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COCKINGTON COURT, COCKINGTON LANE, COCKINGTON, NEAR TORQUAY, DEVON
TREE-RING ANALYSIS OF TIMBERS

SCIENTIFIC DATING REPORT

Martin Bridge

INTERVENTION
AND ANALYSIS

ENGLISH HERITAGE

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SUMMARY
Eight floor timbers from the first floor floor-frame of the building were sampled. Only one was dated, a major floor beam from room FF06 in the central range. The parent tree for this beam was found to have been felled in summer AD 1599. This does not correspond to any of the known phases of work, and is therefore of interest in potentially identifying another construction phase right at the end of the sixteenth-century, although care must be taken in interpreting dates based on a single timber. A major remodelling did take place about a century later, but there is no evidence to suggest that this timber was re-used at this time.

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INTRODUCTION

Cockington Court is a grade II* listed building in a narrow valley, surrounded by 117ha (290 acres) of parkland, to the west of Torquay (Figs 1 and 2). The earliest parts of the building are thought to be medieval, but these have been well hidden by later alterations. The south-west wing is dated AD 1577, and the house is known to have been extensively remodelled in *circa* AD 1673 and *circa* AD 1820. The house (Fig 3) is currently managed by the Torbay Coast and Countryside Trust.

The first floor was recently vacated as part of proposals to re-plan and re-use the space. This enabled an inspection of the floor to take place. A number of large timbers (approximately 0.38m, 15 inches, square) with complex joints were revealed (Fig 4), thought to pre-date the *circa* AD 1673 remodelling. Those in the north-east wing respect a sixteenth-century fireplace and run below later partitions.

Dendrochronological dating of suitable floor timbers was requested by the South-West regional team of English Heritage in order to inform Listed Building Consent and better understand the development of the building.

METHODOLOGY

Fieldwork for the present study was carried out in September 2010. In the initial assessment, accessible oak timbers with more than 50 rings and where possible traces of sapwood were sought, although slightly shorter sequences are sometimes sampled if little other material is available. Those 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.

The cores were polished on a belt sander using 80 to 400 grit abrasive paper to allow the ring boundaries to be clearly distinguished. The samples had their tree-ring sequences measured to an accuracy of 0.01mm, 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 (2004). Cross-matching was attempted 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 on the computer monitor to allow visual comparisons to be made between sequences. This method provides a measure of quality control in identifying any potential errors in the measurements when the samples cross-match.

In comparing one sample or site master against other samples or chronologies, *t*-values over 3.5 are considered significant, although in reality it is common to find demonstrably spurious *t*-values of 4 and 5 because more than one matching position is indicated. For this reason, dendrochronologists prefer to see some *t*-values of 5, 6, and higher, and for

these to be well replicated from different, independent chronologies with both local and regional chronologies well represented, except where imported timbers are identified. Where two individual samples match together with a *t*-value of 10 or above, and visually exhibit exceptionally similar ring patterns, they may have originated from the same parent tree. Same-tree matches can also be identified through the external characteristics of the timber itself, such as knots and shake patterns. Lower *t*-values however do not preclude same tree derivation.

Ascribing felling dates and date ranges

Once a tree-ring sequence has been firmly dated in time, a felling date, or date range, is ascribed where possible. With samples which have sapwood complete to the underside of, or including bark, this process is relatively straightforward. Depending on the completeness of the final ring, ie if it has only the spring vessels or early wood formed, or the latewood or summer growth, a precise felling date and season can be given. If the sapwood is partially missing, or if only a heartwood/sapwood transition boundary survives, then an estimated felling date range can be given for each sample. The number of sapwood rings can be estimated by using an empirically derived sapwood estimate with a given confidence limit. If no sapwood or heartwood/sapwood boundary survives then the minimum number of sapwood rings from the appropriate sapwood estimate is added to the last measured ring to give a *terminus post quem* (*tpq*) or felled-after date.

