Lasers in the Conservation of Artworks

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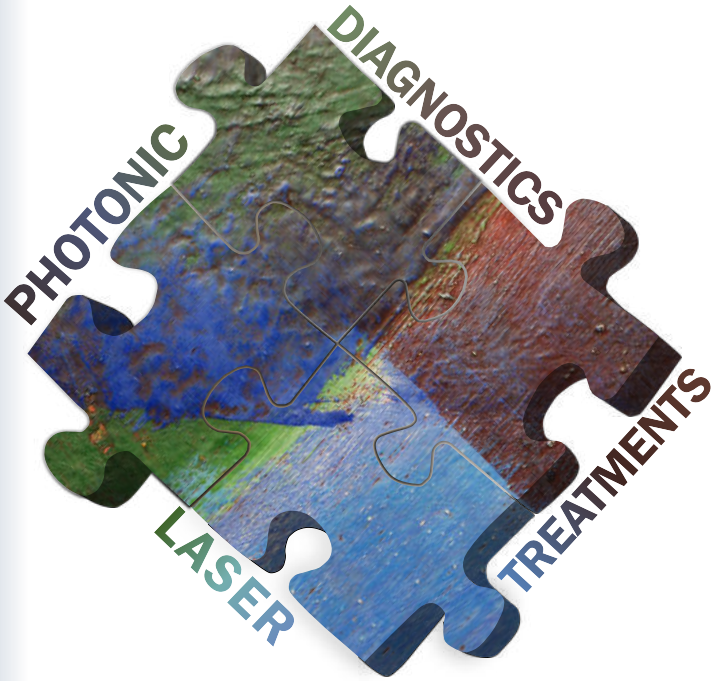


# *Abstract Book*

Consiglio Nazionale delle Ricerche

# In-depth structural and compositional assessments of aged terpenoid varnish layers

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**Keywords**: Nonlinear optical microscopy, Multiphoton excitation fluorescence, Laser-induced fluorescence, terpenoid varnishes, artificial aging

Varnishes are employed in painted artworks for protection from atmospheric pollution and oxidation and for improving the aesthetic appearance of paintings by providing an even and brilliant surface finish. Varnishes undergo complex and differentiated structural and chemical changes over time depending on their composition and conservation conditions. The present work investigates the degradation due to aging of the outermost layers of varnishes as a function of depth by using nonlinear optical microscopy (NLOM) [1] in the modality of multiphoton excitation fluorescence (MPEF). This totally non-invasive technique has been employed for the determination, with a high axial and lateral resolution, of the affected regions of pictorial varnish layers resulting from various types of degradation [2,3]. In this work, terpenoid varnishes such as dammar, mastic, shellac and sandarac, subjected to various types and degrees of aging, natural, artificial and a combination of the two, were tested. A homemade nonlinear optical microscope, based on a tightly focused pulsed femtosecond laser emitting at 800 nm, was used for the investigation. Single-photon laser-induced fluorescence (LIF) measurements served to determine the degree of surface aging and the optimum NLOM-MPEF operating conditions and helped to interpret the results obtained applying the latter [4]. These results signpost the correlations of the nature of the varnish layer, the initial thickness and the type and extent of aging with the in-depth degradation gradients determined by NLOM-MPEF.

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