Ancient Monuments Laboratory
Report 51/2000

TREE-RING ANALYSIS OF TIMBERS FROM WALPOLE OLD CHAPEL, WALPOLE, SUFFOLK

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Summary

The early phases of this building could not be dated as few timbers contained sufficient numbers of rings and the majority were rejected prior to sampling. A single oak timber from the roof was shown to have been felled in the late-eighteenth century or later. A large circular ?mast' supporting the elm valley-beam was found to be softwood. It has been suggested that it could be re-used from a ship, but further study of its profile is needed to confirm this.

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Introduction

Walpole Old Chapel (NGR TM 374752; Fig 1) is one of the earliest Independent chapels in the country. The chapel was clearly converted from an earlier dwelling, thought on stylistic grounds to date from the sixteenth century, although the exact timing of this conversion is unclear. Six elders of the Walpole congregation received a lease on the present building in AD 1689 (Holmes and Rossi 1998) which described a 'house lately built', but the building is thought to have been first used as a chapel in AD 1647. The extensive valley roof is supported internally by three circular timber columns, said to be ship's masts. The building was formally closed in AD 1970, and passed into the care of the Historic Chapels Trust in AD 1995.

Four phases of building have been identified by the historic buildings consultant Anthony Rossi. The first is a timber-framed house of probable sixteenth-century origin, represented by the main wall posts in the front (east) wall. The insertion of the galleries represents a second phase, though some timbers are re-used and others are of small dimension. The third phase involves the conversion of the roof and the most reliable timber for dating is the valley beam. The fourth phase for which dating was requested is the insertion of the 'mast' to support the roof structure. It was hoped that these four phases could be confirmed and dated dendrochronologically.

Dating was requested by Andrew Derrick (English Heritage inspector) in order to inform the present repair programme and to provide dendrochronological data for this part of East Anglia.

Methodology

The site was visited in November AD 1999, when the timbers were assessed for their potential use in dendrochronological study. Oak timbers with more than 50 rings, traces of sapwood, and accessibility were the main considerations in the initial assessment. 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 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. Only samples with more than 45-50 rings were measured and used in subsequent analyses as sequences with fewer than this number of rings rarely give reliable crossmatching. Suitable samples had their tree-ring sequences measured to an accuracy of 0.01 mm using a specially constructed system utilizing a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC. The software used in measuring and subsequent analysis was written by Ian Tyers (1999).

Ring sequences were plotted to allow visual comparisons to be made between sequences on a light table. This activity also acts as a measure of quality control in identifying any errors in the measurements when the samples crossmatch. Statistical comparisons were made using Student's *t*-test (Baillie and Pilcher 1973; Munro 1984). The *t*-values quoted below were derived from the original CROS program (Baillie and Pilcher 1973). Those *t*-values in excess of 3.5 are taken to be indicative of acceptable matching positions provided that they are supported by satisfactory visual matches, and give consistent matching positions.