A review of the geographical distribution of dated sapwood data from historic timbers has shown that a sapwood estimate relevant to the region of origin should be used in interpretation, which in this area is 9–41 rings (Miles 1997a). It must be emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure or object under study.

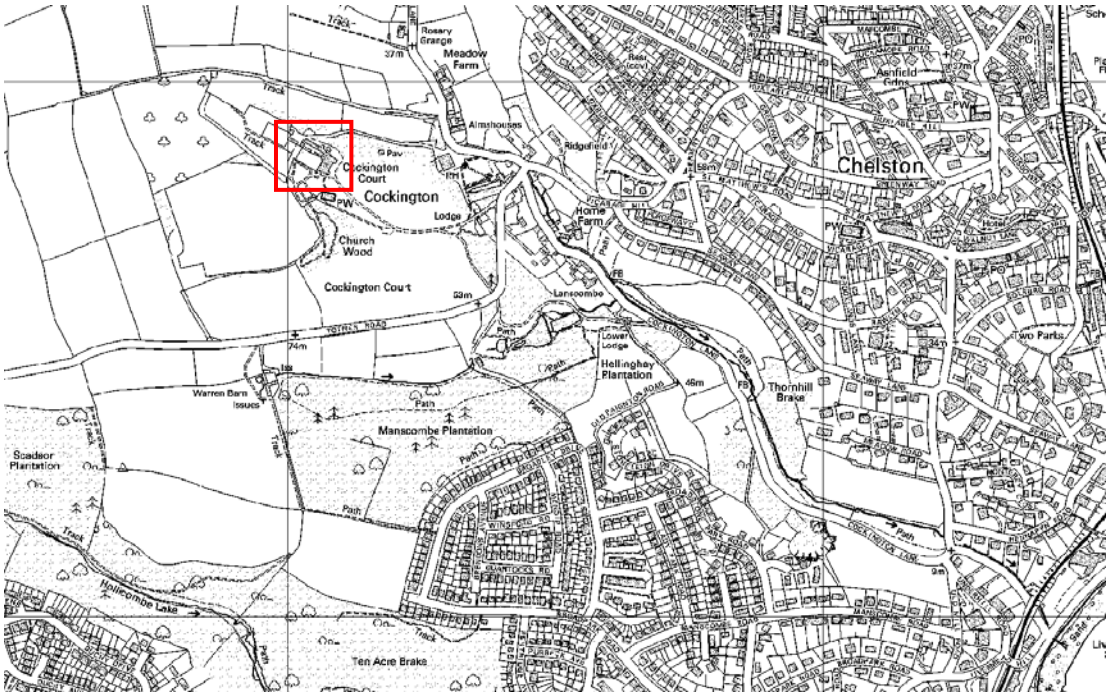

Figure 1. Map to show the location of Cockington (based on the Ordnance Survey map with permission of the Controller of Her Majesty's Stationery Office, ©Crown Copyright)

