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Tree-ring research on Dutch and Flemish art and furniture

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Introduction

Between AD 1500 and 1700, in The Netherlands high-quality art and furniture was produced. The question of the historical meaning of these pieces is, among others, related to their exact age. Dendrochronology can contribute to the determination of their creation dates; usong cross-dating techniques, we can determine the calendar years during which the oak trees used for pieces of art and furniture were felled. Such dates provide a *terminus post quem* for the creation of these pieces. In addition, dendrochronology can be used to identify the provenance of the wood.

Dendrochronological research on Dutch panel and Flemish paintings is common since the 1970's (e.g., Eckstein *et al.* 1975; Fletcher 1978; Klein 1986). However, less attention has been paid to research on Dutch and Flemish furniture and sculptures. Our research on these types of objects is a response to the increasing demand from, among others, museums and art dealers in The Netherlands (Fig. 1).

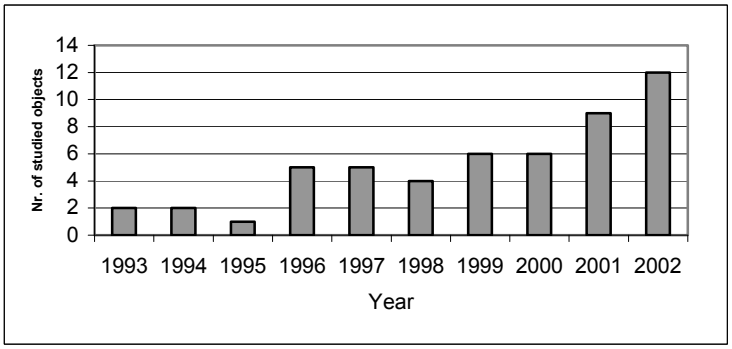

Figure 1 - Number of dating commissions on art and furniture per year

Material and methods

The 51 items we studied represent a variety of object types. They include 15 panel paintings (e.g. Fig. 2), 11 sculptures (e.g. Fig 3), 15 cabinets and chests, 3 desks and tables, an organ, a pulpit and a dolls house, and other items.

Figure 2: 17th century forgery (Museum Flehite, Amersfoort (NL)

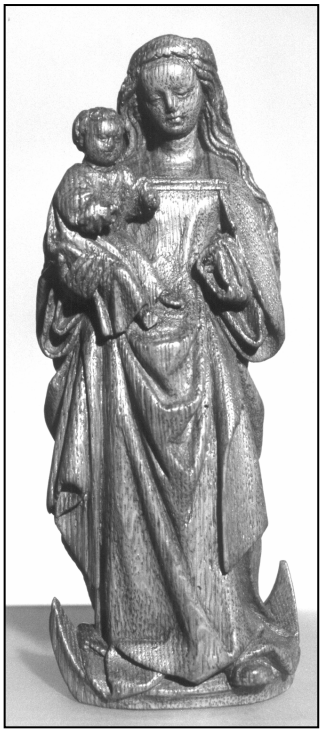

Figure 3: 15th-century statuette

Research in most cases took place *in situ*, at the restoration workshop or museum where the pieces were held. Some relatively small sculptures were analyzed in the laboratory. We mostly used straightforward visual techniques to measure the wood. First, if necessary (and desirable), a narrow section of the wood (2 – 4 mm) was cut with a scalpel from the outer to the inner ring, in order to reveal the cell structure. When working for the Rijksmuseum in Amsterdam, restaurateur Paul van Duin prepared the wood using a small wood plane. Next, chalk was rubbed into the wood, in order to set off the ring boundaries. In some cases we had access to adjustable microscopes, but mostly we measured the ring widths using a simple lens. We measured relative ring width, meaning that we assigned a number (index) to each ring width in comparison to the surrounding ring widths, which is very much like the visual 'skeleton-plot' technique.[1] The essentials of our method are shown in Figure 4.

