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THE SAN VITO WOODEN PULPIT FROM MUSEO DIOCESANO OF PALERMO, ITALY: MULTIDISCIPLINARY APPROACH AND ANALYTICAL TECHNIQUES FOR DATING AND RESTORATION

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Abstract

The aim of the present research is to investigate the constitutive materials and the execution techniques of San Vito *wooden pulpit from Museo Diocesano of Palermo (Italy) and to provide helpful information to dating it in addition to technical, historical and artistic evaluations. The pulpit, attributed to unknown artist, belongs to the decorative arts and the most relevant feature is its double dating, in addition to the singular painting technique: it has a linear structure typical of XIXth century and three polychrome and gilded panels probably dated to the end of XVIIth century. This paper describes the application of analytical techniques (imaging diagnostics techniques, Scanning Electron Microscopy coupled with X-ray Energy Dispersive Spectroscopy and Fourier Transform Infrared Spectroscopy) to better understand and characterize the pulpit, both support and decoration, useful to plan and perform the correct restoration. They revealed a proteinaceous pittoric layer for the linear structure, without a preparation. The panels are entirely covered by gold leaf applied on a preparation composed by a first white layer with gypsum and animal glue and a second one with bole. The traditional pigments, red and green lacquers using oil as binding medium are applied on gold leaf by thin and transparent brushstrokes.*

Keywords*: Wooden pulpit; Decorative arts; Tempera and oil on wood; Water gilding; SEM-EDS; FT-IR Spectroscopy; Conservative restoration; Museo Diocesano of Palermo*

Introduction

A wooden pulpit is an artwork belonging to the decorative art and specifically it can be considered an object, a sort of furniture, used with a liturgical purpose. In a Christian church or in a religious building a pulpit is a raised tribune, platform or stage, reserved for preachers; generally it is made with marble, wood or stone and traditionally located to the side of the chancel or the nave, near the altar; its function and high position, required for audibility and visibility and generally accessed by steps, differentiate it from the ambo, that is only intended to the biblical readings and not to preaching [1-4].

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The *San Vito* wooden pulpit comes from the oratory of San Vito and it is exposed in the Museo Diocesano of Palermo: due to its cultural value it is a relevant example of religious art in Sicily, even if today it has not the original function related to the liturgical preaching. However, this feature must always be identified and considered during a study and a restoration in order to obtain a right knowledge of executive technique or decay processes [5, 6]. The artwork was executed by an unknown artist and it is composed of a wooden structure (210×120×100cm) and three polychrome and gilded panels, showing events of the Saint Vitus martyr life (Fig. 1): the right panel figures the *Coronation of Saint Vitus*, on the left one it is visible the *Healing of the epileptic* and the central panel represents the *Martyrdom of Vitus, Modestus and Crescentia* (Fig. 2).

Fig. 1. Pulpit of *San Vito*, XVIIth-XIXth century, tempera, oil and gilding on molded wooden support, Museo Diocesano of Palermo (Italy). Front after the restoration

Fig. 2. Detail of the panel representing *Coronation of Saint Vitus*

According to Christian legend, Saint Vitus was a saint and martyr born in Sicily (Mazara del Vallo) in IIIrd century (290 C.E.) and died in Lucania on the 15th of June 303, at the age of 12 or 13, because of the persecution of Christians made by Diocletian and Maximian. The child lost his mother and was given to the tutors Modestus and Crescentia [7]. They are mentioned by the *Martyrologium Hieronymianum* and the three episodes represented on the pulpit are related to the *passio* dated to VIth - VIIth century [8]. Saint Vitus is one of the Fourteen Holy Helpers and has two types of iconographic representation: the Latin image, above all Italian, shows him as a teenager with classical or rich Renaissance garments and a cross in the left hand, flanked by two dogs or a dog and a lion; the Germanic illustration represents him as a lad in a cauldron filled with boiling pitch and placed on a burning, alone or between the tutors, with a palm-leaf, his iconographic attribute [9, 10]. On the pulpit of the Museo Diocesano the two representations are present at the same time: the Germanic illustration is evident on the right panel, the Latin image is visible on the others.