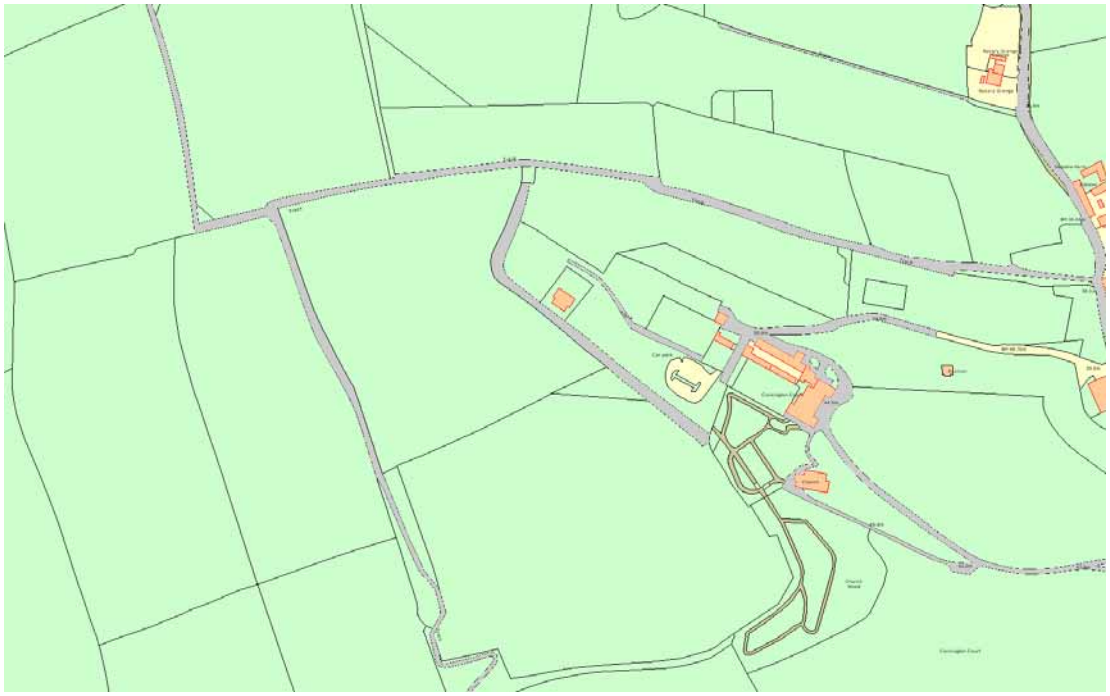

Figure 2. Map showing the location of Cockington Court within its immediate environs (based on the Ordnance Survey map with permission of the Controller of Her Majesty's Stationery Office, ©Crown Copyright)

Figure 3. External view of the house from the south-west, looking north-east

Figure 4. View of one of the beams exposed during recent works

RESULTS AND DISCUSSION

Basic information about the samples taken is presented in Table 1, with the locations of sampling being shown in Figures 5 and 6, and the raw ring-width data of the measured samples presented in the Appendix. It should be noted that no obviously re-used timbers were sampled. Although there were a number of large timbers partially exposed, potentially containing many growth rings, they could only be accessed from above. This hampers the clearance of sawdust and hence may result in problems during coring. This potential problem appeared to be exacerbated here for some unknown reason. The timbers did not seem particularly damp, a factor that often produces this phenomenon. Whilst some good cores were obtained, several fragmented badly and progress was slow. Coring was abandoned in three of the timbers without reaching the centre of these squared whole trunks as the cores split excessively even in secondary sampling positions. Unfortunately these core sections had too few rings to be useful for further analysis, and were not measured. Timber CKG05 had two cores taken from it in an attempt to maximise the ring sequence length obtained. The ring width series for these overlapped, t = 6.0 with 33 years overlap and good visual matching (Fig 7), and they were combined into a single series for further analysis.

During intra-site comparison of the ring sequences derived, only one possible statistical match of potential note was obtained, this being between samples CKG01 and CKG04. Sample CKG04 was subsequently dated individually against dated reference material (Table 2). Although a possible match for CKG01 against this dated series was found (t = 4.7 with 56 years overlap), no independent evidence for series CKG01 dating at this position could be found, and this, along with the other four measured series, remains undated.

Series CKG04 was found to have come from a tree felled in summer AD 1599. Great caution always needs to be taken during interpretation when based on the date of a single timber, which could be stockpiled, a repair, or a replacement. However, with such a large timber in this position (Fig 4) it is difficult to see how it could have been inserted after the construction of this range without major disruption. There was a major remodelling in *circa* AD 1673, but this timber showed no obvious signs of re-use. This may therefore represent a hitherto unidentified phase of construction, right at the close of the sixteenth-century.

Table 1. Details of oak (Quercus spp.) timbers sampled from Cockington Court, Devon.

