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HISTORICAL AND CULTURAL FRAMING OF A MEDIEVAL WOODEN ARTWORK THROUGH DENDROCHRONOLOGY

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Abstract

A small wooden cabin has been analyzed through dendrochronology. The artifact is a choir built by the lords to attend sacred functions while separated from the rest of the hall. The artwork was attributed to the workshop of Arduino da Baiso, but the wooden structure is not entirely convincing because of a stylistic incongruity between the lower carved part and the simple linear cusp, whose panels inlaid with floral motifs are very close to certain Florentine marquetry. Dendrochronological analysis demonstrates that the whole structure of the choir is coeval and that the panels of the two parts come from the same batch of trunks. This means that the entire choir was designed and built by the same workshop with fir wood, probably coming from the Tuscan Emilian Apennines.

Keywords*: Dendrochronology; Inlay; Wooden sculpture; Medieval wooden art; Dating.*

Introduction

The Torchiara wooden choir (Fig. 1) is a masterpiece of Italian medieval wooden art. It is a small cabin built by the lords to attend sacred functions while separated from the rest of the hall. Until 1894, it was in the corner to the left of the main altar of the chapel of S. Nicomede in the Castle of Torrechiara near Parma. Then, the choir passed from the Castle to become the property of Florentine anthropologist Elia Volpi, who tried to sell it at auction in 1914. Being unsold, it was placed in the Davanzati Palace and exhibited in the so-called Parrot Hall. Together with the Palace, the choir was acquired by the antiquarian Leopoldo Bengujat and then became part of the Achillito Chiesa and Agosti-Mendoza collections. Finally, the choir was purchased by the City of Milan in 1936, where it is currently part of the Furniture Collection of the Museum of Decorative Arts of Castello Sforzesco.

According to critical sources [1], the wooden choir was commissioned by Pier Maria Rossi, a warlord born in Berceto (Parma, Italy), a small village in the Apennines near the Passo della Cisa on March 25, 1413.

The warlord rebuilt the castle of Torrechiara in its current form between 1448 and 1475 to welcome his lover Bianca Pellegrini, wife of Melchiorre d'Arluno. The castle became the property of French noble Pietro da Rohan and later of the Sforza family, who over the centuries further embellished it until 1909, when they sold it to Pietro Cacciaguerra. Three years later, without furniture, the castle became the property of the Italian State.

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The choir was attributed to the workshop of Arduino da Baiso. The inlays in particular resemble the decorations that adorn the Castle's "Golden Chamber", made around 1475. The perforated rosettes, however, are stylistically close to those found in the chorus benches of the church of San Domenico in Ferrara made by Giovanni da Baiso towards the end of the 14th Century [2].

The choir is made up of two corner walls, each decorated with carved motifs of late Gothic rosettes, alternating with others depicting the coat of arms or emblems of Pier Maria Rossi with the mottos "*Digne et in aeternum*" (worthily and eternally) and "*Nunc et Semper*" (now and forever) placed on painted and golden wooden supports. Each form is enclosed in frames inlaid with geometric motifs. On the left side of the choir, there is a door, and on the right, there is a small window on a shelf. The furniture is finished with a hexagonal cusp (Fig. 1), of which only the three frontal sides have a decorative design representing flower pots.

Fig. 1. The Torchiara wooden choir

If there is no doubt about the authenticity of the carved part, there are some doubts about the structure of this singular object, of which no other variants are known except for the Twentieth-Century replica at the Victoria and Albert Museum in London. The wooden structure appears not entirely convincing because a stylistic incongruity exists between the lower carved part and the linear cusp, whose panels inlaid with floral motifs are very close to certain Florentine marquetries, such as those of the sacristy benches of the church of Santa Croce in Florence [2].

One interpretative hypothesis sees the choir made after the middle of the Nineteenth Century using wooden fragments of the Fifteenth Century according with the then-new liking for antiquity. In effect, Charles III of Bourbon, the Duke of Parma and Piacenza, during those years asked the architect Paolo Gazola to revitalize in neo-Gothic style some of the halls of the ducal residences in Parma [3], thus directing local craftsmen to the "stylistic" restoration and rearrangement of the antique furnishings and promoting, at the same time, a sort of re-discovery of the late Gothic and North Italian Renaissance as an alternative to the Biedermeier style of the Austrian archduchess of Parma, Marie Louise.

The aim of this work is to consider the choir's constructive uniformity from a xylological and dendrochronological point of view and therefore to evaluate the presence of different construction phases, replacements, or reconstructions.

Material and methods

The access door of the choir, considered part of the original structure, and the cusp, considered a possible substitution, were analyzed (Fig. 2).

