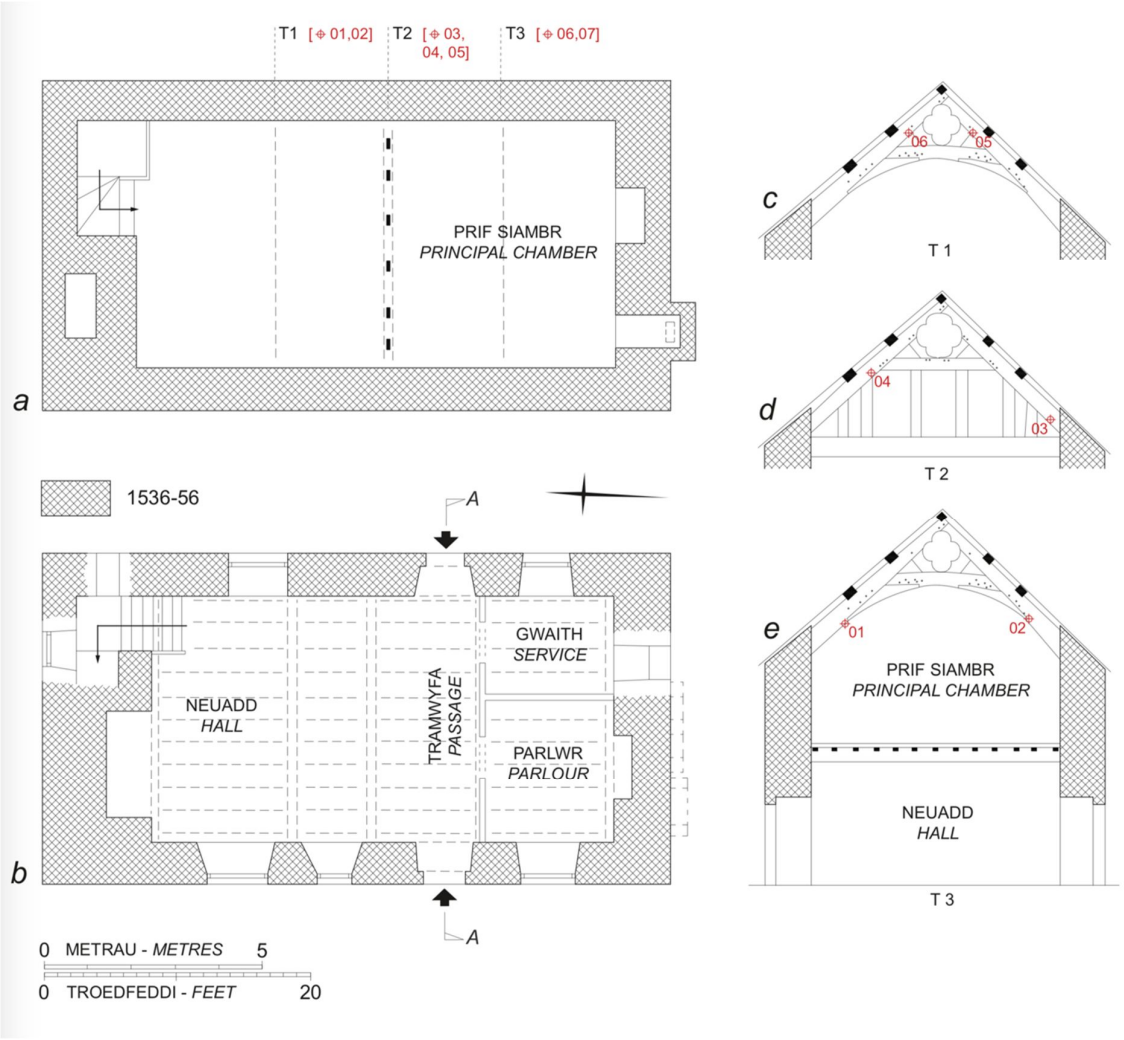
TREE-RING DATING OF
TŶ MAWR
NANTLLE, LLANDWROG
(CAERNARFONSHIRE)
GWYNEDD

(NGR SH 509 533)

Tree-ring dating was commissioned in 2009-10 by the North-West Wales Dendrochronology Project (in association with RCAHMW) and carried out by the Oxford Dendrochronology Laboratory, Mill Farm, Mapledurham, Oxfordshire RG4 7TX (Daniel Miles, Michael Worthington and Martin Bridge). Additional research by Margaret Dunn and Richard Suggett. A full account of Tŷ Mawr appears in Richard Suggett and Margaret Dunn, *Discovering the Historic Houses of Snowdonia* (RCAHMW, 2014), 178-82.