Sample	Timber and position	No of rings	Date of sequence (AD)	Mean width (mm)	Mean sensitivity (mm)	Sapwood rings	Felling date (AD)
Central Range							
CKG01	Main central east-west floor beam, room FF03	56	undated	1.66	0.26	27½C	unknown
CKG02	Northern floor beam, room FF03	74	undated	1.84	0.20	20C	unknown
CKG03	Floor beam between rooms FF05 and FF06	<40	NM	-	-	h/s	unknown
CKG04	Central floor beam room FF06	148	1451–1598	0.99	0.22	31½C	Summer 1599
North-East Wing							
CKG05a	Central north-south floor beam, room FF07	48	-	1.74	0.25	-	
CKG05b	ditto	36	-	1.64	0.26	-	
CKG05	Mean of 05a and 05b	51	undated	1.86	0.21	-	unknown
South-West Range							
CKG06	Central east-west floor beam, room FF01	59	undated	1.82	0.18	h/s	unknown
CKG07	East floor beam, room FF01	<40	NM	-	-	-	unknown
CKG08	Floor beam in corridor between rooms FF01 and FF02	<40	NM	-	-	h/s	unknown

Key: NM = not measured; h/s = heartwood-sapwood boundary; ½C = complete sapwood, felled summer

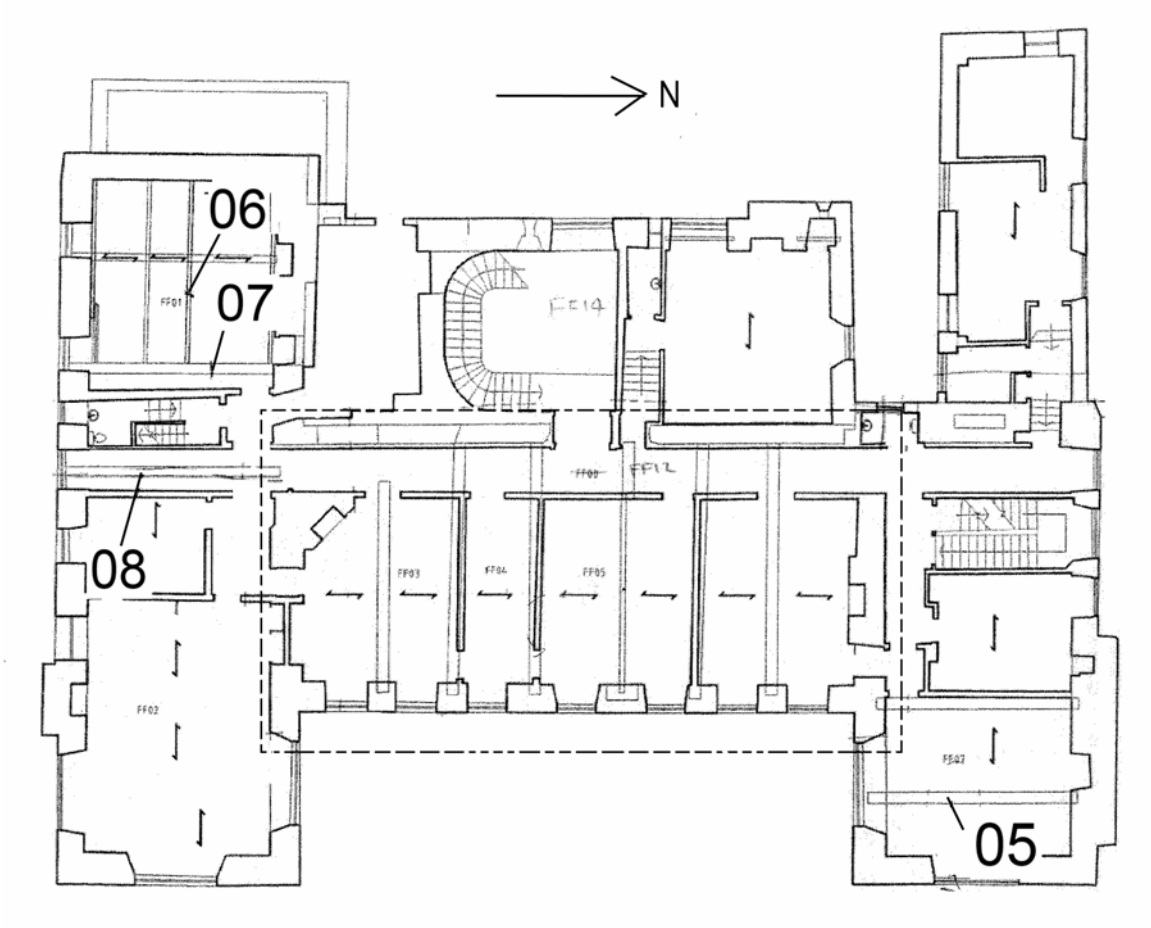

Figure 5. Plan of the first floor of Cockington Court showing the locations of the timbers sampled for dendrochronology in the two wings. The rectangular dashed box is shown in more detail in Figure 6

