

Non invasive diagnostic techniques (MicroCT and SEM microanalysis) for the study of musical instruments at the Correr Museum in Venice, Italy

ABSTRACT

In 2007 the Italian Ministry of Cultural Heritage and Activities, promoted (on television) a fund raising called *Maratonarte*. Among the seven financed initiatives, one was intended for the research and experimentation of scientific procedures aimed to the preservation of musical instruments. The initiative was carried out with the collaboration of the Correr Museum in Venice.

In the Correr Museum, is conserved the only existing organ with paper pipes, dated 1494, made by Lorenzo Gusnasco. In order to better understand its state of conservation, we decided to analyze some pipes and to define the state of conservation, aiming to identify the materials and to investigate the techniques used by the maker.

A collaboration with Synchrotron Elettra Research Center in Basovizza (Micro CT analysis) and with ENEA (Italian Agency for new technologies, energy and sustainable economic development) in Bologna (SEM microanalysis), allowed to achieve a great deal of information, which are currently being examined.

Feasibility studies have been carried out at the SYRMEP beamline of the Elettra synchrotron laboratory in Trieste with the aim of demonstrating the advantages and evaluating the effectiveness of synchrotron radiation X-ray microtomography as a suitable technique for non-destructive analysis of musical instruments. The particular geometry of the X-ray beam and the use of a novel detector allowed structural evaluation of the main details of the instruments with unprecedented richness of details. This, in turn, will allow precise dendrochronological investigation of historical stringed instruments.

Computed tomography (CT) provides the modern luthier and acoustic scientist with a unique tool for characterization of normal structure, defects, and repair and for accurate measurements of wood thickness and density. In this case it has been possible to obtain extremely detailed information on the techniques used to manufacture the pipes, and to evaluate the kind of wood and its present condition, especially regarding presence and activity of larvae.

The Scanning Electron Microscope (SEM), with respect to traditional optical microscopes, can provide three-dimensional images, with higher magnification. Moreover, SEM analysis, once combined with an EDXRS (Energy Dispersive X-Ray Spectrometry) system, can be used to catch X-rays from the atoms of the elements and to yield the chemical composition of the sample. Samples of the paper used for the pipes has been investigated with stereomicroscope and then with SEM. The SEM and microanalysis studies have contributed to define the kind of paper used by the maker, thus complementing the Micro CT approach.

PPT presentation, with video (and audio)