

# PHOTONICS AND MATERIAL HISTORY: INSIGHTS INTO OUR PAINTED HERITAGE

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*Technical investigations of paintings using techniques based on photonics and advanced chemical analysis yield novel insights into materials, their stability and the way they were used and manipulated in the past.*

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Binding media, metals and pigments in works of art are material history - and are evidence of technology, artist practise, exchange and trade. Through the study and identification of materials, crucial data regarding physical and chemical stability can be acquired, thus informing conservation decisions. This presentation seeks to provide an overview of recent insights gained through the complementary application of in situ techniques, as well as the study of samples using cutting-edge proteomics and micro-Raman spectroscopy.

Case studies of works of art and archaeological materials will draw on current research using portable instrumentation and cutting-edge analytical methods. Investigations on wall painting fragments from the ancient Canannite capital Tel Kabri allowed the identification of degraded binding media from the Aegean style wall paintings that date to the 18th C. B.C.E. The discovery of traces of organic media in the characteristic blue paint is significant for the conservation and treatment of the paintings, for understanding of the sophistication of painting practise and the use of egg-based binding media in the Eastern Mediterranean, and more broadly also questions the presence of domestic animals in the region [1].

Organic red lake pigments are the focus of the third case study. Analysis demonstrates how deep crimson pigments from European insects were adopted by Leonardo in the Last Supper, and how, by contrast, Veronese adopted newly introduced Mexican pigments from cochineal insects. The molecular characterization of cross-sections demonstrate the use of similar kermes-based lakes in paintings by Leonardo and Masolino, and carmine-based reds in paintings by Tintoretto and Veronese, while also revealing soluble uncomplexed dyes in samples that has direct implications for conservation, cleaning and lighting [2, 3].

The study of paintings in museum collections with insitu methods ranging from Fluorescence Lifetime Imaging to more conventional X-ray fluorescence Spectroscopy, and Reflectance Fourier Transform Infrared Spectroscopy allows the documentation of materials found in Modern Art, and the identification of semi-conductor pigments including cadmium yellows and zinc white [4, 5]. Case studies will include recent results from the analysis of paintings by Vincent Van Gogh, Pablo Picasso and Emile Bonnard, among others.

## References

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