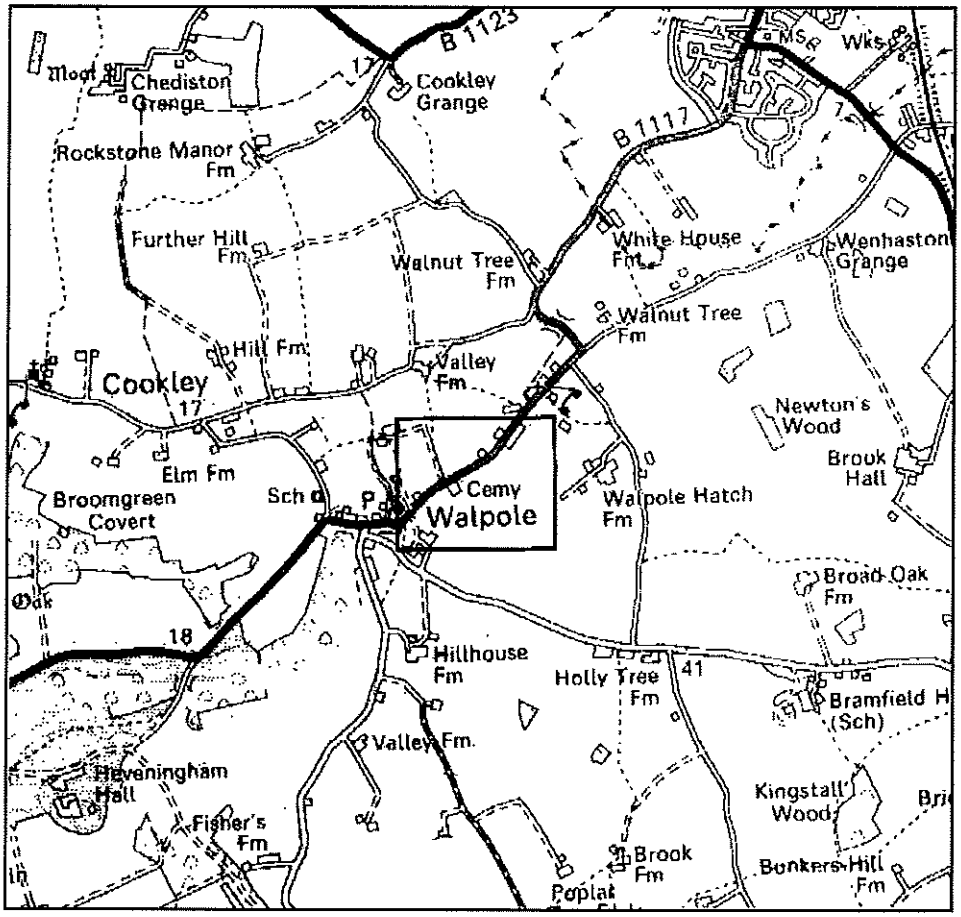

Figure 1: Map showing the location of Walpole Old Chapel, Walpole, Suffolk.