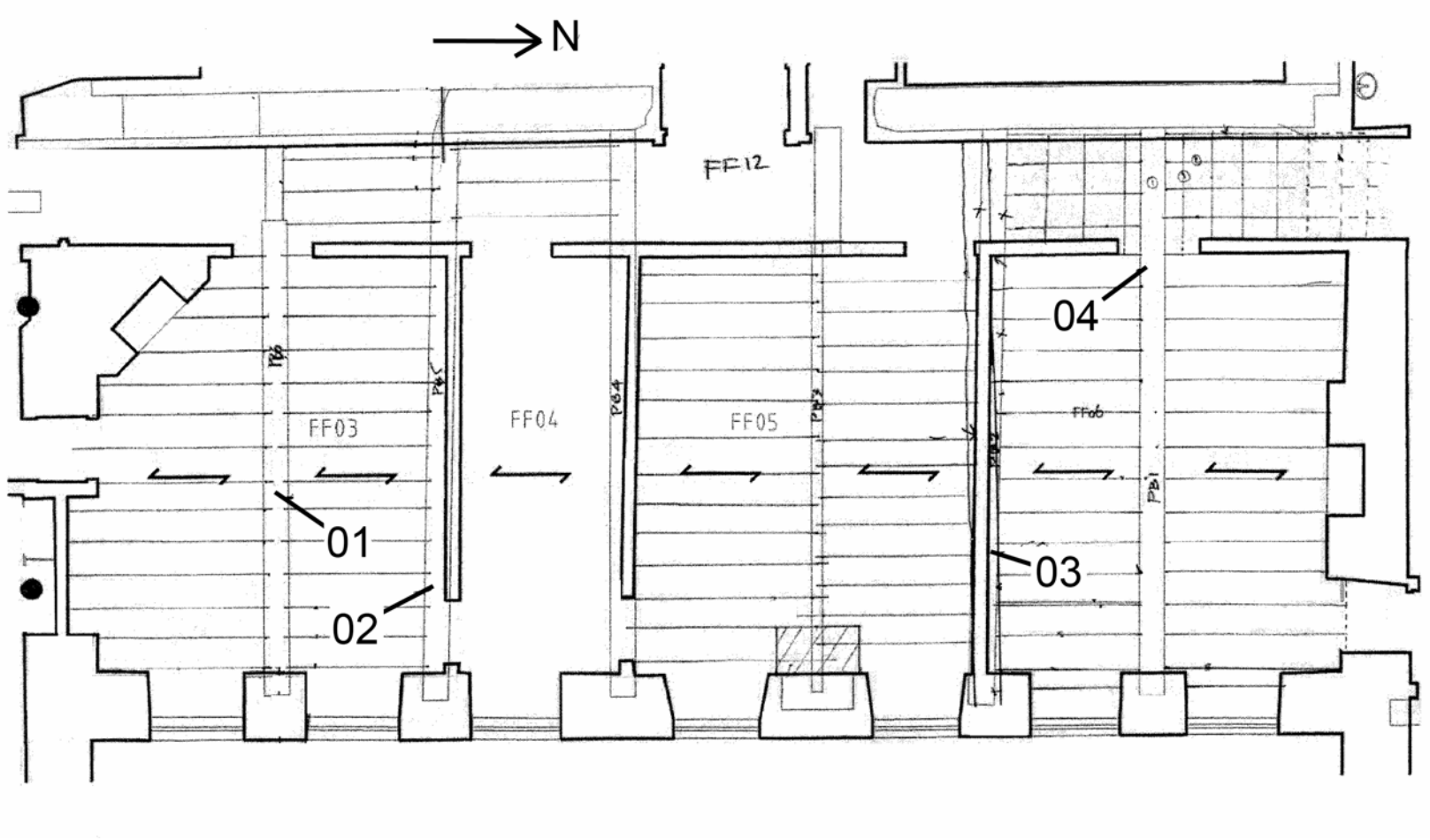

Figure 6. The central range of Cockington Court first floor, showing timbers sampled for dendrochronology

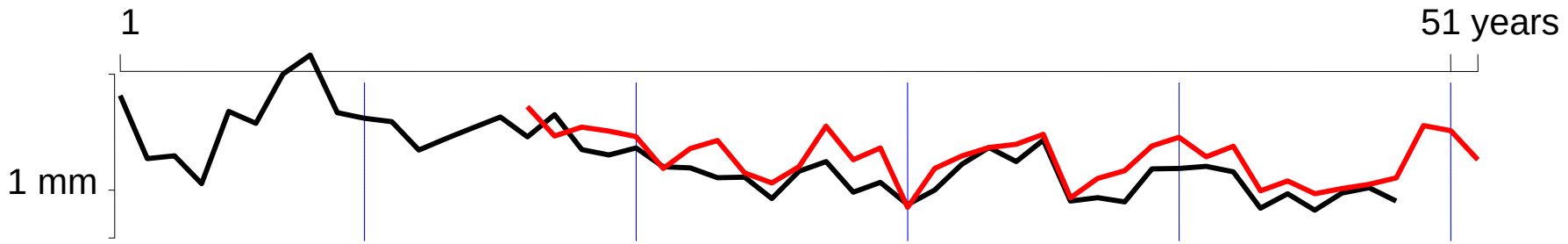

Figure 7. Plots of the ring width series for the two samples from ckg05 (ckg05a, ckg05b), the y axis is ring width on a logarithmic scale

Table 2. Dating evidence for the site series CKG04 at AD 1451–1598; file name in bold is a regional chronology

County/region:	Chronology name:	Short publication reference:	File name:	Spanning: (yrs AD)	Overlap (yrs)	t-value
Shropshire	Church Farm, Clungunford	(Miles and Worthington 2002)	CGFD	1443–1597	147	7.5
Hampshire	Beaulieu Abbey	(Hillam and Groves 1992)	BEAULIE2	1494–1594	101	7.0
Wales	Parc Llanfrothen	(Miles *et al* 2006)	BDGLRT22	1386–1669	148	6.7
Wales	Oxwich Castle	(Miles *et al* 2006)	OXWICH	1459–1630	140	6.6
Warwickshire	Baddesley Clinton	(Miles and Worthington 2002)	BADESLY3	1423–1577	127	6.4
Cornwall	Old Duchy Palace, Lostwithiel	(Tyers 2010)	LSTWTHEL	1464–1620	135	6.3
Shropshire	Clungunford Farm	(Miles and Worthington 2002)	CGFB	1273–1628	148	6.0
Herefordshire	Farmer's Club, Hereford	(Tyers 1996)	HEREFC	1313–1617	148	5.9
Shropshire	Ashwood, Ash Magna	(Miles and Haddon-Reece 1994)	ASHWOOD	1419–1619	148	5.8
Wales	Welsh Master Chronology	(Miles 1997b)	**WALES97**	404–1981	148	5.6
Hampshire	Tudor House, Southampton	(Miles *et al* 2009)	TUDORHS5	1399–1630	148	5.6