Detailed information about the pulpit doesn't exist but the most interesting feature is its double dating: it is composed of a linear structure made with a style typically belonging to the XIXth century, but the three panels show characteristics of the end of XVIIth century. This fact documents their origin from an ancient artwork and their reuse for the pulpit according to a common custom in the past both for artists and customers, that is related to many factors like changes of culture, new technical requirements and adaptation to the artistic currents. In the history of art, in fact, it is often possible to find many artworks executed reusing materials coming from other ancient objects and sometimes the authors, also the most famous, carried out true masterpieces due to their skill [11].

In this paper we investigate the constitutive materials and the execution techniques of the *San Vito* wooden pulpit providing helpful information to dating it in addition to technical, historical and artistic evaluations.

Materials and Methods

Constitutive materials and executive techniques

Concerning the **support** the pulpit has a tridimensional structure and it is constituted by many elements of softwood with a tangential cut, assembled with metal nails and joints; the visual observation revealed that the wood is not homogeneous and many elements have knots.

Starting from the bottom the lower structure is formed by four vertical pillars with a square cross section linked to four horizontal boards; the upper level presents the same constructional scheme. The square platform is composed of four rectangular panels connected by metals nails and strengthened by a crossbeam, located on the lower side with a perpendicular direction. The parapet is composed of three side while the fourth doesn't exist because it stands for the entry for the preacher: each parapet is composed of four rectangular broads (the vertical ones are 10cm wide) around a central empty space high 53.5cm, connected with a butt-joint; two vertical crossbeams are nailed to this frame, on the reverse (*verso*), covering all the vertical boards and a part of the horizontal ones and they have a support function (Fig. 3).

Fig. 3. Detail of the parapet's reverse that shows the joinery

The pulpit is also composed of many small-in size elements, sometimes molded, linked to the main structure mostly with animal glue and sometimes with metal nails: the four square feet, the capitals, the gilded frames and a sort of entablature on the top, composed of an architrave and a cornice. The three panels are formed by single rectangular board with a horizontal direction and inserted within a bearing structure composed of four rules linked by metal nails and the joint named *capitello*: in this joint the first element shows a H cross section, the second has the complementary one [12]. The panels have also four laths with a trapezoidal shape that highlight the effect of the gilding with their tilt. The artist used chisels and planes as woodworking tools but the observation of the panels painted surface under raking light revealed also the probable use of a more ancient axe [13]; this feature suggests the reuse of the panels, as it was confirmed by the presence of some holes referring to a first assembly with nails.

The white **preparation** (the typical *ammannitura*) is present only in the three painted panels and their frames [14]. It is 2mm thick and it is made of gypsum and animal glue, applied in two different layers. Over these layers, the artist applied the red bole necessary for the gilding.

Concerning the **painting technique**, the structure is characterized by a light green colour probably applied by proteinaceous binder; this irregular green layer is applied directly on wood without any setting; a bronze powder coat is visible on the little frames of this main structure. The front (*recto*) of each panel is covered by gold leaf, applied with the technique of water

gilding. The painting is made over this gilded background, using lacquers (red and green for draperies) and pigments (earth colours, green earth, white lead, ivory black or bone black), as commonly found in XVIIth century, applied by oil as binding *medium*. The brushstrokes are thin and, due to their transparency, the brilliant underlying gold leaf emerges.

State of conservation and previous treatments

Before the restoration the pulpit was in bad state of conservation. The deterioration was related to the natural alteration of the constitutive materials and the conditions in which the artwork was kept. For the support it was observed a slight deterioration caused by an ancient insect infestation (maybe *Anobium* beetles) that was visible as few tunnels and circular emergence holes, fortunately without inducing a structural instability. On the linear structure there were lack and lacunae of the wood probably caused by impacts and natural crackings near the knots and the joints. Every painted panel was interested by a cup but also by a deep cracking located on the lower part near the center that split the broad into two elements. For the painting layers the deterioration consisted in loss of adhesions, abrasions of the gold leaf and lacunae of the preparation, above all near the borders of the frames around the panels and the crackings in the center. Finally there were drippings of wax and various substances, splashes of lime, accumulations of dust and a whitening of the panels' surface due to the varnishes' oxidation.

