Paintings can be analyzed for their molecular content by using a variety of different instrumental methods of analysis [13]. The principal methods applied to paintings are chromatographic and spectrometric. Chromatographic analysis of paintings can involve the use of thin-layer chromatography (TLC), gas chromatography (GC) and liquid chromatography (LC). TLC is typically only used to obtain rapid information about a particular class of analyte being present in the painting. The lack of resolving power forces the use of GC and LC methods for separation and quantitative analysis.

Gas chromatographic methods have been widely used in the chemical analysis of paint samples [14]. GC has been applied to amino acid analysis [15,16] and fatty acid analysis [17,18]. Pyrolysis-GC allows for the online decomposition of materials to yield volatile products that can be chromatographically separated. Pyrolysis-GC is commonly applied to analyze synthetic resins or the varnishes that are applied to different paintings [19,20].

High performance liquid chromatographic separation of derivatized amino acids has been applied to determining amino acid content of paint binders [21]. LC analysis of individual amino acids in different proteinaceous binders (gums, egg yolk, and egg white) has been reported [22]. More recently, various LC-MS approaches to molecular analysis of paintings for determination of amino acids, fatty acids, and organic dyes using either atmospheric pressure ionization (APCI) or electrospray ionization (ESI) have been described [23,24,25].

Thermal analysis can be used to determine chemical composition changes in the binding media [26,27]. Different laboratory methods have been described for studies of paint aging as well as accelerated aging [16,28,29]. Numerous methods have been described for protein analysis of binders including standard chromatographic methods [18,30], immunofluorescence methods [31], as well as more sophisticated LC-MS [32] and MALDI methods [33]. Analysis of the pigment is challenging, as it can be inorganic or organic and often requires an art historian or conservator consultant with knowledge of the painting style of the artist. Inorganic pigments can be identified using x-ray fluorescence [34].