Farm
Mapledurham
Oxfordshire
RG4 7TX

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The Tree-Ring Dating of BRANAS UCHAF Llandrillo, (Edeyrnion, Merioneth) Denbighsire. (SJ 011 372)

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).

Table 1: Summary of Tree-Ring Dating 2010

GRONANT, LLANFACHRAETH, HOLYHEAD, ANGLESEY

Sample	Timber and position	Dates AD	H/S	Sapwood	No of	Mean	S t d
Mean	Felling seasons and						
number & type		spanning	bdry	complement	rings	width	d e v n
sens	dates/date ranges (AD)						
						mm	mm
mm							
Main range							
angc1	c East principal rafter S truss	1506-1590	1578	12	85	1.22	0.61
0.165	1592-1622 (Welsh)						
angc2	c West principal rafter S truss	-		H/S	109	1.09	0.25
0.187							
angc3a1	c East principal rafter 2nd truss from S	1405-1589	1580	9	185	1.00	0.38
0.209							
angc3a2	c ditto	-		29C	29	0.46	0.14
0.269	*c*. 1618/19 (Irish)						
angc3b [1]	c ditto	1476-1587		13C+20CNM	112	0.94	0.43
0.239							
angc3c	c ditto	1475-1579			105	0.91	0.25
0.224							
* **angc3**	Mean of **angc3a1** + **angc3b** + **angc3c**	1405-1589			185	1.01	0.38
0.206	*c*. 1618/19 (Irish)						
angc4	c West principal rafter 2nd truss from S	-		33¼C	99	0.88	0.42
0.206							
* **angc5**	c West V-strut 2nd truss from S	1442-1573	1573	H/S	132	0.76	0.20
0.204	1590-1630 (Irish)						
South-east wing							
angc11 [2]	c Axial beam, kitchen	1427-1538	1515	23 ?C	*112	1.28	0.84
0.248	*Circa* 1540 (Welsh)						
angc12	c Mantel beam, kitchen	1441-1519	1510	9	79	2.09	1.04
0.256	1524-54 (Welsh)						
*** = ANGC Site Master (Irish)**		**1405-1589**			**185**	**0.90**	**0.29**
0.182							

[1] Last 20 rings of sapwood unreliable and not included in measured sequence [2] Sapwood unreliable, bark edge questionable

Key: *, †, § = sample included in site-master; c = core; mc = micro-core; s = slice/section; g = graticule; p = photograph; ¼C, ½C, C = bark edge present, partial or complete ring:

¼C = spring (last partial ring not measured), ½C = summer/autumn (last partial ring not measured), or C = winter felling (ring measured); H/S bdry = heartwood/sapwood

boundary - last heartwood ring date; std devn = standard deviation; mean sens = mean sensitivity. Sapwood estimate of 14-44 used for North Wales and 17-57 for Irish timbers (Hillam 1987)

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