The pulpit has been subjected to few interventions over the time, which unfortunately is not documented. For example on the reverse of the central panel a not original lath was applied and it is recognizable because of the different direction of the wooden fibers: it is smaller than the board and located on the top of the bearing structure, linked with metal nails. Concerning the painting layers there aren't significant previous treatments except some overlaps applied on the main structure, identified thanks to the observation under UV rays: nevertheless these layers didn't show an evident difference in their fluorescence, so they were probably applied shortly after the original execution of the pulpit.

Methods

Multispectral and non-invasive investigation techniques like microphotography, macrophotography and photography under visible (raking light in specific cases) and UV radiation were chosen as informative first-step analyses.

Microphotography: digital microscope (Dino-Lite, Digital Microscope with magnification rate from 20-50× to 200×), connected to a pc by a USB 2.0 interface.

Macrophotography and photography: digital reflex (DRLR) photo camera with a CCD image sensor.

Visible radiation: daylight fluorescent tubes (5000°K), 45cm long, 25W, 220V single-phase; for raking light the illumination was made from a single side with an oblique angle (above 80° or almost parallel to the surface).

Ultraviolet radiation: UV-A long wave tubes (emission peak 368nm) with UV-A light, 45cm long, 25W, 220V single-phase.

For the chemical characterization of the painted layers five representative samples (with the size of a few mm^2 each) were collected, taking a small amount of materials from already damaged areas; their name and description are given in Table 1.

Samples were examined by using the following techniques:

Scanning Electron Microscopy with Energy Dispersive X-ray Spectroscopy: Philips Quanta FEI 200 Environmental Scanning Electron Microscope (ESEM) equipped with an energy dispersive X-ray spectrometer (EDS), model 6103 from Link Analytical Oxford (UK); the elemental analysis was performed in low vacuum (acceleration voltage 30kV, filament current 40μA); the data provided were obtained from the average of three analyses performed in different areas.

FT-IR spectroscopy (002, 003 and 004): Fourier-transform infrared spectrometer (Spectrum One, Perkin Elmer, using CsI windows in the range of 4000–250cm^{-1} with 4cm^{-1} resolution, 64 scan); the samples were analyzed as nujol mull.

Table 1. Sampling table

Sample name	Colour and description	Sampling details	Type of analysis
001	Preparatory layers and gilding	Front, right panel (*Coronation of Saint Vitus*), gilding lower right corner	1. SEM-EDS
002	Preparatory layers and red pigment	Front, right panel (*Coronation of Saint Vitus*), red drapery of the throne	1. SEM-EDS 2. FT-IR
003	Preparatory layers and green pigment	Front, left panel (*Healing of epileptic*), green background on the left	1. SEM-EDS 2. FT-IR
004	Preparatory layers and dark pigment	Front, left panel (*Healing of epileptic*), dark pedestal on the right	1. SEM-EDS 2. FT-IR
005	Preparatory layers and ruddiness	Front, central panel (*Martyrdom of Vitus, Modestus and Crescentia*), first figure shoulder on the left	1. SEM-EDS

Results and Discussions

The results of the scientific analyses were combined evaluating their relationship with the technical observations, as the nature of a component is often difficult to assess with a single analytical tool, as known. The preliminary investigation, made by different photographic and microphotographic approaches, allowed for highlighting some details (painting technique, brushstrokes, woodworking signs, decay processes) supporting the hypothesis of the double dating.