1 SUMMARY

Tŷ-mawr is a classic early storeyed gentry house of Snowdonian type and of high quality. The ground-floor plan is characteristic: a cross-passage separates the ceiled hall with end fireplace from twin outer rooms. A stone fireplace stair (possibly later) gives access to two intercommunicating first-floor chambers formerly open to the roof. The principal chamber on the first floor has a corbelled end fireplace with the refinement of a latrine shute alongside. The roof of four bays has arch-braced trusses with quatrefoil apexes flanking the cusped partition truss. The roof timbers gave a date range of **1536-56** confirming it as one of the earlier houses of Snowdonian plan-type.



Above, plans (reconstructed) and sections (a) 1st floor; (b) ground floor; (c-e) trusses: the red numbers show the location of tree-ring samples. Dunn & Suggett, *Discovering the Historic Houses of Snowdonia*, 178. Crown Copyright: RCAHMW. The red figures indicate the location of tree-ring samples.

The holding was formerly the site of Baladeulyn, one of the royal courts of the thirteenth century princes of Gwynedd, seized by the English crown in 1284. The history of the families associated with the property is detailed in the house history. Tŷ-mawr passed to Richard ap Robert in 1509. On his death in 1539, William, his son (b. 1520), inherited and was most likely responsible for building the house.

There is a plan and account in RCAHMW, *Caernarvonshire Inventory* III (1964), 184; A detailed house history, from which the above narrative is derived, along with a historic building report are accessible on this web site and also Coflein (reference below).

Comprehensive coverage (including images), much of it on-line is accessible via the NMR website, Coflein at https://coflein.gov.uk/en/site/16960?term=ty%20Mawr%20nantlle

RCAHMW National Primary Reference Number (NPRN): 16960

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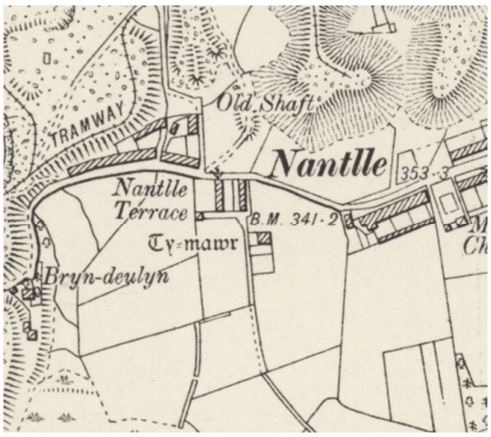


2 TECHNICAL DATA

The following summary of technical data regarding Tŷ Mawr is taken from *Vernacular Architecture* 41 (2010), 114. https://doi.org/10.1179/174962910X12838716154041 .

The abbreviation 'h/s' indicates the presence of the heartwood-sapwood boundary. For '*t*', see next section, which discusses reference chronologies (site masters) – in general, the higher the 't' value the more secure the dating.

Felling date range: **1536-56**

Principal rafters 1535(7), 1520(1), 1518(5), 1515(52), 1509(h/s).
Site Master 1428-1535 GWYNEDD1 (t = 8.3 PLASMAWR; 8.1 GWYDWN; 7.9 NORTH).

3 BACKGROUND TO DENDROCHRONOLOGY (Daniel Miles)

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.

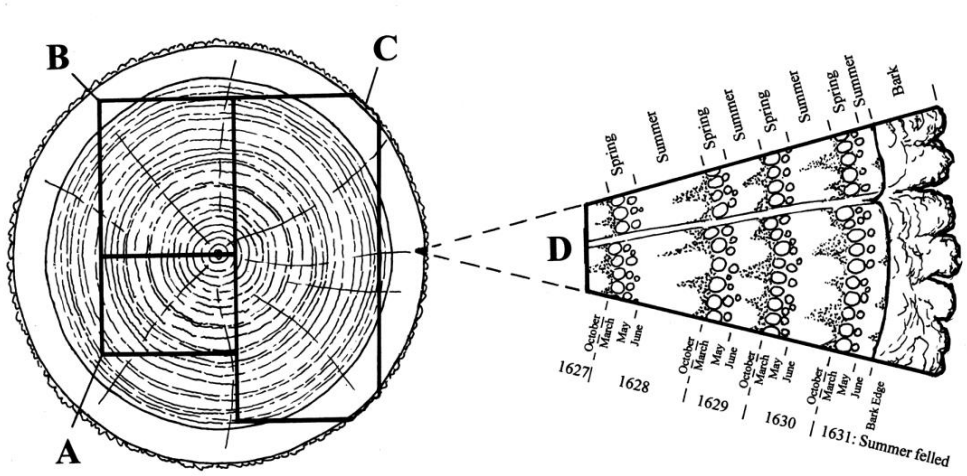
This process can be done by a trained dendrochronologist using plots of the ring-widths and comparing them visually, which also serves as a check on measuring procedures. It is essentially a statistical process, and therefore requires sufficiently long sequences for one to be confident in the results. 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.



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.

Notes compiled by Martin Cherry, June 2022, from material generated by the North-west Wales Tree-ring Dating Project. The origins of this programme of dating lay with the Beddgelert Historical Society under the direction of Margaret Dunn (see the 'About Us' page.) This report should be read in conjunction with the other reports in this section.