Centre for Archaeology Report **/2006

Tree-Ring Analysis of Timbers from The Grange, Grange Park, Northington, Hampshire

Dr Martin Bridge[1] and Helen Swan[2]

Summary

This seventeenth-century house was thought to have been built between AD 1665–73 before later being remodelled as one of the earliest Greek Revival country houses in Europe. Dendrochronology was commissioned in an attempt to refine the construction date still further, although many of the primary timbers proved to be inaccessible. Two timbers matched each other and have a likely combined felling date range of AD 1649–81. A third minor timber had no sapwood, and was not dated.

Keywords
Dendrochronology
Standing Building

Authors' Addresses

[1] Institute of Archaeology, University College London, 31–34 Gordon Square, London, WC1H 0PY. Tel: 020 7679 1540. Email: martin.bridge@ucl.ac.uk

[2] formerly of University of East London

Introduction

The Grange (NGR SU 562 362; Fig 1) is a country house thought to have been built in AD 1665–73 by William Samwell for Sir Robert Henley. It was encased and remodelled by William Wilkins in AD 1804–9, and is an important early example of the Greek Revival style. It has had several additions since this time. It is a Grade I listed building and Scheduled Ancient Monument in the care of English Heritage. The architectural history of the site is described by Geddes (1983). During renovation work, several primary phase timbers were exposed, and dendrochronology was requested by David Brock, English Heritage Historic Buildings Inspector, to try and determine a more exact date of construction.

Methodology

The site was visited in January 2003. In the initial assessment, accessible oak timbers with more than 50 rings and traces of sapwood were sought. Those building timbers judged to be potentially useful were cored using a 15mm auger attached to an electric drill. The cores were glued to wooden laths, labelled, and stored for subsequent analysis. Only three timbers were sampled on this occasion, as others of interest were very high up above unstable floors, and could not be accessed. It was hoped to find a way to get at these timbers at a later date, but that has so far proved impractical.

The cores were prepared for measuring by sanding, using an electric belt-sander with progressively finer grit papers down to 400 grit. Any further preparation necessary, eg where bands of narrow rings occurred, was done manually. Suitable samples had their tree-ring sequences measured to an accuracy of 0.01 mm using a specially constructed system utilising a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC, which recorded the ring widths into a dataset. The software used in measuring and subsequent analysis was written by Ian Tyers (1999). Cross-matching and dating was accomplished by a combination of visual matching and a process of qualified statistical comparison by computer. The ring-width series were compared for statistical cross-matching, using a variant of the Belfast CROS program (Baillie and Pilcher 1973). Ring sequences were plotted to allow visual comparisons to be made between sequences on a light table. This method provides a measure of quality control in identifying any errors in the measurements when the samples cross-match.

In comparing one sequence or site sequence against another, *t*-values over 3.5 are considered significant, although in reality it is common to find *t*-values of 4 and 5 which are demonstrably spurious because more than one matching position is indicated. For this reason, it is necessary to obtain some *t*-values of 5, 6, and higher, and for these to be well replicated from different, independent chronologies and with local and regional chronologies well represented, unless the timber is imported. Where two individual sequences match with a *t*-value of 10 or above, and visually exhibit exceptionally similar ring patterns, they most likely came from the same parent tree.

When cross-matching between samples is found, their ring-width sequences are averaged to form an internal 'working' site mean sequence. Other samples may then be incorporated after comparison with this 'working' master until a final site sequence is established. This is then compared with a number of reference chronologies (multi-site chronologies from a region) and dated individual site masters in an attempt to date it. Individual long series which are not included in the site mean(s) are also compared with the database to see if they can be dated.

The dates thus obtained represent the time of formation of the measured rings in each sample. These dates require interpretation for the construction date of the phase under investigation to be determined. An important aspect of this interpretation is the estimate of the number of sapwood rings missing. The sapwood estimates used here are based on those proposed for this area by Miles (1997), in which 95% of oaks contain 9–41 rings. Where complete sapwood or bark is present, the exact date of tree felling may be determined.

The dates derived for the felling of the trees used in construction do not necessarily relate directly to the date of construction of the building. However, evidence suggests that, except in the re-use of timbers, construction in most historical periods took place within a very few years after felling (Salzman 1952; Hollstein 1965).

Figure 1: Map showing the location of The Grange.

