

# Poster Abstract

## Title

Varnished surfaces of bowed string instruments:  
a multi-analytical non-invasive approach to cleaning methods

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## Abstract

This project is the first step for a systematic study on cleaning procedures for string musical instruments, a need that raised in the last years between museum conservators, restorers and violin makers. The value of a musical instrument is expressed particularly when it is played, fact that means direct contact with the player and fast change in conservation environment. The very act of playing involves dirt deposition and involves cleaning problematics.

We tested both well-established and innovative water-based cleaning methods on ad hoc varnished wooden mock-ups, over which we reproduced a dirty layer. The overall aim of the project was to evaluate cleaning methods in order to help restorers in choosing the most suitable ones for different musical instrument necessities. Cleaning methods were tested with various supporting materials and times of application, thus reproducing the cleaning process of musical instrument varnished surfaces. The procedures were monitored in each step with non-invasive analytical methods, in order to find parameters to describe different cleaning methods efficacy, thus trying to define standard procedure to evaluate the cleanings. A preliminary stereo microscopy investigation, both in direct and in grazing light, was followed by colorimetry and imaging in the visible range in order to evaluate changes in color. Therefore, multispectral imaging assessed ultraviolet-induced visible fluorescence (UVIF) phenomena and estimated infrared response of the dirty layer. X-ray fluorescence (EDXRF) and mid-infrared spectroscopies (ATR and reflection FTIR) were also used to collect information about elemental and molecular content of dirt. Characteristic signals of dirt were identified, which allowed the evaluation of cleaning efficacy. In particular, the use of mapping mode gave information on dirt/cleaning spatial distribution. The choice of using non-invasive analysis allowed finding parameters that could be considered also in real case studies, i.e. on historical instruments.

Natural development of the work will be the application of these cleaning methods directly on historical musical instruments and to use the same analytical setup to evaluate new ones.