

Mechanical Degradation in Paintings – Cracks, Delamination, and Loss

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The preservation of paintings is a complex challenge at the intersection of material science and cultural heritage. Paintings are inherently multimaterial systems, and their mechanical integrity is influenced by environmental fluctuations, chemical aging, and accidental damage. This talk discusses mechanical degradation phenomena such as cracking, distortion, and delamination in painted surfaces using both physical and digital models as well as real artworks as study objects.

Experimental approaches for monitoring and characterizing damage are discussed, including mechanical testing (tensile, DMA, indentation) and advanced imaging techniques (digital image correlation, multispectral analysis, microscopy). Results from these techniques are complemented by chemical characterization (primarily spectroscopic methods) to reveal the interplay between structure and composition and to identify stress concentrations within layered systems that can lead to failure. The collected data feed into numerical models to predict degradation patterns and guide conservation strategies.

Achieving meaningful outcomes requires a multidisciplinary approach, involving conservators, physicists, chemists, engineers, and art historians. While deterioration cannot be completely halted, science-based insights allow us to manage degradation and prioritize interventions, ensuring the long-term preservation of cultural heritage.