Concerning the wooden support, the most interesting datum was offered by the observation of the reverse under raking light that showed the different surfaces: on the panels the presence of irregular signs, attributable to an axe as main woodworking tool, can be referred to the oldest dating of the artefact, whereas the detailed finishing of the structure, related to more modern utensils, has to be considered as a more recent intervention. On the front, the irregularity of the painting layer applied on wooden structure and, above all, the brushstrokes referring to the three panels were detected by raking light: the brushstrokes are generally very thin but, at the same time, they show an evident complexity related to the mixture of different pigments (Fig. 4).

Concerning the state of conservation the macro and microphotography, sometimes combined with the raking light, shed light on degradation processes: loss of adhesion, scratches, lacunae, few tunnels and circular emergence holes caused by the ancient infestation of wood-boring beetles. The ultraviolet fluorescence revealed the absence of large repainting and several overlaps on the wooden structure (Fig. 5) [15]. The white preparation (2mm) is composed by two layers which are different in thickness and composition. In all samples the presence of gypsum was verified by SEM-EDS (presence of Ca and S). The animal glue as binding *medium* was hypothesized by technical evaluations, according to the technique of the XVIIth century [16]. Gypsum and animal glue have been confirmed by FT-IR analyses. Spectra show the stretching bands ν(OH) at 3540 and 3402cm^{-1}, bending (OH) vibrations at 1682 and 1620cm^{-1}, two bands at 1110 and 672cm^{-1} assignable respectively to the stretching and bending modes of sulphate anions and the proteins bands (broad band centered at 3308cm^{-1} attributed to the stretching ν N–H, 1654cm^{-1} attributed to the stretching ν C=O of amide I and 1518cm^{-1} attributed to the bending δ N–H of amide II) [11, 17]; even if the spectra are very diluted and the peaks are not much evident, this result is reliable due its relationship with the SEM-EDS and the technical observations. On the panels, red bole was identified by SEM-EDS and FT-IR analyses (presence of Ca, K, Mg, Fe, Si and Al). It is mainly composed of iron oxides with aluminum-silicate [18-21]. The water gilding entirely covers the surfaces and the gold leaf was identified in all samples by SEM-EDS analysis, which always shows the peak of Au. The pigments are applied on the gold leaf by thin and transparent brushstrokes; for that reason all FT-IR spectra are very diluted. The palette is composed by pigments and lacquers using oil as binding *medium*, such as it was common in this technique [20].

Sample 001 (gilding): as well as in the other fragments, in the sample 001 SEM-EDS measurements identified Ca (percentage by weight 13.38%) and S (8.05%) attributable to the gypsum ($CaSO_4 \cdot 2H_2O$) of the preparation [11]. The peak of the spectrum relative to the chemical element Au (5.07%) refers to the metal foil.

Sample 002 (red pigment): it can be assumed as a mixture of earth colours. The SEM-EDS peaks (Ca, K, Mg, Fe, Si, Al and Cl) are typical of red earth (or red ochre), Sienna and umber, which are generally composed of kaolinite (clay silicate), quartz, hematite, goethite and sometimes calcite and gypsum [18, 19]. The presence of these compounds was confirmed by FT-IR that showed the characteristics bands: 3700-3400 and 1032cm^{-1} (kaolin), 1084-1080 cm^{-1} (quartz), 1035-1028cm^{-1} (goethite's bands), 1010-1008 and 629cm^{-1} (raw umber), 560-530cm^{-1} (kaolin), 480-450cm^{-1} [20]. Traces of Ti are also present on the sample (SEM-EDS spectrum) and they are usually associated to hematite in brown, yellow or red earth.

