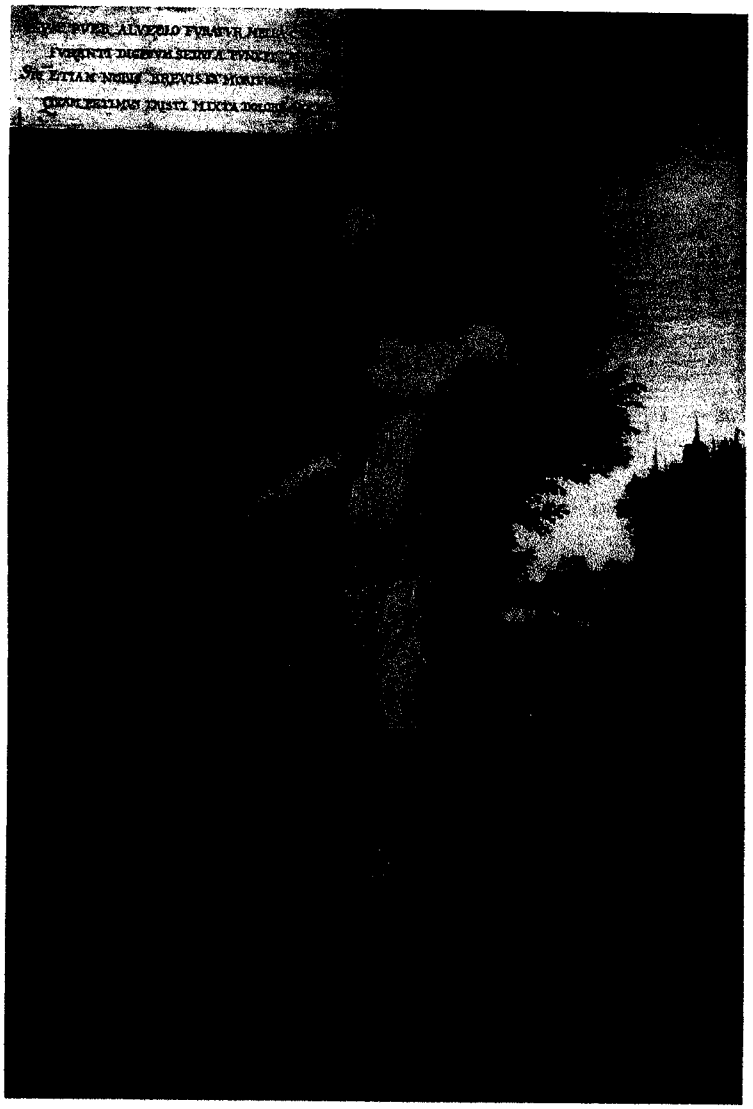
Dendrochronological Consultancy Limited

Report 376

Tree-ring analysis of a panel painting: *Venus with cupi*



by Ian Tyers, August 2010

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Summary

The panel support for the '*Venus with cupi*' painting comprises a single oak board. Analysis of the tree-ring sequence from this provides a likely date for the board of between 1607 & 1637. This board was derived from a tree probably sourced from western Germany.

Tree-ring dating

Tree-ring dating or dendrochronology is a dating technique that utilises the pattern of ring widths within a section of timber to determine the calendar period during which the tree grew. From England and elsewhere in north-western Europe there are a large number of oak (*Quercus*) ring-width reference chronologies against which new oak sequences can be tested. The geographical and temporal coverage of these ring-width reference chronologies is extensive and it is possible to produce a series of strong regional chronologies for most of the northern, central and western parts of the continent. If suitable ring sequences can be obtained, it is possible to provide dates for many art-historical objects for which the date has hitherto been unknown or uncertain. It is not intended here to provide comprehensive details of the method as there is an extensive body of literature upon the subject. Details of the technique are given in Schweingruber (1988). The Dendrochronological Consultancy tree-ring laboratory follows the methodology and working practises recommended in English Heritage (1998) these are summarised below.

It is necessary that enough rings are obtained from any one sample in order to be able to find reliable cross-correlation with other tree-ring sequences. For oak the minimum acceptable is 50 rings.

Since not all timbers contain datable sequences, it is appropriate to measure sequences from each suitable timber in any object for which a date is sought.