BIBLIOGRAPHY

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

Hillam, J and Groves, C, 1992 List 42 - Tree-ring dates, *Vernacular Architect*, **23**, 44-7

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

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

Miles, D H, and Haddon-Reece, D, 1994 List 56 - Tree-ring dates, *Vernacular Architect*, **25**, 28-36

Miles, D H, and Worthington, M J, 2002 Tree-ring dates, *Vernacular Architect*, **33**, 81-102

Miles, D H, Worthington, M J, and Bridge, M C, 2006 Tree-ring dates, *Vernacular Architect*, **37**, 118-32

Miles, D H, Worthington, M J, and Bridge, M C, 2009 Tree-ring dates, *Vernacular Architect*, **40**, 122-8

Tyers, I, 1996 *The tree-ring analysis of six secular buildings from the city of Hereford*, Anc Mon Lab Rep, **17/96**

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

Tyers, I, 2010 *Old Duchy Palace, Lostwithiel, Cornwall - Dendrochronological analysis of oak timbers*, EH Res Dept Rep Ser, **1-2010**

APPENDIX

Ring width values (0.01mm) for the sequences measured

ckg01

322	339	87	208	288	253	321	265	318	278
204	276	201	195	224	271	274	398	289	370
212	271	216	117	170	149	186	173	146	185
116	141	102	89	87	102	121	135	112	87
63	94	132	116	76	76	45	26	38	41
41	50	51	41	47	81				

ckg02

194	177	205	193	225	233	181	152	200	166
239	246	249	210	256	265	253	179	169	194
280	272	314	223	306	244	251	170	241	247
235	155	130	151	164	172	156	144	224	222
261	238	206	112	113	167	165	216	133	227
184	116	119	137	97	165	178	153	124	165
147	176	128	123	132	87	176	156	96	122
126	123	137	124						

ckg04

229	134	149	202	174	152	138	167	27	142
193	184	159	86	134	140	112	112	112	134
112	87	81	78	126	150	102	77	88	105
134	173	110	134	121	161	125	117	103	95
113	115	121	127	128	151	113	70	82	101
111	98	107	82	97	90	53	76	108	42
90	81	105	95	66	67	66	63	80	56
89	138	86	74	79	72	98	92	89	60
93	94	69	54	83	93	129	87	86	94
89	74	118	96	73	82	74	84	101	63
104	53	70	59	79	60	86	62	87	90
97	88	84	93	96	61	62	63	116	102
114	93	106	95	77	96	91	85	90	97
83	97	75	84	109	88	83	75	83	80
80	90	87	88	92	63	99	99		

ckg05a

361	153	159	109	291	247	483	625	286	265
253	172	201	233	269	206	278	173	161	177
137	135	118	119	89	129	147	97	111	82
100	142	178	147	197	86	90	85	133	134
138	128	78	95	76	96	103	86		

ckg05b

310	208	235	223	207	134	176	196	126	110
137	238	151	177	79	134	159	178	186	213
90	117	130	182	205	157	181	99	113	95
102	108	118	240	224	151				

ckg06

340	334	320	251	183	290	261	209	245	153
171	161	186	176	156	128	158	196	218	165
183	199	210	200	163	168	204	235	202	157
172	181	170	121	183	136	163	147	105	137
157	194	134	155	171	130	99	151	160	152
154	149	182	224	182	174	121	201	134	

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