Fig. 2. On the left: the wooden door which gives entry inside the choir; on the right, an internal view of the cusp.

The wood species determination of the panels was made by microscopic observation using specific identification keys [4–6]. Sampling was carried out by collecting small fragments on invisible faces of the artifact. The wood species determination of the marquetry was made only macroscopically, maintaining the integrity of the carved wood.

Dendrochronology is the scientific wood dating technique that studies the growth rings of trees in relation to time, which today represents the principal method of dating and studying wooden artifacts [7]. There are numerous art-historical applications of dendrochronology, ranging from panel paintings and wooden sculptures to antique furniture. In fact, the formation of growth rings in wood depends on numerous environmental factors, including climate, which is a most important aspect. In a fairly well-defined region, and for a particular tree species, these factors are rather similar [8], which explains the usually high level of cross-matching between trees of the same species from the same area. Dendrochronological dating is performed by comparing a series of tree rings from the sample to be dated with a well-chosen reference chronology [9]. If a particular part of the curve matches the chronology, both trees grew during the same time period, and the sample is dated.

On the choir, sampling was carried out by photographs. Measurement of tree-ring widths was made directly on photographic images with the CooRecorder and CDendro programs [10].

Several measurements were performed on the same image so as to include as many rings as possible and at the same time to avoid errors due to any accidental deformation of the grain.

Nine tree-ring series were obtained: four from the cusp, and five from the back of the door. The mean tree-ring series obtained from the two parts of the choir were compared with each other and with reference chronologies valid for the study area and for the same species.

Statistical tests

Each mean tree-ring sequence (Table 1) was compared visually and statistically with others (Table 2) and with published reference chronologies (Table 3).

Table 1. Single tree-ring series.

Code	Element	Tree-ring n.
1	Cusp	107
2	Cusp	92
3	Cusp	72
4	Cusp	87
5	Door	73
6	Door	81
7	Door	71
8	Door	52
9	Door	70

The statistical cross-dating tests used in this study are as follows.

•T_{BP}: Student's t-test adapted to time series by Baillie and Pilcher [12].

•Glk: Gleichläufigkeit and its value Gleichläufigkeitswert as discussed by Eckstein and Bauch [13]. In comparing two chronologies in a given time interval, Glk is a nonparametric test representing the percentage of agreement between the signs of growth from one year to another.

•Statistical significance of Glk at the 95.0%, 99.0%, and 99.9% levels is indicated by the symbols *, **, and ***, respectively.

•Overlap, i.e., the number of rings that were compared with reference chronologies and to which the statistical tests refer. Dendrochronological dating relies on statistical comparison procedures whose significance lessens as the number of tree rings available for analysis decreases. Typically, the number of tree rings analyzed should never be less than 40, whereas dealing with at least 70 rings represents a suitable condition, although a definite threshold does not exist. This implies that the results summarized in the tables below have different meanings. For instance, a high T_{BP} value obtained with 40 tree rings is statistically less powerful than the same T_{BP} value obtained with 150 rings. Basically, the threshold of statistical significance was $T_{BP} > 4$, together with high values of Glk.

Table 2. Grid correlation report between the single tree-ring series of the choir.

	1	2	3	4	5	6	7	8
2	16.00							
3	7.03	8.21						
4	5.47	5.95	7.91					
5	5.23	4.61	6.27	5.85				
6	6.45	5.57	5.52	6.42	7.10			
7	6.14	5.35	5.28	4.67	4.47	4.45		
8	3.15	1.66	2.95	2.13	2.55	2.42	2.83	
9	7.17	7.13	7.01	6.43	4.29	5.34	4.30	3.73

Cross-dating was performed using the PAST4 (SCIEM, Vienna, Austria, http://www.sciem.com), and TSAPWin (RINNTECH, Heidelberg, Germany, www.rinntech.de/index-52147.html) programs. For internal consistency and uniformity, because the algorithms used by different programs may generate different t-values [14], the values of Student's t-test were calculated using the PAST4 software.

Table 3. Silver fir reference chronologies.

Authors	Geographic area	Start year	Final year	Length (y)
Becker e Giertz-Siebenlist, 1970	Tyrol	820	1961	1142
Bernabei Bontadi NCIAC, 2017	North-Central Italy	1092	1897	806

Results

All the wooden structure, including the panels of the door and the cusp, is made of fir, *Abies alba* Mill., whereas the inlay works are of walnut, *Juglans regia* L.

The tree-ring series of the cusp and the door show strong reciprocal correlations (Table 2), supporting the hypothesis that the boards of both parts originate from the same tree trunk (Fig. 3). A statistical comparison between the two mean series shows $T_{BP} > 10$, which is usually considered to be the threshold for belonging to the same tree [15–16].