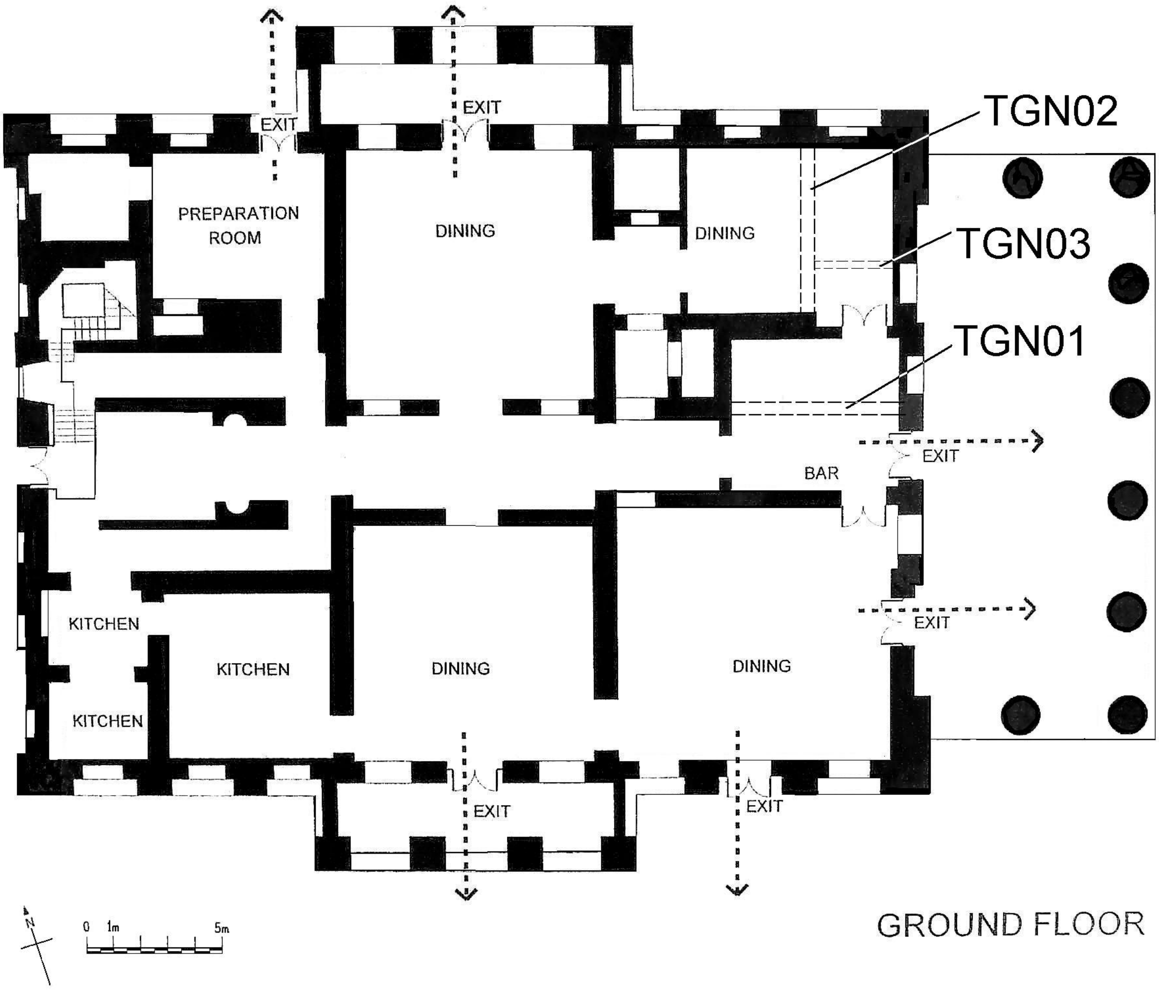

Figure 2: Ground floor plan of The Grange, showing the positions of the timbers sampled for dendrochronology

Results

Only three primary timbers judged worthy of further investigation could be sampled on this occasion, although several others were noted as likely to be of use, but inaccessible (see above). Three samples were taken from the first timber sampled (**TGN01**) in an attempt to get the full sapwood complement visible on the timber, but all three samples lost the sapwood on coring. This may have been as a result of timber degradation during the time in which they had been exposed.