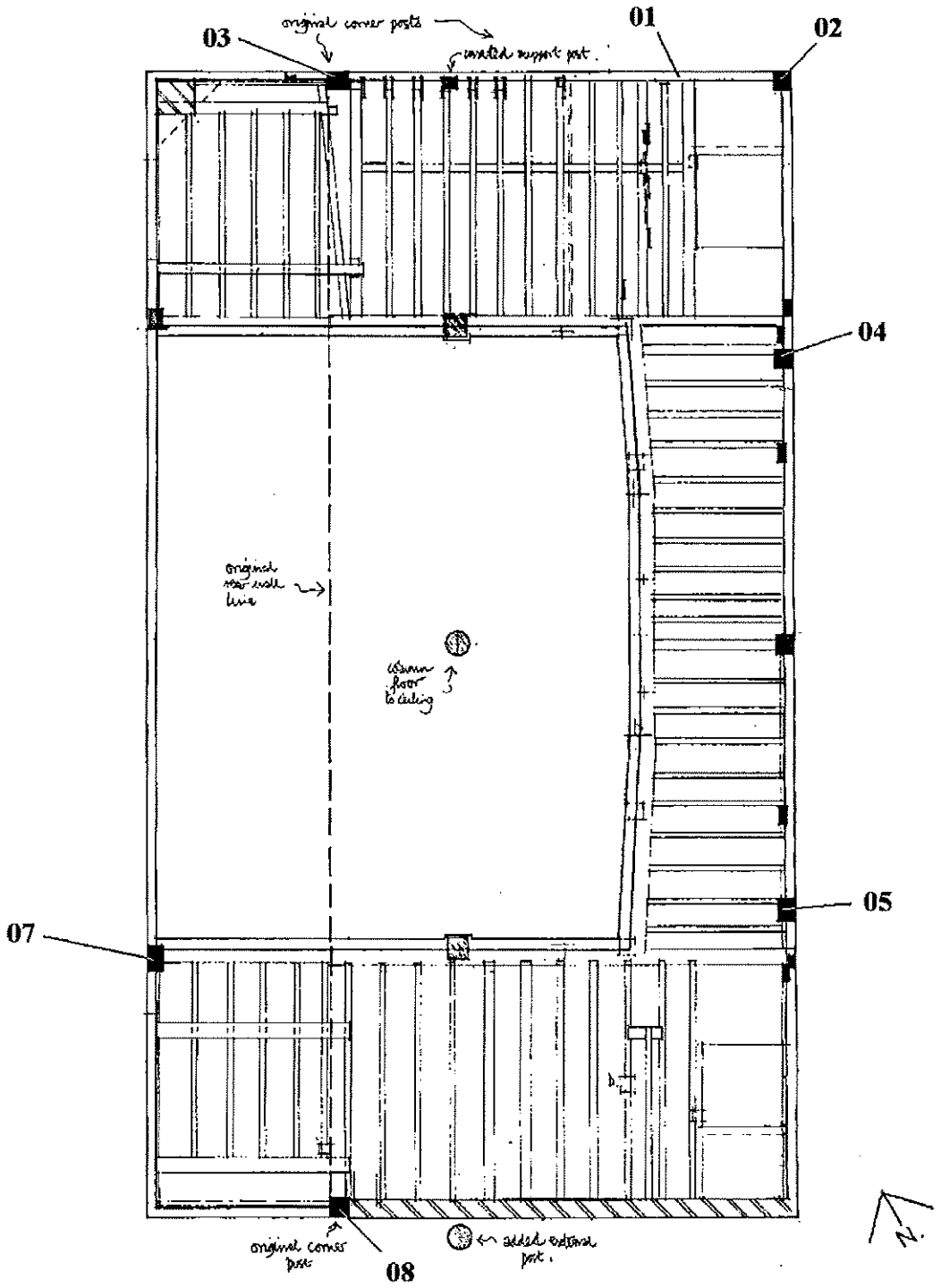

Figure 2: Plan of Walpole Old Chapel showing the location of timbers sampled for dendrochronology. Adapted from an original drawn by Anthony Rossi