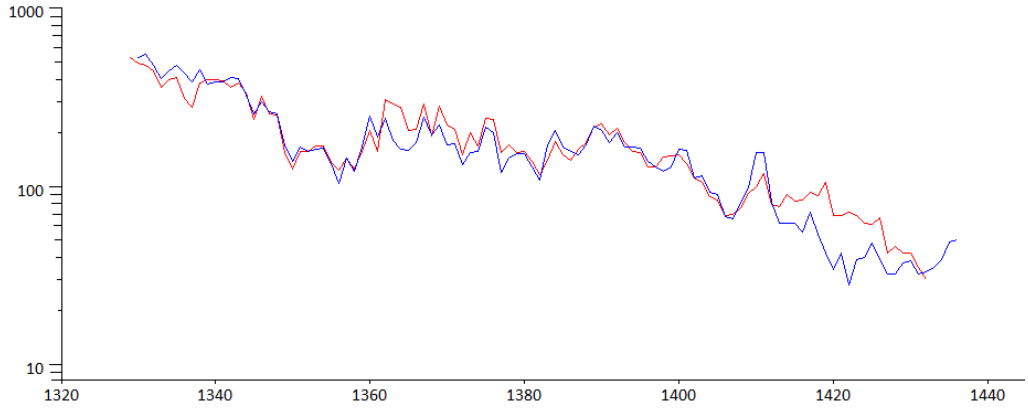

Fig. 3. Visual comparison between the tree-ring series of the cusp (in blue) and the door of the choir (T_{BP} = 10.90, Glk 82.30***).

The mean tree-ring series of the cusp, the door, and their mean chronology were compared with fir reference chronologies (Table 3) valid for the Alps and Central Italy [17–18]. The dating of the last tree ring measured on the choir is 1436 AD (Table 4).

Table 4. Cross-matching statistics for the cusp, the door, and the choir.
The difference in the dating of the door and the cusp depends on the length of the mean series.

Tree-ring series	Reference	T_{BP}	Glk	Overlap	Year
Cusp	Bernabei *et al.* (2016)	6.01	63.10***	102	1436
//	Becker e Giertz-Siebenlist (1970)	2.50	59.30*	102	1436
Door	Bernabei *et al.* (2016)	5.05	61.10*	99	1432
//	Becker e Giertz-Siebenlist (1970)	2.91	56.70	99	1432
Choir (mean)	Bernabei *et al.* (2016)	5.09	68.10***	102	1436
//	Becker e Giertz-Siebenlist (1970)	3.02	61.40*	102	1436

Discussion

In the study of any work of art, in addition to its historical and iconographic aspects, material analyses are becoming increasingly important. Apart from restoration issues, a deep analysis of materials enables a better understanding of the work, helping its framing in a precise historical period. Furthermore, the use of any specific material is related to the technical knowledge of the craftsman/artist and to the cultural environment from which the artifact comes [19–20].

For instance, knowing the wood species gives an idea of geographic origin (e.g., stone pine wood was used mainly in sculptures in the Alps, whereas linden was preferred in the lowlands) or the cultural context which supported the creation of the artifact (all the panel paintings of the Italian Renaissance are on poplar wood, whereas the Flemish ones are on oak).

The contribution of dendrochronology in this sense is often crucial, and this work represents a clear example. Before dendrochronological analysis, Torchiara's wooden choir was considered the product of recent reconstructions, a sort of collage made in late Gothic style, which only in some details referred to its original beauty.

The greatest doubts concerned the relationship between the body of the structure and the cusp, which did not seem convincing. On the contrary, dendrochronology demonstrates that the whole structure of the choir is coeval, made with the same species (fir), with panels that probably come from the same trunk or from the same batch of trees, as shown by the high correlation values. This means that the entire choir was conceived and built by the same workshop and is therefore the result of a unitary composition process.

The strongest correlation (Table 4), with the reference chronology of the Apennines [18] with respect to the one from Tyrol [21], may suggest that the wood comes from the area of the Tuscan Emilian Apennines, where fir forests are still present today and where some of the samples of the Italian fir chronology originate.

Conclusions

1436 is the *post quem* term. To obtain the year of construction of the choir, a number of years must be added, which are difficult to quantify, including a portion of tree rings lost during the operation of milling the boards and the years of timber seasoning. As an estimate, a date around 1450 can be hypothesized.

Given the correspondence with the decorative inlays that adorn the "Golden Chamber" of Torchiara Castle, which were made no later than 1475, the choir was most likely constructed between 1450 and 1475 in the whole configuration we see today.

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