# 3rd International Conference on Innovation in Art Research and Technology – INART 2018

## Parma, Italy


http://www.inart2018.unipr.it/

black ink used in the Kabylia region (ink made from burned sheep wool). Our results are confirmed buy a 17th century manuscript that describes how pigments are made. Our work is the first positive identification of inks used in Algerian manuscripts and confirmed by an old manuscript of the 17th century.

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[2]: Catalogue of Islamic Manuscripts in the Private Library of Shaykh Lmūhūb Ūlahbīb, Bejaia, Algeria (ed. by Aymen Fouad Sayed ; Al-Furqân Islamic Foundation). London. (2004)

**ABSTRACT O.4.5**

## THE EXEMPLARY CASE OF A REMARKABLY WELL-PRESERVED HISTORICAL MUSICAL INSTRUMENT: THE "TUSCAN" STRADIVARI VIOLIN (1690)

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Keywords: Musical instrument, Material science, SEM-EDX, FTIR, XRF

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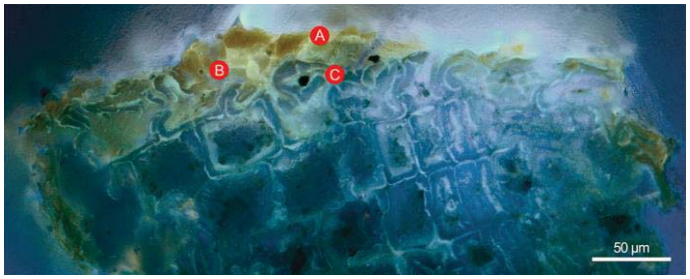
In recent years, scientific diagnostic analysis has increasingly focused on historical musical instruments, especially bowed stringed ones. The materials composing the stratigraphy of these peculiar works of art are characterized by a complex and heterogeneous nature, which is representative of the working techniques employed by the great violin makers of the past. The entire coating system, so called wood finish [1], includes multiple varnish layers on a previously grounded wooden substrate to prevent varnish penetration. Over the time, however, the original stratigraphy of these centuries-old masterpieces could have been affected by the extended handling during performances and practice, the very close contact of the instrument with the musician skin, or, again, accidents and interventions of maintenance and restoration. As a consequence, variations in its coating thickness and composition have most often occurred.
The object of the present study is one of the best-conserved instruments by Antonio Stradivari, namely the "Tuscan" violin (1690) today preserved at the Accademia of Santa Cecilia in Rome (Italy). Commissioned by the Medici family in 1684, as a part of the famous quintet, it is one of the earliest examples of the master's multiple-layer varnishing method [2]. The remarkably well-preserved wood finish of the violin was non-invasively studied by UV-Induced Fluorescence (UVIFL) photography (by B. Brandmair), Fourier-Transform Infrared (FTIR) reflection spectroscopy and X-Ray Fluorescence (XRF) spectroscopy. The hypothesis drawn from the non-invasive approach was supported by a micro-destructive analysis performed on two micro-samples, one taken from the violin's top plate (Fig. 1) and the other from the centre bass rib. The micro-samples were analysed by the Optical Microscope (OM) equipped with visible and ultraviolet lights and by the Scanning Electron Microscope (SEM) coupled with Energy Dispersive X-ray (EDX) spectrometer. The aim of the multi-analytical investigation was the characterization of varnishes, pigments and wood treatments constituting the violin's stratigraphy, trying to understand the methods used by Antonio Stradivari to finish the instrument.

From the results, the varnish is confirmed to be applied in a two-layer system: the uppermost salmon-fluorescent coloured varnish (Fig. 1, level A) is oil-resinous composed, with crystals of calcium oxalates witnessing the age of the varnish as a decomposition product of lipid materials [3]; the lowermost yellow-whitish fluorescent layer (Fig. 1, level B) is also characterized by an aged oil-resinous varnish with an aluminium- and oxygen-rich grain dispersed therein which gives rise to possible attributions, including that of alumina ($Al_2O_3$) as a substrate for lake pigments [4]. At the interface between the wood and the overlying varnish (Fig. 1, level C), probably related to a wood treatment, a proteinaceous compound can be likely identified as a binder of a few silica and silicates mineral phases. Moreover, rare particles of possible titanium-manganese-iron oxides and/or hydroxides as well as iron-containing aluminosilicates, both suggesting the possible presence of iron-based pigments such as red-ochre or umber earth [5], were found at this level. Under the treatment level, finally, small amounts of chlorine, sulphur, potassium and calcium could be ascribed to a wood pre-treatment method [2].
In conclusion, by combining data from the non-invasive and micro-destructive analytical campaign it was possible to propose a stratigraphic hypothesis of the “Tuscan” violin.

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