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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 2018/04

THE DENDROCHRONOLOGICAL DATING OF TIMBERS FROM GARNEDDWEN FAWR, YSCEIFIOG, LIXWM, FLINTSHIRE.

(SJ 17332 70447)

Photo: Margaret Dunn

Summary

Seven timbers were sampled from the main range of this building. Unfortunately most ring patterns showed anomalous sudden growth reductions (probably resulting from management of the trees) and dating was difficult, but two tiebeams matched each other and were dated. The mean heartwood/sapwood boundary date was 1546, giving a likely felling date range of **1557–87**.

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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 Dating of Timbers from Garneddwen Fawr, Ysceifiog, Lixwm, Flintshire (SJ 17332 70447)

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.

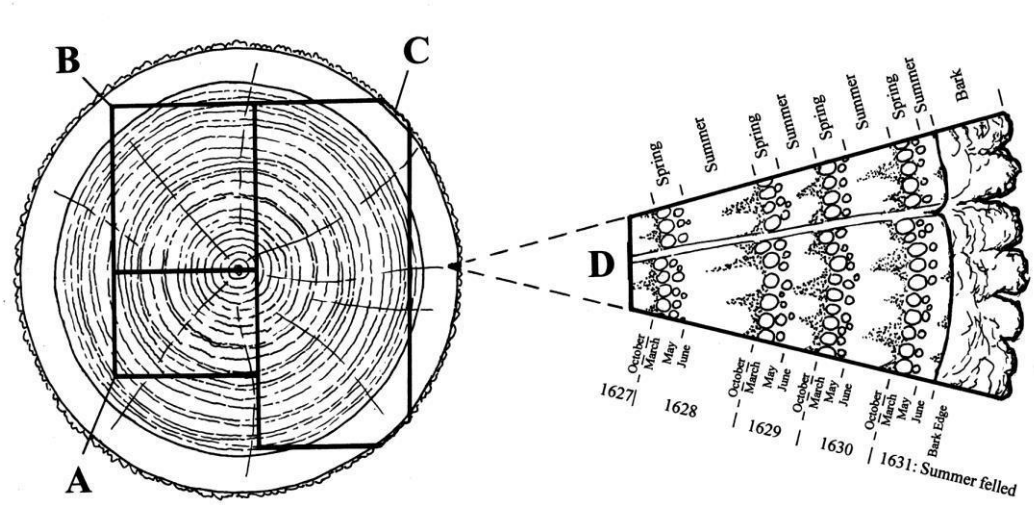
The dendrochronologist also uses objective statistical comparison techniques, these having the same constraints. The statistical comparison is based on programs by Baillie & Pilcher (1973, 1984) and uses the Student's *t*-test. The *t*-test compares the actual difference between two means in relation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

Garneddwen Fawr (NPRN 36331 - Coflein entry by Richard Suggett)

C16th century stone 2 storey, slate roof. Large rect. Central and projecting stacks. Thick walls. Interior low doors with wide boards & Strap Hinges. Old bake house to NE.

[Addition:] Y Garneddwen-fawr seems to have been the principal farmhouse in the township of Garneddwen and is a substantial vernacular house of considerable interest. An L-plan, stone-walled, storeyed house of c.1600+, with lower parlour wing. The downslope house appears to be (unusually) of hearth-passage type with the passage between the hall and parlour. Architectural features in the hall/kitchen include beams with small broach stops; a large fireplace with angled stops on the beam; the two-door partition between hall and inner-room may be of post-and-panel type but wainscoting has been applied to the partition on the hall side. The parlour wing and stair alongside are accessed from the passage and the range continues with service-rooms. Architectural features in the parlour wing include a lateral fireplace (detail concealed) and beam with angled stop. A run of splat balusters survives on the landing. The detail in the service-rooms is mostly concealed. External steps at the upper gable end lead

give access to a servants' room over the hall and inner-room. The queen-post truss is fully exposed (although the tie-beam has been cut). The trusses in the family chambers in the lower part of the house are mostly concealed. A detached C18th/C19th bakehouse completes the domestic ranges apart from C20th additions to the house.

The farm buildings (stable, cowhouse etc) appear to be C19th but the three/four-bay barn adjacent to the house is probably earlier.

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 **gndw.** 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, with a field sketch plan of the building (Margaret Dunn) shown in Fig 1. Truss 1 was sampled in the open floored loft area, accessible from the external stair. Sample **07** split and was measured as two separate sequences.

The outer rings were edited out of the whole core sequence in some instances (beyond the bands of narrow rings) and analysed separately to see if they would match other site sequences or date on their own, but no satisfactory matches were found.

