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## **A Survey of the Possibilities of Various Radiographic Techniques for the Non Destructive Examination of Cultural Heritage Artefacts**

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How, where and when artefacts were manufactured, how they were exchanged between folks, when, where and how techniques appeared, prospered or disappeared, what has been their evolution and/or degradation during time...are topics of increasing interest. How can we better understand art objects and cultural heritage artefacts and keep them available, in condition as satisfactory as possible, for future generations is a very significant challenge.

Due to the broad diversity of materials, and as the artefacts have various, often complex and undetermined compositions, as their elaboration processes are often unknown or at least uncertain, it is generally useful or necessary to combine various examination, characterisation and analysis methods, in order to get pertinent information and thus to give a rational basis for their restoration and conservation.

Furthermore, because of the unique or rare nature of cultural heritage artefacts, as a general rule, the techniques which can be used must be either well tested and proven non destructive and non contact methods without any sampling, or tests with strictly authorised small size sampling

Radiography has long been applied to the medical diagnosis & to the non-destructive examination of industrial objects. In the area of cultural heritage, it has proven to be invaluable for the examination and the study of works of art.

In a first part, a brief survey will be given of the basic physics principles of the different possible variants of the radiographic techniques. They include: conventional X-ray radiography, gamma radiography, radiography using accelerator, radioscopy, beta radiography or secondary electron radiography, electron emission radiography, neutron radiography, autoradiography & computer assisted tomography.

Many major types of artefact collections are concerned by radiographic examination: easel paintings (X-ray, electron emission, autoradiography), ceramics (X-ray), stone, metal & wooden statues (X-ray &  $\mu$  ray, tomography), paper & drawings ( $\mu$  particles & secondary electrons), archaeological objects (various techniques), musical instruments (X-ray & tomography).

The second part will provide examples of applications of these different techniques on various types of artefacts, focusing on issues related to the study of historical fabrication techniques, the diagnosis of eventual previous restoration & of the object's condition.

If this palette of techniques, eventually associated with complementary NDT techniques, is used by a competent & skilled technician, & if there is a real dialogue between himself & the curator, or the conservator-restorer, or the art historian, or the historian of techniques, or the archaeologist..., it can provide many pertinent elements, contributing to a deeper knowledge of the artefact & insure a conservation process as pertinent as possible.

### **Country/Organization invited to participate**

France

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