



## Diagnosics Applied to an Easel Painting by Ferrau Fenzoni (Cathedral of Todi)

**M. Marabelli<sup>1</sup>, A. Mannaioli<sup>1</sup>, S. Ridolfi<sup>2</sup>, M.P. Sammartino<sup>1</sup>**

<sup>1</sup>Sapienza University of Rome, p.le A. Moro 5, 00185 – Rome

<sup>2</sup>ArsMensurae, Via Comparini 101, 00188 Rome

### Abstract

Our team has recently applied a set of complementary techniques to obtain analytical information on four large oil paintings on canvas (3.50 m h. x 2.50 m l.) of the artist Ferrau Fenzoni, located in the Todi Cathedral. Results on one of them, not subjected to recent restoration, are here illustrated, as the most suitable to identify pigments and materials used by this author.

Even if more methodologies have been used, we here mainly compare results coming from Mineralogical Microscopy and X-ray Fluorescence Spectroscopy (XRFS), while only the most significant information from UV Fluorescence (UVF) Photography and Reflectance Spectroscopy is reported.

Data have allowed us to identify almost all the pigments as well as the composition of the preparatory layer. A chemometric treatment of the data obtained for all the four paintings, through the techniques quoted above, surely will add further information: this work is now running.

### Introduction

A meaningful development of archaeometry today, involving an increasing collaboration between conservation scientists and restorers, is the preventive application of NdT (Non-destructive Techniques) and MdT (Micro-destructive Techniques) to the artefacts before and during restoration, in order to reduce at max. dangerous misunderstandings and possible damages.

With this aim, a large easel oil painting by Ferrau Fenzoni [1], “The Ascension of the Virgin Mary” has been studied. The artist, from Faenza (1562 – 1645), spent a long while in Todi - Umbria, producing many canvas paintings, now conserved inside the Cathedral, and the famous fresco “The Last Judgement” of the wall of the counterfaçade. The canvas “The Ascension of the Virgin Mary” has been chosen because not recently restored, so being particularly suitable for analysing pigments and materials adopted by this interesting and not sufficiently studied baroque painter.

XRFS has made easy to individuate roughly the pigments’ composition through the elemental analysis and the comparison between these data and the results from the mineralogical microscopy has furnished a better level of further identification.

### Materials & Methods

A portable XRFS Instrument assembled and optimized by ARSMensurae Company has been utilized: X-ray tube 25 KV, 60 microA, spot area 1 mm<sup>2</sup>, resolution 190 eV/5.9 Kev, Software PC Ampetek PMCA.

For the mineralogical observation of pigments, a Leitz Microscope, equipped with a transmitted and polarized light apparatus, has been used: microsamples of pigments’ powder have been previously embedded and dispersed inside a polyester resin.

### Results

Table 1 shows a good agreement between the data from XRFS and the results of Mineralogical Microscopy. In all the ground paintings Ca, Sr and Pb have been found by XRFS, probably corresponding to a preparatory layer constituted by gypsum containing impurities of Sr + a finishing layer of white lead.

Pigments employed by the painter are: white lead, azurite, smalt, cinnabar, a lead-tin yellow, various ochres, raw and burnt umber, bone black, a red lake.

A brown amorphous component, quite ubiquitous, corresponds perhaps to copper resinate, altered and darkened. It is impossible to state if it is an original pigment or the reaction product of verdigris with a natural resin medium, as both these components were used in the past to obtain greenish and/or cold hues and for enhancing the siccative properties of the oil medium. The red lake, not precisely identified, pertains to a glaze finishing and to an old retouching [2].

The palette is partially corresponding to the set of pigments adopted by the same painter for the “at secco” wall paintings’ decoration of the Chapel of St. Charles Borromeo in the Cathedral of Faenza.

Typical wave length values in the reflectance spectra, corresponding to minima, maxima and to “spalle”, have given us a further proof of the use of azurite and of a red lake; the last one has been also identified, by UVF, through its typical pink fluorescence and, probably, was applied in a past old intervention on a “lacuna”.

Table 1 - Identification of colours of the painting “The Ascension of the Virgin Mary”

Colour	XRFS / Elements	Mineralogical Microscopy / Components
Blue 1	Cu, Pb, Co (As, Ca)	Azurite ++, White lead ++, Smalt ++, (Bone black)
Blue 2	Cu, Pb, Co, (Fe, Ca)	Azurite +, Copper resinate + ?, White lead ++, Smalt +, (Red ochre, Bone black)
Blue 3	Cu, Pb	Azurite ++, Lead white ++
Pink	Pb, Fe (Mn, Hg)	White lead ++, Raw umber +, (Cinnabar)
Light pink	Pb (Cu, Hg)	White lead ++ (Azurite, Copper resinate ?, Cinnabar, a Red lake)
Dark brown	Cu, Pb, Fe (Mn, Ca, K)	Copper resinate ++ ?, White lead ++, Raw umber +, Bone black ++
Green	Cu, Pb, Sn (Fe)	Azurite +, Copper resinate + ?, White lead ++, a Lead-Tin yellow ++, Bone black +, (Yellow ochre)
Light green	Cu, Pb (Sn, Fe)	Azurite +, White lead ++, a Lead-Tin yellow +, (Yellow ochre)
Light violet	Cu, Pb, Co, Fe, Hg (Ca)	Azurite +, White lead ++, Smalt +, Brown ochre ++, Cinnabar +, (Copper resinate ?, Bone black, a Red lake)
Dark violet	Pb, Fe (Mn, Ca)	White lead ++, Burnt umber ++, a Red lake +
White 1	Pb (Fe)	White lead, (Brown ochre, Bone black)
White 2	Pb (Cu, Fe, Ca)	White lead ++, Bone black +, (Azurite, Brown ochre)

++ main component, + secondary component, traces in brackets

## Conclusions

XRFS, as a true non-destructive, valuable and cheap technique, is generally used as a first diagnostic tool suitable to identify pigments as well as to guide sampling for further analyses; Mineralogical Microscopy requires micro-sampling and allows to recognise the mineralogical phase of the pigments, so being a cheap alternative to the X-ray diffraction. A comparison of these two techniques has allowed to identify almost all the pigments used by Ferraù Fenzoni in a not recently restored canvas; anyway, the UVF has revealed the presence of a red lake that must be attributed to an old intervention. A chemometric treatment of an enlarged set of data coming from different methods applied to all the easel paintings by the same author is now in progress.

## References

- 1) A. Tucci, F. Bevilacqua, C. Di Francesco, V. Tagliatti, Italian wall painting in oil: Carlo Bonomi and Ferraù Fenzoni, two artists of the seventeenth century, in *Painting Techniques. History, Materials and Studio Practice*. Edited by A. Roy and P. Smith. IIC, Proceedings of the Dublin Congress, 7-11 Sept. 1998, London 1998. ISBN: 9780950052588
- 2) F. Catalano, Apprenticeship’s Report *Diagnostic investigations on the easel canvas paintings of Ferraù Fenzoni – Todi Cathedral*, Academic Year 2008/2009, SMFN Faculty, Triennial Univ. Degree in “Scienze Applicate ai Beni Culturali e alla Diagnostica per la loro Conservazione”, University of Rome “Sapienza”.