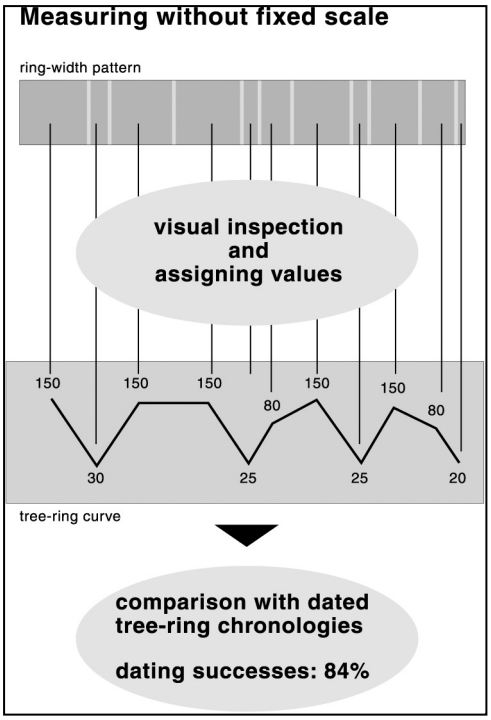

Figure 4: Schematic presentation of the visual measuring method

We dated the measurement series against the standard chronologies in the RING archive (the Baltic region, Belgium, France, Germany and the Netherlands; Jansma 1992) using standard cross dating methods. Based on the origin of the chronology that provided the best match, the most likely region of

[1] e.g., http://tree.ltrr.arizona.edu/skeletonplot/introcross date.htm

origin was deduced for each piece of wood. We then grouped the ring-width series according to this origin, detrended the series and calculated average chronologies using standard dendrochronological approaches (Dendrochronological Program Library DPL[2]; COFECHA (Holmes 1983); CRONOL default option (50% variance preserved at a wavelength of 128 yrs)).

Results and interpretation

Of the 185 measurement series, 159 could be dated against existing standard chronologies (Table 2) or, incidentally, by internal cross dating (Table 1, 2nd collumn). In this manner, 43 objects out of a total of 51 could be dated, which is a success rate of 84%. The chronological distribution of the end dates of the objects is shown in Figure 5.

Table 1 - Provenance of the studied wood

Provenance	**Chronology code**	**Author(s)**	**Chronology description**	**Nr. of matching samples**
Unknown	Internal match			16
Baltic	GBB1	Hillam and Tyers 1995; ibid., personal communication	Chronology of Baltic wood	65
Baltic	NLPP	Eckstein, Brongers and Bauch 1975	Chronology of Dutch paintings	22
Baltic	GBB2	Hillam and Tyers 1995; ibid., personal communication	Chronology of Baltic wood	4
Baltic	FRFP	Lambert and Lavier, personal communication	Chronology of Flemish paintings	3
Baltic	Eubig7	Leuschner, personal communication	EU-project ADVANCE 10-K, West Poland	2
Baltic	Polen	Wazsny, personal communication	Polish chronology	1
Baltic	Eubig8	Leuschner, personal communication	EU-project ADVANCE 10-K, East Poland	1
Total Baltic				**98**
German	DLSO	Hollstein 1965	South German chronology	22
German	DLCE	Hollstein 1980	Central German chronology	16
German	NLHist-1	Jansma 1995	Chronology of wood imported from central Germany	5
German	DLWF	Tisje unpublished data; De Vries, personal communication	Eastern Netherlands and adjacent Westphalia	2
Total German				**45**