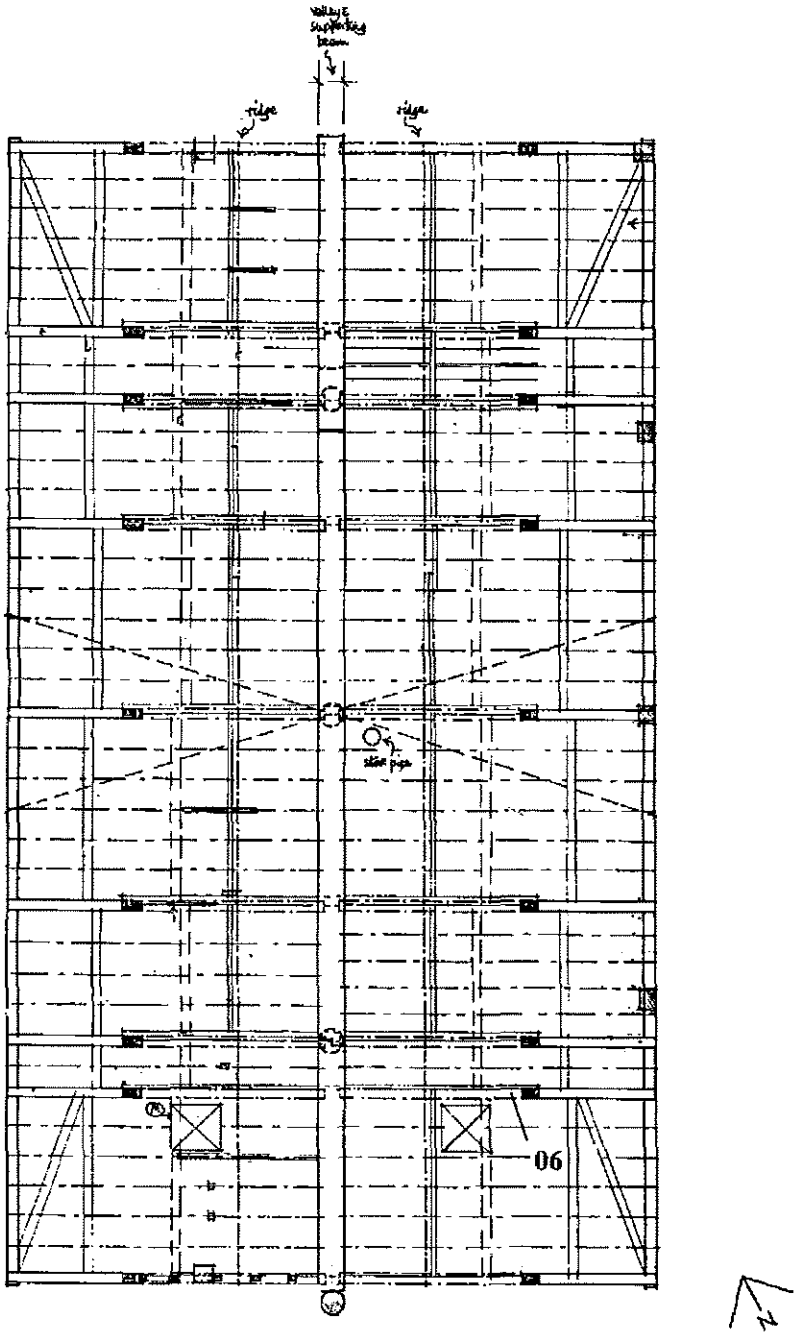

Figure 3: Plan of the roof of Walpole Old Chapel showing the location of timber WOC06 sampled for dendrochronology. Adapted from an original drawn by Anthony Rossi