Details of the cores are given, along with other basic information, in Table 1, and their approximate positions are illustrated in Figure 2. The three cores from **TGN01** matched each other well, and were combined into a single sequence, **TGN01m**, which was used in subsequent analysis. **TGN01m** was found to cross-match with **TGN02** (t = 6.1 with 68 years overlap), and the two series were combined to form a 79-year site master chronology **GRANGE**. No matching was found between this and the third sample, **TGN03**. The site master was subsequently dated to the period AD 1565–1643, the best results being shown in Table 2.

The 45-year sequence **TGN03** was thought to be too short to give a reliable date, but comparisons with the dated reference material showed that it had strong well-replicated matches at a position corresponding to the outside ring representing a year in the early sixteenth century. This matching position is much earlier than those found for the other timbers, and although it remains a possibility, the match was not accepted as a date at this stage.

The relative positions of overlap of the samples are illustrated, along with the likely felling dates of the series in Figure 3.

Interpretation and Discussion

With so few timbers accessible to sample, it was not possible to refine the construction date within the already known restricted period of activity between AD 1665–73, although it was possible to date two timbers which have likely felling date ranges that incorporate this period. Other primary timbers were noted as potentially good candidates for dating, notably those above the stairwell. These were not accessible as the high stairwell was a void, following removal of the staircase, and the floor area was very uneven and not solid. Should these timbers become accessible at some stage in the future, it is recommended that they are assessed to see whether they have complete sapwood and hence may have the potential to refine the dating evidence derived from this dendrochronological analysis. A likely felling date range for the two timbers, based on an average heartwood-sapwood boundary date of AD 1640, is AD 1649–81, which encompasses the likely construction period.

The third timber had no sapwood, and was only a very short sequence. Whilst it gave consistent matches at a position in the early sixteenth century, this was not accepted as a date, and it does not add much to the interpretation of the building at this stage.

Acknowledgements

This work was commissioned by Peter Marshall, formerly of English Heritage. David Brock introduced us to the building. The contractors, R J Smith of Whitchurch, were helpful in arranging access to the site. I am very grateful to Cathy Groves (Sheffield University) and John Meadows (English Heritage) for their useful comments on an earlier draft of this report, and to Amanda Grieve for coming to the site to help gain the floor plan.

Table 1: Details of oak (*Quercus* spp.) timbers sampled from The Grange, Northington

Sample Number	Timber and position	No of rings	Mean width (mm)	Mean sens (mm)	Dates AD Spanning	H/S bdry AD	Sapwood complement	Felling seasons and dates/date ranges (AD)
TGN01a	Main east-west beam in East Room	71	2.28	0.23	1573–1643	1643	h/s	1651–83*
TGN01b	ditto	41	1.96	0.21	1601–41	1641	h/s	1651–83*
TGN01c	ditto	70	2.00	0.27	1572–1641	1641	h/s	1651–83*
TGN02	Main north-south beam in North Room	75	2.02	0.30	1565–1639	1637	2	1646–78
TGN03	Secondary beam in North Room	45	3.47	0.22	undated	-	-	unknown

Key: h/s bdry = heartwood/sapwood boundary - last heartwood ring date; mean sens = mean sensitivity.
Sapwood estimate of 9–41 used (Miles 1997).
* this date is derived by applying the standard sapwood estimate to a mean h/s boundary date of AD 1642 for this timber derived from all three samples

Table 2: Dating evidence for the site chronology **GRANGE**, AD 1565–1643
(regional multi-site chronologies have the file name in **bold**)

County or region	*Chronology name*	*Short publication reference*	*File name*	*Spanning (yrs AD)*	*Overlap (yrs)*	*t-value*
Hampshire	Chawton House *	(Miles and Worthington 1998)	CHAWTON5	1559–1665	79	7.1
Hampshire	The Spain, Petersfield *	(Miles and Worthington 2000)	GOODYERS	1433–1641	77	6.2
Hampshire	Hampshire Master Chronology	(Miles 2003)	**HANTS02**	443–1972	79	6.0
Hampshire	The Vyne, Sherbourne St John *	(Miles and Worthington 1998)	THEVYNE3	1543–1653	79	4.7
London	White Tower, Tower of London	(Miles and Worthington 1997)	WHTOWER6	1517–1616	52	4.5
Wiltshire	Wilton House, Wilton	(Hillam 1990)	WILTON	1536–1636	72	4.4
Oxfordshire	Ashdown House, Ashdown Park	(Miles and Worthington 2000)	ASHDOWN1	1524–1661	79	4.1