Fig. 4. Detail of the painted layer under raking light showing the brushstrokes

Fig. 5. Detail of a painted panel under UV radiation

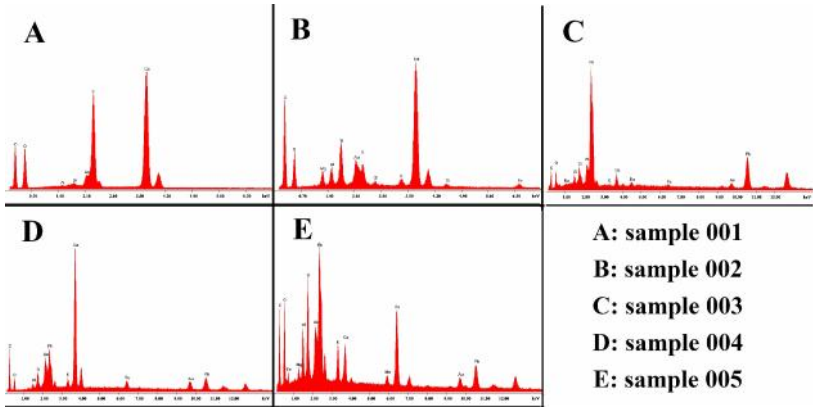

Fig. 6. SEM-EDS spectra of sample 001 (A), 002 (B), 003 (C), 004 (D) and 005 (E)

Sample 003 (green pigment): the SEM-EDS analysis allowed us to suppose the presence of green earth due the peaks of Fe, Si, Al, Na and Ba; it is a pigment composed of glauconite $[(K,Na)(Fe^{3+},Al,Mg)_2(Si,Al)_4O_{10}(OH)_2]$ and celadonite $[K(Mg,Fe^{2+})(Fe^{3+},Al)\ [Si_4O_{10}](OH)_2]$ [20, 22-24]. On the FT-IR spectrum are present little bands at 3700-3400, 3600, 3555, 1640-1630, 975 and 970cm^{-1}, which are typical of the green earth, even if it is diluted like the others; therefore, this result must be compared with the data obtained by SEM-EDS and supported by painting tradition's knowledge. The peak of Pb on SEM-EDS spectrum is attributable to white lead, used for making the light colour.

Sample 004 (dark pigment): it can be assumed dark-grey pigment, composed of ivory black (or bone black) mixed with a small amount of white lead, related to the presence of the Ca and Pb elements. The mixture probably contains also red and brown earths.

Sample 005 (ruddines): analysis identified a mixture of white lead, Sienna and umber. Specifically, the traces of Mn allowed us to suppose the presence of raw umber, which has MnO_2 among the components (Fig. 6 and Table 2) [24].

Table 2. Results of SEM-EDS analysis (weight percents)

Sample name	C	O	Ca	K	Mg	Fe	Si	Al	Au	Na	Pb	Cl	Sr	Ba	Mn	S	Ti	N
001																		
Preparatory layer	45.88	28.86	13.38	--	---	---	---	0.08	3.29	---	---	---	0.46	---	---	8.05	---	---
Gilding	79.78	15.15	---	---	---	---	---	---	5.07	---	---	---	---	---	---	---	---	---
002																		
Preparatory layer	39.45	17.00	23.71	---	---	---	0.23	---	7.29	---	---	---	---	---	---	12.32	---	---
Red pigment	55.71	19.04	10.57	0.55	1.40	0.69	2.94	1.31	5.66	---	---	0.31	---	---	---	1.48	0.35	---
003																		
Green pigment	21.30	9.13	1.71	---	---	0.56	2.01	1.18	6.63	0.34	55.45	---	---	1.70	---	---	---	---
004																		
Dark pigment	35.82	9.11	18.33	1.04	---	1.81	1.51	0.48	11.43	---	20.48	---	---	---	---	---	---	---
005																		
Bole and ruddiness	29.64	29.14	6.14	0.59	0.25	2.92	4.89	4.11	11.30	---	---	0.22	---	---	---	6.45	---	4.36
Ruddiness	35.42	18.89	2.03	1.88	0.73	7.49	4.48	2.64	6.51	---	19.05	---	---	---	0.89	---	---	---

Conclusions

The complete knowledge of the main features of the pulpit was the essential prerequisite to perform a correct restoration, according to modern theory and scientific principles. The technical, historical and artistic observations highlighted a structure of the XIXth century and decorative panels attributable to the end of XVIIth century, probably coming from another ancient artwork. The scientific investigations provided a support to the double dating, highlighting for example the different characteristics of the wooden surface; moreover, the analyses identified preparatory layers and pigments typical of the different periods.

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