[2] www.ltrr.arizona.edu/software.html

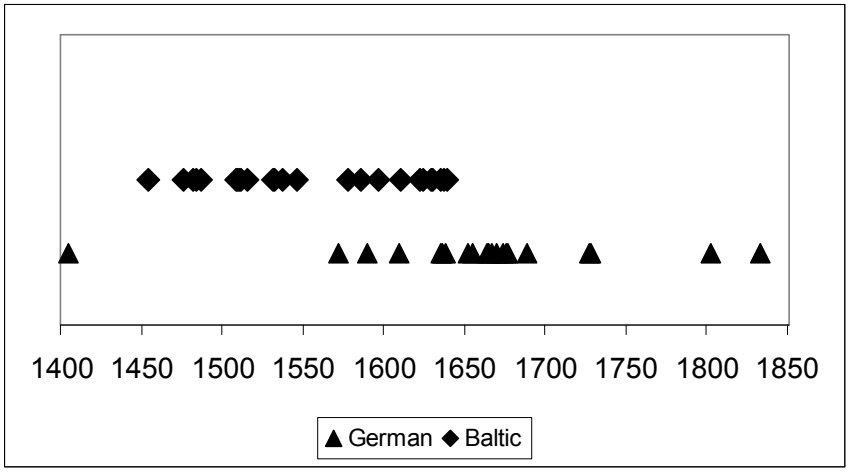

Figure 5: Chronological distribution of the end dates of the studied objects. German = series dated against German master chronologies; Baltic = series dated against Baltic master chronologies.

Most studied wood (98 series) was imported from the Baltic region (Table 2). This Baltic oak most often was used in art objects (paintings, sculptures, altar pieces; Fig 6a). The remaining wood (45 series) was obtained from South and central Germany and used mostly for cabinets, tables and such, less than 25% being used for paintings and altar pieces (Fig. 6b). Both groups of measurement series were detrended and, after removal of (parts of) series showing low correlation with the bulk of the material, compiled into average chronologies (Fig. 7). The new 'Baltic import' chronology covers the period from AD 1167 to 1637 (Table 2). The 'German import' chronology, from which one anomalously early object was excluded (Fig. 5, end date ca. 1400), covers the interval from AD 1360 to 1837 (Table 3).

