

## Molecular fingerprints to tell the story of a painting

Maria Perla Colombini  
University of Pisa, Italy



### Abstract

Knowing the chemical composition of a painting allows us to define not only the original materials (pigments, binders, paints) used by the artist but also to highlight the materials added in restorations or products induced by time and pollution.

In particular, the chemical characterization of organic binders is an important aspect for the reconstruction of the pictorial technique, but this investigation is made problematic by the fact that organic materials are particularly subject to degradation processes and are present in very low quantities, compared to the inorganic material.

At the current state of the art, techniques based on chromatography and mass spectrometry (SIFT-MS, EGA-MS, Py-GC / MS, GC-MS, HPLC-MS) are the analytical techniques that have the greatest potential in the recognition of macromolecules in pictorial micro-samples. In fact, natural and synthetic organic substances are complex mixtures of numerous chemical species that must be separated and identified in order to obtain a characteristic molecular profile, which provides significant information on the type of material used and on degradation products.

The knowledge at the molecular level allows, therefore, to choose an appropriate restoration approach in order to selectively remove the non-wanted materials without interacting with the original binders. Moreover, this knowledge also provides information for the authentication of ancient and contemporary paintings: a problem that has reached great proportions in recent decades.

This communication focuses on the application of micro-invasive techniques mainly based on analytical pyrolysis and chromatography / mass spectrometry that allow the characterization of macromolecules in a painting, showing how this knowledge can be useful to integrate historical information, and in the attribution of a painting to an artist. Some significant cases are discussed both for ancient and modern/contemporary art.



### Biography:

She holds the position of Full Professor of Analytical Chemistry at the Department of Chemistry and Industrial Chemistry of Pisa University, and in 2013-2017 was the Director of the CNR Institute for Conservation and Valorization of Cultural Heritage. She teaches Analytical Chemistry and Cultural Heritage Chemistry; she is the Director of the Summer School of Heritage Science at Pisa University. Her main research aims to optimize analytical procedures based on chromatography/mass spectrometry to identify organic compounds and their deterioration products in complex matrices from Cultural Heritage. Her research has resulted in over 300 publications in refereed journals and books.

### Speaker Publications:

1. "Indian Ocean trade connections: characterization and commercial routes of torpedo jars", Heritage Science/ 04 August 2020
2. "Discovering Giuseppe Capogrossi: Study of the Painting Materials in Three Works of Art Stored at Galleria Nazionale (Rome)", Heritage/ Volume 3 Issue 3, 21 August 2020
3. "Profiling of high molecular weight esters by flow injection analysis-high resolution mass spectrometry for the characterization of raw and archaeological beeswax and resinous substances", Talanta/ Volume 212, 15 May 2020, 120800
4. "Oak wood degradation processes induced by the burial environment in the archaeological site of Biskupin (Poland)", Heritage Science/Vol 8, Issue 44 , 07 May 2020

5. "Development of a method based on high-performance liquid chromatography coupled with diode array, fluorescence, and mass spectrometric detectors for the analysis of eosin at trace levels", Journal of Separation Science/Volume3, Issue6, 02 April 2020

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