Fig 2 shows the undated cores with the sudden growth-rate declines, probably resulting from management of the trees used, but usually undetectable in the timbers before sampling. Two series did however match, samples **05** and **06** – from two adjacent tie beams. These matched each other (t = 6.8 with 186 years overlap) and the series were combined to form a new sequence, **gndw65m**, which was subsequently dated to the period 1359–1456, the strongest matches being shown in Table 2. The relative positions of overlap are shown in Fig 3. Taking the mean heartwood-sapwood boundary date (1546), this gives a likely felling date range of **1557–87**.

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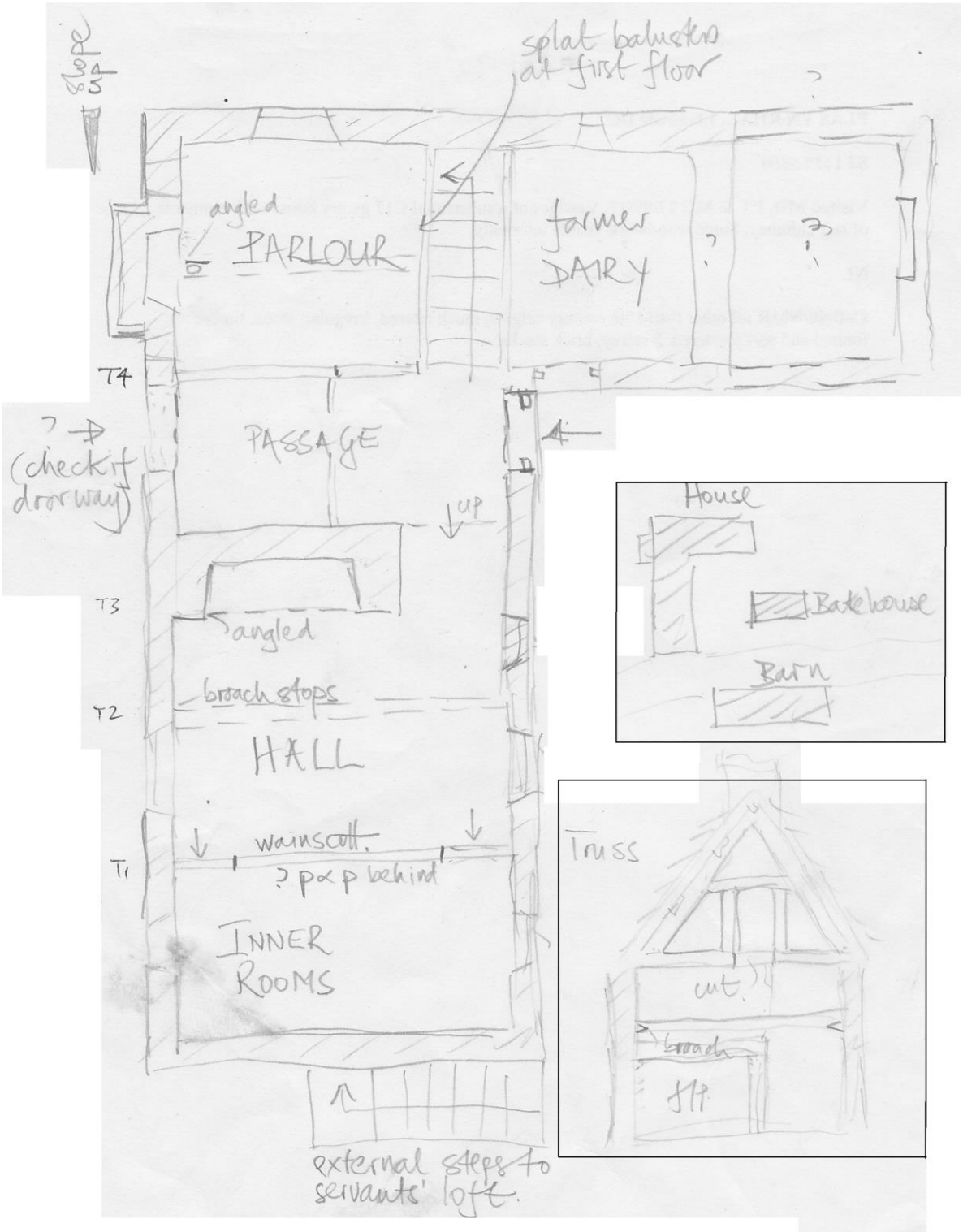

Figure 1: Field-sketch of the site (Ricahrd Suggett) showing the location of the trusses referred to in Table 1.

Figure 2: Scan of the undated cores highlighting the positions of sudden growth rate declines responsible for the non-dating of these sequences.