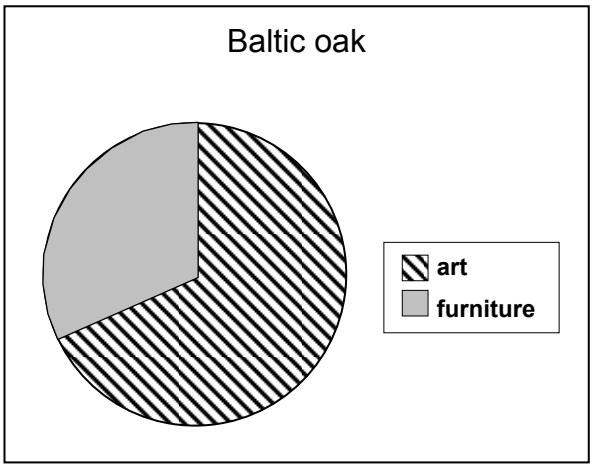

Figure 6a - The application of Baltic oak

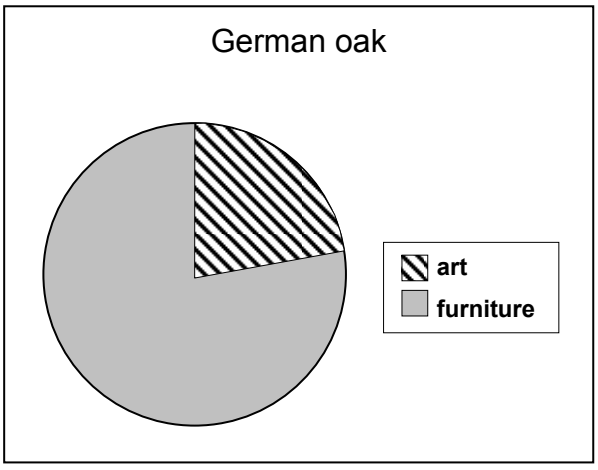

Figure 6b - The application of German oak

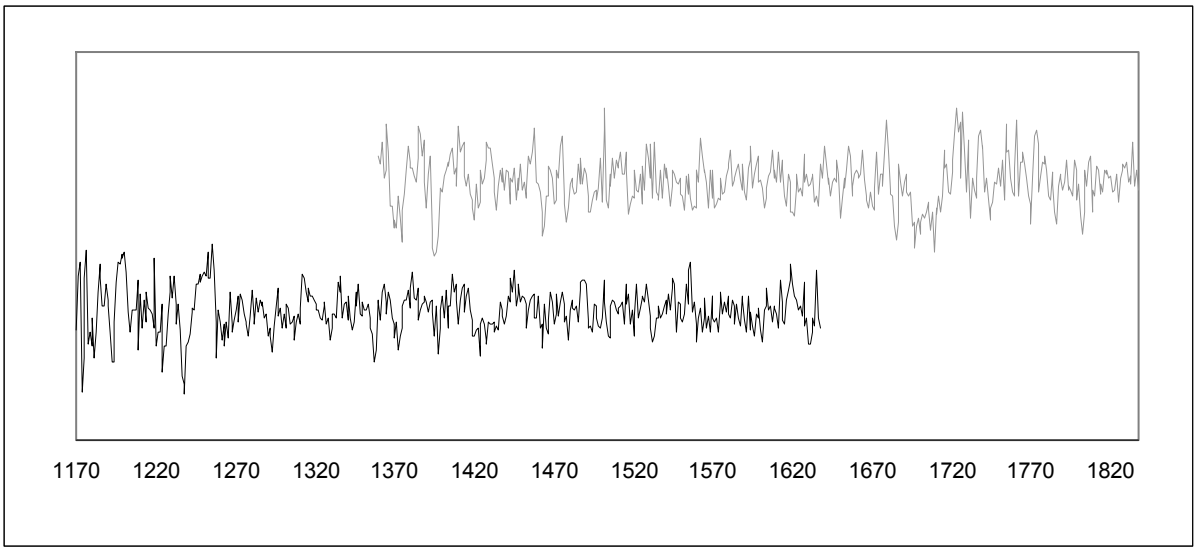

Figure 7: Average chronologies of imported Baltic (black) and German (grey) oak

The overlap between the end dates of the studied material (AD 1576 – 1637; Fig. 5) can be used to infer the decennia during which in Belgium and The Netherlands both Baltic and German wood was used by carpenters and artists. When calculating this interval, we should keep in mind the minimum number of missing sapwood rings (ca. 20) and minimum aging period of the wood (4 years)[3]. The correction for these factors shifts the overlapping interval to ca. 1600 - 1660. Our data before ca. 1600 point to a preference of Baltic timber, after ca. 1660 only German wood was used. The switch to German oak coincides with the British Navigation Acts, a series of laws which, in 1651 and 1660, successfully restricted Baltic trade by the Dutch.

[3] Only dry oak was used for art and furniture, in order to prevent morphological deformations of the end products.

Table 2 – Average annual-growth indices in the 'Baltic import' chronology of oak

Year	year+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
1167	159	48	63							
1170	85	127	137	37	63	126	147	74	84	73
1180	94	63	84	115	136	125	104	104	120	109
1190	104	83	60	61	91	122	138	136	144	140
1200	145	130	99	84	84	100	101	101	123	70
1210	113	86	108	91	115	102	100	97	86	140
1220	73	83	83	105	53	73	73	97	114	127
1230	110	127	105	90	105	85	50	44	35	72
1240	76	82	99	102	101	120	121	128	122	127
1250	130	127	145	125	125	152	131	91	63	101
1260	92	78	89	73	92	79	114	90	83	93
1270	101	112	92	113	108	98	92	90	80	96
1280	116	95	89	110	99	109	103	107	94	98
1290	81	86	80	68	88	104	117	96	102	87
1300	97	87	105	102	89	92	96	78	92	98
1310	90	102	128	126	115	106	118	111	111	109
1320	105	100	101	95	93	104	107	90	95	78
1330	87	97	98	95	122	114	127	94	105	106
1340	93	112	94	85	92	114	104	120	97	96
1350	107	100	100	105	94	86	82	60	70	108
1360	106	93	114	121	106	98	115	109	94	89
1370	79	91	69	80	86	103	108	109	116	102
1380	118	130	110	108	118	93	101	105	106	112
1390	107	99	106	108	99	81	104	67	87	100
1400	111	95	116	86	103	104	129	115	121	109
1410	90	109	118	120	99	112	118	101	93	81
1420	81	85	87	65	89	94	90	77	74	91
1430	90	89	91	83	88	85	106	101	96	89
1440	96	111	107	126	115	132	103	113	120	106
1450	112	110	105	86	100	109	112	113	94	94
1460	111	86	89	71	105	87	82	93	115	107
1470	89	97	113	96	106	115	105	91	96	77
1480	100	109	102	100	103	92	116	122	123	123
1490	120	93	86	88	84	105	103	94	88	86
1500	94	123	106	91	80	79	103	109	106	100
1510	98	102	103	107	90	120	105	113	89	100
1520	81	96	120	95	102	110	111	106	121	108
1530	96	86	76	80	94	94	104	95	97	104
1540	108	97	113	101	117	126	120	84	107	105
1550	95	91	98	121	105	131	137	99	107	89
1560	76	95	102	83	94	110	87	96	84	111
1570	95	91	95	84	106	115	97	107	99	111
1580	98	95	108	103	90	105	95	88	111	108
1590	93	83	112	85	99	88	80	98	94	102
1600	85	76	100	104	117	100	104	91	103	102
1610	98	86	123	106	93	89	108	116	124	136
1620	121	111	108	108	100	103	96	122	88	95
1630	75	75	83	94	88	131	94	87		