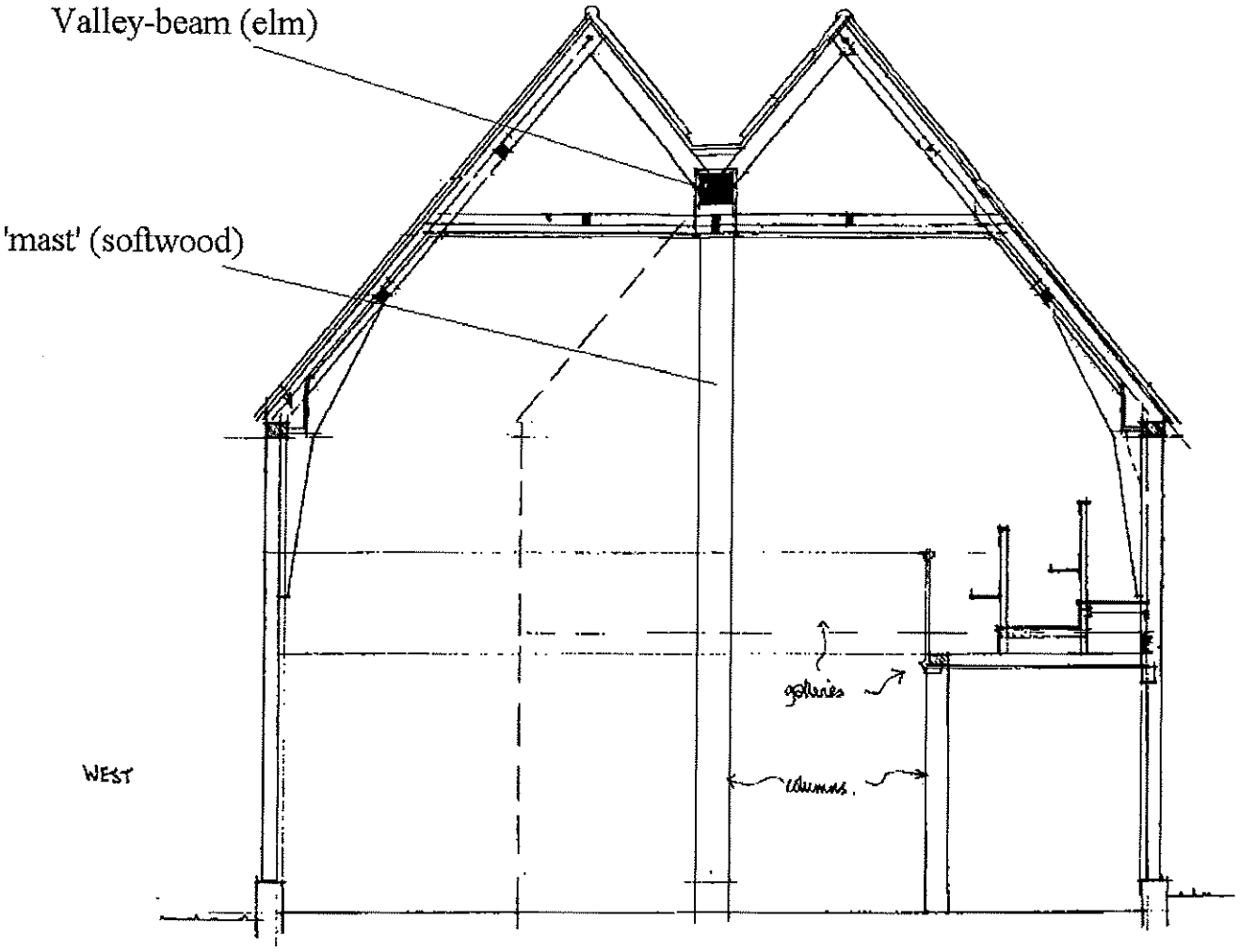

Figure 4: Cross-section of Walpole Old Chapel showing features mentioned in the text. Adapted from an original drawn by Anthony Rossi

Table 1: Oak (*Quercus* spp.) timbers sampled from Walpole Old Chapel, Walpole, Suffolk. h/s = heartwood-sapwood boundary

Sample No	Origin of core	Total No of years	Average growth rate (mm yr^{-1})	Sapwood details	Date of sequence AD	Felling date of timber AD
WOC01	Tie beam in north wall	<40	not measured	-	unknown	unknown
WOC02	North-east corner post	<35	not measured	h/s	unknown	unknown
WOC03	North-west corner post	<45	not measured	h/s	unknown	unknown
WOC04	Stud at north-east end	<35	not measured	-	unknown	unknown
WOC05	East wall, old post, sampled through gallery void	<25	not measured	-	unknown	unknown
WOC06	West principal rafter north of inspection hatch	60	1.68	-	1698 - 1757	after 1766
WOC07	West post at south end	<40	not measured	-	unknown	unknown
WOC08	South-west corner post of phase I	69	2.02	h/s?	unknown	unknown

When crossmatching between samples is found, their ring-width sequences are meaned to form an internal site mean sequence which 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 rings available on each sample. Interpretation of these dates then has to be undertaken to relate these findings to the construction date of the phase under investigation. An important aspect of this interpretation is the estimate of the number of sapwood rings missing. In this instance, the sapwood estimates are based on those proposed for this area by Miles (1997), in which 95% of samples are likely to have from 9 to 41 sapwood rings. Where bark is present on the sample the exact date of felling of the tree used 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).

Results

All the timbers sampled were oak (*Quercus* spp.). Details of the samples and their origins within the building are given in Table 1, and illustrated in Figures 2 and 3. The main valley-beam in the roof was found to be of elm (*Ulmus* spp.) and was not sampled. The central 'mast' was coniferous (probably pine), as were the supporting masts. Both of these features are shown in Figure 4, they were not sampled.