The date of a tree-ring sequence must not be confused with the date of usage of a tree. The felling year of a tree can only be determined by obtaining sequences that have complete sapwood and either bark or identifiable bark-edge. Such samples, that also have enough rings, are infrequently available on panels. This is probably because the removal of the sapwood was a standard part of panel construction. Most dendrochronological studies of panel paintings can thus provide felling date ranges or a *terminus post quem* date for a panel.

The date of felling of a tree is not necessarily the date of use of a board. Panels can provide tree-ring dates significantly earlier than the true usage date where the panel remained in storage between construction and use, or the panel was re-used some considerable time after its first use. The process of converting boards into panels of particular sizes could involve the removal of outer rings from each board and the transport of imported timber may have taken an unusual length of time.

Dendrochronological analysis is at its most useful when the question relates to identifying a year after which a panel must date. But even under these circumstances it requires interpretations of some sort to convert the dates of the rings in a panel into a likely felling or usage date.

Dendrochronology is potentially not so useful in a situation where the question relates to identifying if a panel is from before a certain date, since there are a variety of circumstances in which normal assumptions are not valid. Situations where the use of tree-ring dating is not appropriate include unusually small panels, or panels which are re-used.

It is not clear, despite extensive academic discussion, whether the seasoning of boards prior to construction of panels was normal practise. Since panels were made in a variety of locations and over an extended period there may in any case be differences of practise. Most tree-ring evidence, along with practical evidence based on rates of drying of thin boards, suggests there was either no intentional seasoning or a very short seasoning period. In effect for most panels

any seasoning probably occurred during the transport of the raw material in board form, any deliberate seasoning period is likely to be only a few months or years in length and if present it is likely to be masked by the natural variability in numbers of sapwood rings.

Trees put their new growth on the outside of their trunk, just under the bark. The years of a series of tree-rings therefore runs from the oldest which are those nearer the centre through to the most recent which are nearer the outside.

The external cross-matching *t* table (Table 2) lists examples of matches for the data from this panel against reference series. This table is intended to show that there is independent corroboration for the dating given, the details of which chronologies match best is (to some extent) irrelevant except if very high correlations had indicated the material was derived from the same tree as those in another panel. This correlation list is not exhaustive, since this sequence matches many other reference series.

The standard method of reporting correlation between tree-ring sequences employed throughout European dendrochronology is by use of coefficients calculated using the CROS algorithm of Baillie and Pilcher (1973). This algorithm produces *t* values. A *t* value of between -3.0 and 3.0 is normally found for each non-matching position of overlap between any two sequences. Values of between 3.0 and 5.0 have some statistical relevance and may reflect the correct dating position. Values between 5.0 and 10.0 are usually reliable indicators of synchronous sequences. Values over 10.0 usually indicate pairs of boards from a single tree.

Venus with cupi

DCL reference OS526, Sotheby's reference 5T8NK

This panel was examined in London during July 2010. It is *c.* 253mm wide, *c.* 379mm high, and *c.* 5mm thick. It is constructed from a single oak (*Quercus*) board rather surprisingly aligned horizontally (Figure 1).

The board had grain that is reasonably straight, and contained enough rings for analysis. The right edge, and the outer part of the left edge of the board were carefully prepared by removal of later varnish so that the ring sequence was clearly visible. The annual ring width sequences from these edges were then measured directly onto a computer based measuring system where the individual ring widths were measured to an accuracy of 0.01mm. The measured sequences include the last complete heartwood ring present along the bottom edge of the board. There is a small amount of surviving sapwood along the left hand side of the bottom edge, which was too fragile to prepare and measure. The presence of sapwood means that it is possible to calculate a *felling date range* for this panel.

Results

A sequence of 124 annual tree-rings was recovered from the right edge of the board (Table 1), the 37 year sequence from the outer part of the left edge did not extend the right edge sequence. The right edge sequence was then compared with a set of English & European master tree-ring chronologies. The comparisons involve the examination of each possible position of overlap between the new sequence and each reference sequence, this search was undertaken by computer. These comparisons identified one statistically significant correlation between the sequence from this panel and more than one of the master reference sequences. This position was checked visually using standard tree-ring plots to confirm that these matches were reliable. The checking process then proceeded to separately test the board series at its dating position against a large number of independent sequences of similar date and origin. This process was used to confirm that the identified dating position

exhibited statistically significant correlations against sufficient independent tree-ring data that this result can be regarded as reliably replicated. These checks proved satisfactory and confirm the date of the tree-ring sequence from the board of the *Venus with cupi* panel that is given in Table 1. The next stage involves the interpretation of the result obtained from this analysis.