* component of **HANTS02**

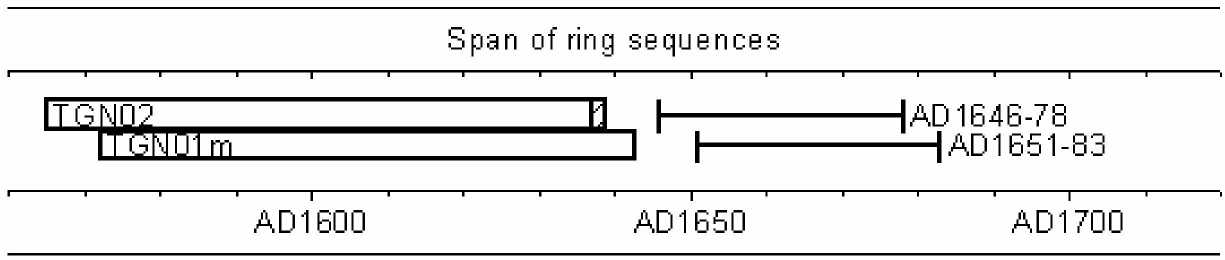

Figure 3: Bar chart showing the relative positions of overlap, and felling dates for the dated timbers. The hatched part of the bar represents sapwood

Table 3: Ring width data for the site master **GRANGE**, AD 1565–1643

Ring widths (0.01mm)										**no of trees**									
217	167	154	170	252	238	376	163	155	177	1	1	1	1	1	1	1	2	2	2
100	133	250	232	297	391	230	184	203	237	2	2	2	2	2	2	2	2	2	2
313	262	259	138	275	209	350	268	290	280	2	2	2	2	2	2	2	2	2	2
127	105	176	231	203	237	253	270	254	223	2	2	2	2	2	2	2	2	2	2
184	270	190	215	144	130	232	197	247	249	2	2	2	2	2	2	2	2	2	2
194	152	99	168	168	185	219	252	239	150	2	2	2	2	2	2	2	2	2	2
135	147	182	214	226	258	175	215	242	149	2	2	2	2	2	2	2	2	2	2
187	147	108	115	110	205	200	247	211		2	2	2	2	2	1	1	1	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, 2001 *Tree-ring analysis of timbers from Priory Barn, Little Wymondley, Hertfordshire*, Centre for Archaeol Rep, **18/2001**

Geddes, J 1983 The Grange, Northington, *Architectural History*, **26**, 35–48

Haddon-Reece, D, Miles, D H, and Munby, J T, 1989 List 32 - Tree-ring dates, *Vernacular Architect*, **20**, 46–9

Haddon-Reece, D, Miles, D H, Munby, J T, and the late Fletcher, J M, 1993 Oxfordshire Mean Curve - a compilation of master chronologies from Oxfordshire, unpubl computer file OXON93, Oxford Dendrochronology Laboratory

Hillam, J, 1990 *Tree-ring dating of oak piles from Wilton House, Wilton, Wiltshire*, Anc Mon Lab Rep, **47/90**

Hollstein, E, 1965 Jahrringchronologische von Eichenholzern ohne Walkande, *Bonner Jahrbuecher,* **165,** 12–27

Laxton, R R, and Litton, C D, 1988 An East Midlands Master Tree-Ring Chronology and its use for dating Vernacular Buildings, Univ Nottingham, Dept of Classical and Archaeol Studies, Monograph Ser, **3**

Miles, D, 1997 The interpretation, presentation, and use of tree-ring dates, *Vernacular Architect,* **28,** 40–56

Miles, D, 2003 Dating buildings and dendrochronology in Hampshire, in *Hampshire Houses 1250–1700: Their Dating and Development* (ed E Roberts), 220–6, Southampton (Hampshire County Council)

Miles, D H, and Worthington, M J, 1997 Tree-ring dates, *Vernacular Architect*, **28**, 159–81

Miles, D H, and Worthington, M J, 1998 Tree-ring dates, *Vernacular Architect*, **29**, 111–29

Miles, D H, and Worthington, M J, 2000 Tree-ring dates, *Vernacular Architect*, **31**, 90–113

Salzman, L F, 1952 *Building in England down to 1540,* Oxford

Tyers, I, 1997 *Tree-ring analysis of Timbers from Sinai Park, Staffordshire*, Anc Mon Lab Rep, **80/97**

Tyers, I, 1999 *Dendro for Windows Program Guide 2nd edn*, ARCUS Rep, **500**