Table 3: Average annual-growth indices in the 'South- and central-German import' chronology of oak

Year	year+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
1360	119	114	131	103	109	144	122	81	81	64
1370	70	64	89	71	53	78	90	109	127	115
1380	110	110	104	99	118	143	136	119	132	100
1390	80	106	119	63	48	43	45	57	93	95
1400	92	104	108	115	112	121	126	105	111	97
1410	143	123	128	130	104	96	106	90	86	80
1420	70	98	80	84	108	98	102	116	130	126
1430	126	114	103	91	78	96	109	100	111	94
1440	109	107	83	102	100	110	85	102	94	114
1450	94	100	87	93	120	113	122	139	142	99
1460	98	92	76	57	65	89	88	112	109	102
1470	83	85	109	102	128	135	88	82	68	80
1480	98	102	96	90	92	113	98	118	98	111
1490	105	88	77	77	85	91	94	86	95	118
1500	84	139	156	85	79	106	96	118	103	116
1510	111	114	122	105	105	122	108	74	83	88
1520	87	109	94	91	105	83	112	94	129	118
1530	102	129	87	130	92	89	86	108	87	114
1540	102	111	96	81	96	109	106	100	98	102
1550	90	89	78	104	90	106	87	78	81	79
1560	108	100	133	119	107	108	100	79	108	87
1570	109	80	83	87	85	103	90	91	104	111
1580	114	125	97	101	103	108	113	101	94	113
1590	91	86	111	116	128	95	106	114	120	99
1600	101	95	79	87	95	104	107	124	102	108
1610	99	123	99	116	110	88	81	105	100	77
1620	77	73	95	106	92	95	89	121	100	106
1630	96	98	104	106	84	89	81	114	113	103
1640	128	114	98	103	88	99	102	99	117	105
1650	71	87	102	95	109	127	119	88	97	105
1660	108	106	103	105	124	101	89	85	80	91
1670	81	78	95	122	90	106	105	97	122	148
1680	123	94	90	89	66	55	69	113	99	88
1690	100	105	92	89	92	65	68	48	65	72
1700	60	69	74	71	76	84	78	62	77	46
1710	80	74	88	76	89	125	111	114	91	90
1720	107	117	137	156	138	146	103	153	123	92
1730	132	108	72	103	94	87	102	135	140	126
1740	128	91	103	86	70	79	84	100	98	111
1750	110	96	116	85	144	123	125	103	91	88
1760	111	147	89	115	115	122	113	102	89	83
1770	67	104	135	140	129	92	104	115	114	119
1780	109	89	86	107	98	76	67	96	105	103
1790	94	99	117	93	97	94	89	116	108	86
1800	98	73	60	77	108	97	115	119	76	94
1810	89	112	108	90	98	91	108	105	109	102
1820	104	91	94	93	105	84	102	109	113	110
1830	115	99	104	98	131	97	109	94		

Conclusion

The data set we studied is small, and general inferences based on small data sets are necessarily shaky. However, if our data are correct, they indicate that before ca. 1600 artisans and artists in the Netherlands mainly used oak derived from the Baltic, and that around 1660 a switch occurred to oak from South and central Germany.

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