

## **Fusion of tomographic documentation of art-objects based on electromagnetic radiation in the near and mid infrared area of the spectrum and ultrasonic microscopy. Application to Byzantine icons from Cyprus**

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Conservation science, after many years of research experience, provides us with significant tools in order to ‘identify’ art object bottom-up with high fidelity information. In particular, the internal structure – the stratigraphy – can be revealed, which provides important information related to the materials and the technique used for the creation of the object.

The materials and the technique are the components of the creation phase of the object but may have altered due to the time that has passed as well as due to restoration. Together these have influenced the object’s appearance. The identification of all this knowledge related to the materials and their alterations caused by environmental conditions and light, their distribution on the surface and below, the techniques that have been used, as well as later significant interventions to the objects helps to understand the current state of preservation.

This information has been up to now been mainly acquired through analytical spectroscopic methods, which require a micro-sampling operation and time consuming work in the laboratory. Moreover, most of the time, the objects under study are highly valuable and therefore must not be subjected to any intervention. Consequently, non-destructive testing (NDT) tomographic techniques are valuable for revealing information about from the art object’s paint layer structure (stratigraphy), beneath as well as on the surface, and can inform decisions about how to store and handle it.

The fidelity and the resolution of the information is an issue which relates to the potential for its exploitation. Do we need high resolution and high fidelity information which eventually cannot be traced in future measurements or do we need “lower” resolution or fidelity that still produces reliable information but will always be traceable?

### *Acquisition methods and case study on cultural Heritage*

Remote sensing spectroscopic techniques, which reveal the interaction of the materials with external conditions and electromagnetic radiation in several wavelength bands, when used in a tomographic way can be targeted towards revealing subsurface information.

Many potentialities exist. One novel one is the use of tomographic techniques that can reveal bulk information combined with spectroscopic imaging techniques, providing the distribution of the materials within this bulk. Various kinds of waves can be used for this application, based on the latest technological means that are available, which are very well defined and interconnected as far as integration of their information is concerned. In the current case, we are presenting techniques based on both electromagnetic and mechanical waves, revealing information from the subsurface at a micrometer level. Novel applications on painted art objects will also be involved in this analysis, based on thermal emission and reflection phenomena. The resolution of the information can vary from macro (metres or centimetres scale) to micro (micrometers to nanometers) scale. At this point we reach the technological and practical frontiers where a thorough discussion is necessary to find a compromise between fidelity, reproducibility of measurements, portability of the infrastructure and non destructiveness.