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Table 1: Details of samples taken from Garneddwen Fawr

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
gndw01	Bay 1-2, north lower purlin	-	-	36¼C	91	1.22	0.62	0.27	-
gndw02	Tiebeam, truss 1	-	-	29¼C	95	1.36	0.78	0.32	-
gndw03	North principal rafter, truss 1	-	-	19½C	80	1.49	1.19	0.30	-
gndw04	Collar, truss 1	-	-	4	71	1.91	0.98	0.34	-
gndw05	Tiebeam, truss 4	1359–1546	1546	H/S	188	0.77	0.46	0.20	1557–87
gndw06	Tiebeam, truss 3	1360–1545	1545	H/S	186	0.75	0.50	0.19	1556–86
gndw07i	Girding beam, truss 1 (inner rings)	-	-	-	*35*	*2.95*	*0.90*	*0.21*	-
gndw07ii	*ditto* (outer rings)	-	-	29½C	*69*	*1.02*	*0.39*	*0.27*	-
gndw65m	Mean of **05** and **06**	1359–1546	1546		**188**	**0.76**	**0.46**	**0.17**	1557–87

Key: H/S bdry = heartwood/sapwood boundary - last heartwood ring date; ¼C = complete sapwood, felled the following spring; ½ C = complete sapwood, felled the following summer; std devn = standard deviation; mean sens = mean sensitivity; NM = not measured.

Table 2: Dating evidence for the site sequence **gndw65m** **AD 1359–1546** against dated reference chronologies

County or region:	*Chronology name:*	*Reference*	*File name:*	*Spanning*	*Overlap: (yrs)*	*t-value:*
Regional Chronologies						
North Wales	North Wales Master Chronology	(Bridge 2016)	**NWALES**	1306–1758	188	6.8
England	Southern Central England	(Wilson *et al* 2012)	**SCENG**	663–2009	188	6.2
Site Chronologies						
Herefordshire	Church Ale House, Colwall	(Hillam 1991)	COLWALL2	1354–1435	77	6.8
Shropshire	Clungunford Farm	(Miles and Worthington 2002)	CGFB	1273–1628	188	6.4
Caernarvonshire	Gelli, Llanfrothen	(Miles *et al* 2007)	BDGLRT8	1391–1662	156	6.4
Herefordshire	Cradley Village Hall	(Miles *et al* 2004)	CRADLEY	1347–1530	172	6.3
Hampshire	Abbots Barton	(Miles and Worthington 1998)	ABTSBRTN	1387–1559	160	6.1
Herefordshire	Farmer's Club, Hereford	(Tyers 1996)	HEREFC	1313–1617	188	6.1
Shropshire	Home Farm, Middleton	(Miles *et al* 2004)	DITTON4	1315–1611	188	6.0
Shropshire	Cotton's House, Market Drayton	(Miles *et al* 2005)	COTTONHS	1416–1584	131	5.9
Flintshire	St Winefride's Well, Holywell	(Miles *et al* 2010)	HOLYWELL	1388–1524	137	5.7

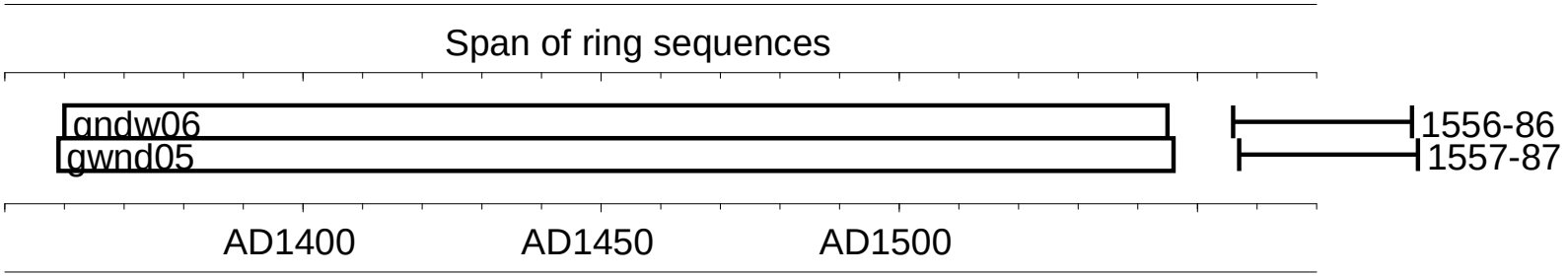

Figure 3: Bar diagram showing the relative positions of overlap of the dated samples, with their actual or likely felling dates / date ranges. White sections represent heartwood rings and yellow hatched sections represent sapwood.