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EXPERIMENTAL STUDIES ON THE WOODEN SUPPORT OF THE “MONA LISA”

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THE
SAFEGUARD
OF CULTURAL
HERITAGE

The “Mona Lisa” (Louvre Museum, Paris) has been painted during the period 1503-1514 by Leonardo da Vinci on a panel of Poplar (*Populus alba* L.) ~79 x 53 cm, ~13 mm thick.

The panel, which features a complex double curvature, is affected by a ~11 cm-long crack, possibly dating not long after the painting was made, running through the whole thickness, tightly connected with the pattern of permanent curvature. The panel is inserted in an Oak frame (“châssis-cadre”), and is slightly forced against it by means of four cross-beams, which hold it flatter than it would be if unconstrained.

Since the “Mona Lisa” was going to be moved in a new display case in the “Salle des États”, in 2004 the Curators of the Louvre Museum asked us the main following questions:

- evaluate climatic specifications for the new display case
- assess the risk of crack propagation
- suggest possible modifications to the frame (“châssis-cadre”)
- improve the monitoring procedure (the display case gets opened yearly, to check the conditions of the painting).

Our group studied the panel’s geometry, the anatomical and physical properties of the panel’s wood, and evaluated the constraint conditions produced by the frame. We also designed and implemented, among others, techniques and equipment:

for manual measurements, to be performed on the panel, on the occasion of the yearly opening (weight, shape, forces exerted by the cross-beams).

for automatic monitoring deformations and forces exerted by the cross-beams, during the normal stay of the panel in the display case, where the climate is tightly controlled, but however some slight variations of T and RH inevitably occur and produce some very small distortions.

In 2006 a Book was published, summarizing the results of the several researches carried out on the “Mona Lisa” in that period.

Among several other results, the following were obtained and described in such book.

The observed trend for deflection of the Panel could be well predicted by a heat & mass transfer + hygromechanical computer model.

The risk of crack propagation has also been assessed, on the basis of the computer model and by means of Griffith theory.

This study keeps ongoing, every year we are present at the opening of the display case.

Data obtained so far provides valuable information on this Panel’s behaviour; data analysis and mechanical modeling provide promising results also for Panel Paintings in general – work is still in progress.