The date of the Venus with cupi board

The interpretation of the date of the sequence from the board is shown on Figure 2 in the form of a bar diagram. The onset of sapwood on the bottom edge of this board allows a *felling date range* to be calculated. The addition of the minimum & maximum expected number of sapwood rings that are typical for oaks from its region of origin, 8-38, to the date of the last heartwood ring obtained from the panel provides the felling date range. The most recent measured heartwood ring dates to 1599. This board was therefore derived from a tree which was probably felled between 1607 & 1637. The analysis indicates that this panel can be no earlier than 1607.

The board has sapwood, so it is unnecessary to make assumptions about whether trimming is likely to have occurred.

The origin of the Venus with cupi board

The matches between the *Venus with cupi* sequence and reference data are with a number of regional chronologies derived from western Europe. The *Venus with cupi* series also matches data from a number of other objects previously identified by dendrochronology as being derived from the same area (Table 2). This area is thus the most likely source region for this board.

Conclusion

The *Venus with cupi* panel support was made from an oak board suitable for tree-ring analysis. This board was derived from a tree still growing in 1599. Applying standard estimates for missing sapwood indicates that this tree was likely to have been felled between 1607 & 1637. This oak tree grew somewhere

in the northern or western part of Germany, or less plausibly in the eastern part of the Netherlands, a more precise location cannot be identified.

The analysis of a tree-ring sequence from this panel provides strong evidence for the date, and source, of the board. However, the painting need not be co-eval with the date of production of its support. A dendrochronological study is of interpretative value when integrated with other technical and art-historical studies.

Acknowledgements

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References

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

Delorme, A, 1972 *Dendrochronologische Untersuchungen an Eichen des Südlichen Weser- und Leineberglandes*, unpubl PhD thesis Göttingen Univ

English Heritage, 1998 *Dendrochronology: guidelines on producing and interpreting dendrochronological dates*, English Heritage

Jansma, E, 1995 *RemembeRINGS*, Nederlandse Archeologishe Rapporten, 19

Schweingruber, F H, 1988 *Tree Rings*, Kluwer Academic Publishers

Tyers, I, 2009 *The tree-ring analysis of 2 panel paintings: A Tavern Scene and A Flower Scene*, Dendro Co Rep, 309

Figure 1. The *Venus with cupi* panel, front. The board labels, dimensions and directions of growth are also shown, photo Sotheby's.

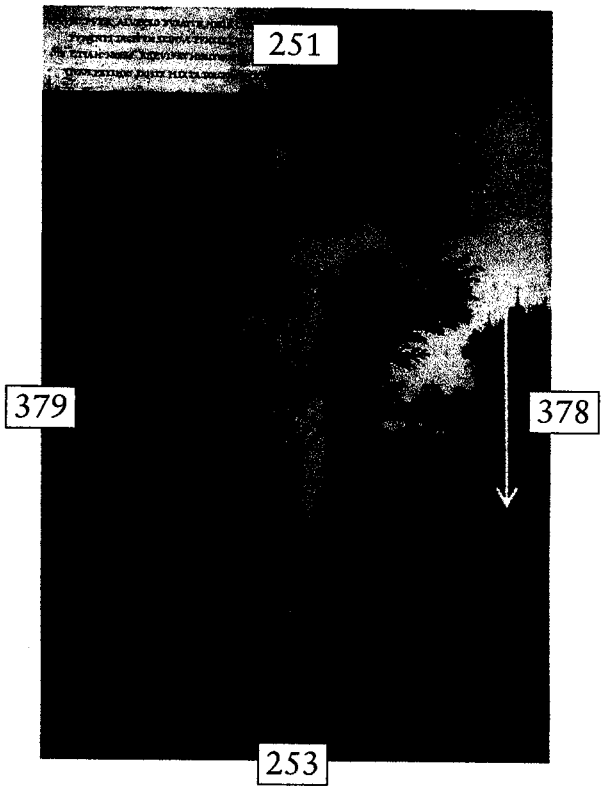

Figure 2. A bar diagram showing the position of the dated ring sequence obtained from the *Venus with cupi* panel. The measured sequence contains oak heartwood (white bar) but ends at the onset of sapwood. The interpretation based on the minimum & maximum likely number of missing sapwood rings is also shown.