Not many cores were taken as the most promising looking timbers in two phases were found not to contain many rings when the samples were extracted. The proposed Phase I is represented by samples WOC 01, 02, 03, 04, 05, and 08, of which only WOC08 had sufficient rings for further analysis. In phase II, only a single sample, WOC07 was taken, this being the most promising timber. When this sample was found to contain so few rings it was decided not to sample further in this phase. The roof was inspected and found to contain many unsuitable timbers with too few rings, only one principal rafter being sampled.

Only two timbers exhibited ring-width sequences in excess of 50 years, WOC06 and WOC08, both from different phases of the building. These sequences were compared with a wide range of oak chronologies and no consistent matches were found for WOC08. Sample WOC06 however, gave a number of satisfactory crossmatches in the position corresponding to the years AD 1698 – 1757 (Table 2). The ring-width data for WOC06 and WOC08 are given in Table 3.

Table2: Dating of the oak sample sequence WOC06

	WOC06 AD 1698 - 1757	
Dated reference or site master chronology	*t*-value	Overlap (yrs)
FEB2000 (Bridge unpubl)	4.9	60
Hants 97 (Miles pers comm)	4.8	60
East Midlands (Laxton and Litton 1988)	4.5	60
Oxon93 (Miles pers comm)	4.4	60
Reading Abbey waterfront (Groves *et al* 1997)	5.6	50
Winchester (Barefoot 1975)	5.1	60
Thaxted Church, Essex (Tyers 1990)	5.0	60
New Farm House, Mapledurham, Hampshire (Miles and Haddon-Reece 1995)	4.5	60
Exeter Cathedral, Devon (Groves pers comm)	4.3	60
HMS Victory (Barefoot 1978)	4.3	60
Bishopstone, Wiltshire (Bridge 1999)	4.2	53

Interpretation and Discussion

Only very limited sampling was carried out at this site. It was difficult to assess the potential of timbers from their external appearance and when those thought to be most potentially useful yielded such low numbers of rings, sampling was curtailed. Similar fast-grown trees have been noted as a feature of many buildings in this county.

The single dated sample (WOC06) came from the roof. The late date for this principal rafter may represent a single repair, or more likely a previously unrecognised phase of re-roofing. The lack of rings in the other timbers mean that in this case the earlier phases could not be dated. The recognition of the softwood used in the supporting 'masts', coupled with the geographical proximity to the east-coast ports suggests that these structures might well be re-used ship's masts. Closer inspection of their profile and comparisons with known mast forms may solve this question.

Acknowledgements

I would like to thank the contractor, Ian Richardson, for his help and encouragement, and for sharing his understanding of the proposed development of the structure on a cold, wet, windy, and generally dispiriting day. Trudi Hughes (English Heritage) also contributed to discussion about the building whilst on a brief visit to the site. The work was funded by English Heritage.

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Table 3: Ring-width data for samples WOC06 and WOC08

Year	ring widths (0.01mm)									
WOC06										
AD1698								294	128	134
AD1701	162	193	226	306	187	201	182	206	202	135
	145	246	269	256	280	234	205	155	125	243
	264	277	190	204	119	87	113	100	143	171
	151	181	158	143	129	112	143	127	138	75
	67	91	149	141	200	223	175	130	89	87
AD1751	120	172	138	145	155	131	122			
WOC08										
1	322	348	429	322	235	225	252	227	245	357
	305	273	320	396	273	269	230	393	380	349
	220	256	254	251	309	302	292	304	211	228
	315	204	193	175	174	239	199	186	151	105
	81	138	135	167	150	152	158	141	121	89
51	106	133	134	96	97	50	122	77	98	113
	123	119	139	104	71	77	65	72	103	