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Tree-Ring Analysis of a *Cedrus Libani* Sample from Witley Court, Worcestershire

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Summary

A cross-section of the radius of a large *Cedrus libani* (Cedar of Lebanon) was found to contain 155 rings. The section was cut approximately 1.2m above ground level, and the tree was therefore probably a few years older than 155 years. Presuming the tree was still alive when cut in AD 2004, this means it would have started life around the middle of the nineteenth century. An early abrupt growth change probably represents transplantation of the tree to its final growing position.

Keywords

Dendrochronology

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Introduction

Witley Court (NGR SO 769 649) is an early Jacobean manor house which was converted in the nineteenth century to a large Italianate mansion. This transformation was carried out by the 1st and 2nd Earls of Dudley in the AD 1870s and 1880s. The ruins of the house are surrounded by magnificent landscaped gardens by William Nesfield. The property is now in the care of English Heritage. As part of an ongoing tree-management plan, two trees in ill-health were felled and investigated earlier, a *Thuja occidentalis* (Eastern White Cedar) and an *Abies cephalonica* (Greek Fir) (Bridge 2003). On this occasion, the head gardener (Richard Squires) supplied a radial cross-section of one of the largest trees at the site (Figure 1) which had also been felled in order to further understand the development of the garden landscape.

Methodology

The trunk slice was taken about 1.2m above ground level by staff at Witley Court. It was 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. The sample had its 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 (2004).

The ring sequence was plotted to allow visual comparisons to be made between this sequence and those from the trees previously analysed from this site. Statistical comparisons were made using Student's *t*-test (Baillie and Pilcher 1973; Munro 1984). The *t*-values 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 in oak, provided that they are supported by satisfactory visual matches, and give consistent matching positions. The appropriate *t*-values for acceptable matching in the species investigated here are not known.

Results and Discussion

The tree section showed a good deal of 'wedging' of the rings where rings in one part of the trunk can be quite wide, but narrow down in another part of the trunk. This makes the measurement of a single radius of limited value, since a second radius from the same tree may well show a different pattern of growth. The results do however give some indication of growth change, and a good indication of the age of the tree. The 155-year sequence found here for this *Cedrus* section suggests a tree of perhaps 160-170 years of age, allowing for the growth to the height at which the tree was cut. This is older than either of the two series previously investigated and may give valuable information about the development of the garden.

No matching was found between this series and either of the previous two series measured from this site. The series (Figure 2) does however show some interesting growth changes.

One noticeable feature of the ring-width plot is the sudden decline in growth in year twelve, followed by a second year of reduced growth. At 1.2m above ground level this actually occurs slightly later than the twelfth year of growth. It seems likely that this represents transplantation of the tree from a nursery to its permanent growing position. A similar growth reduction was found in the *Abies cephalonica* trunk from the same site at about the same age of the tree (Bridge 2003). Other individual years are noticeably narrow, but it is difficult to read much into these because of the variation of the rings around the trunk.

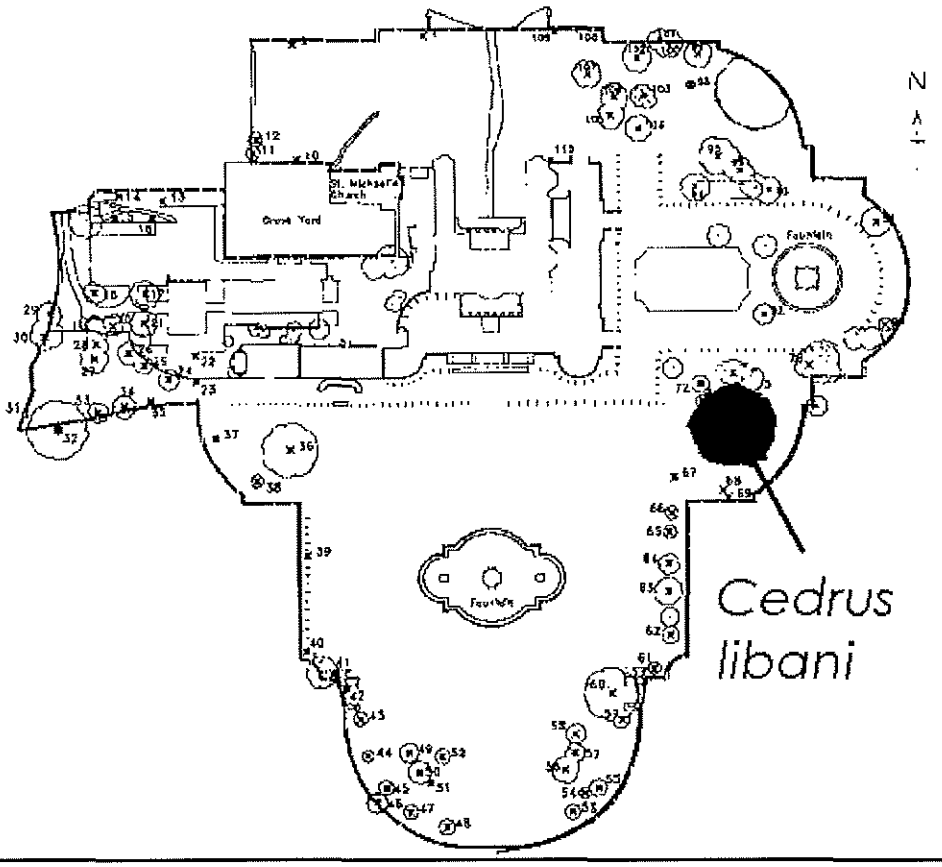

Figure 1: Plan of Witley Court showing the position of the tree from which the sample was supplied (adapted from an English Heritage drawing by G Shand)

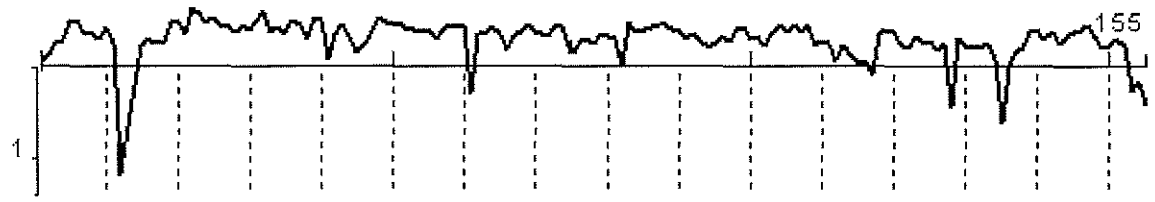

Figure 2: Plot of the ring-width series against time (the y-axis is a logarithmic scale of the width in mm)

Acknowledgements

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Table 1: Ring width data for the radius measured

ring widths (0.01mm)

Average ring width 8.26mm Mean Sensitivity 0.20

543	604	748	772	1069	1116	914	855	794	999
733	73	171	356	715	816	750	746	1080	1100
886	1334	1256	1065	1130	1027	993	916	1014	934
1125	1299	914	967	887	1110	1026	808	1131	1115
564	858	1037	834	630	743	915	1127	1078	1010
1079	930	941	903	929	802	944	1006	994	1032
314	857	856	963	884	647	851	921	1012	916
879	852	991	1002	629	769	790	756	855	825
809	491	1080	909	960	977	1005	1028	957	895
804	883	776	699	745	830	770	934	982	804
836	726	861	1025	902	1002	913	1035	714	761
753	540	716	585	514	516	422	880	949	894
739	699	837	741	771	665	739	245	796	700
673	692	736	560	186	498	646	675	914	942
810	904	745	826	901	939	1024	850	699	701
810	721	323	373	253					