



Handheld FTIR Spectroscopy. The Evaluation of a Non-Invasive Screening Method for the Identification of Varnishes in Paintings by E. Munch

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Background

Fourier transform infrared spectroscopy (FTIR) is a successful and established technique used for the chemical characterisation of organic materials in paint films and varnish coatings [Pinna et al, 2009].

Portable and handheld FTIR (pFTIR) spectrometers allow for non-invasive and *in situ* analyses [Miliani et al, 2007]. This overcomes the disadvantages associated with micro sampling from a specific spot, as the handheld FTIR enables unlimited examination of the painted surface. Notwithstanding these advantages of the pFTIR technique, its practical application as a viable screening method for varnish identification in large painting collections remains to be explored.

This study concerns the collection of 56 Munch paintings at The National Museum of Art, Norway (NMK).

Historically, the museum has always displayed the paintings together as a specific group (Fig. 1), which led to the establishment of the so-called “Munch-Room” in 1937.

Between 1909 and 1980, the collection was embroiled in a varnish controversy, due to the Museum’s application of varnish coatings to unvarnished works [Stein & Rød, 2015].

A series of public debates and criticisms challenged the Museum’s varnishing practice in relation to the perception and to the authenticity of Munch’s paint surfaces (Fig. 2)

Objectives & Methodology

- The main objectives of this study are the implementation of non-invasive techniques for the investigation of the disputed varnish coatings present in 46 of the 56 Munch paintings.
- The focus is on testing pFTIR in diffuse and external reflectance as a suitable screening method for the chemical characterization of the varnish coatings.
- A pilot project consisting of 5 varnished paintings and 1 unvarnished work will be first screened using pFTIR. Different regions of each painting will be analysed in diffuse and external reflectance (Fig. 3)
- The 6 Munch paintings date from a similar period (1890s) and are documented as having been treated at the Museum with one layer of either a natural or a low molecular weight synthetic varnish coating.
- FTIR spectra from the surface readings of the paintings will be compared to FTIR spectra acquired from a selected number of micro-samples taken from the same location. Further comparisons will be undertaken with pFTIR spectra taken from aged mock-up samples of varnish.
- Surface microscopy and multispectral imaging (UV, 320-400 nm; IR, 700-1100 nm) of the varnished surfaces will initially assist the mapping and selection of areas relevant for the pFTIR measurements (Fig. 4)

Expected Outcomes

The anticipated results of this pilot study will serve to evaluate the use of pFTIR as a suitable screening method for the chemical characterisation of varnish coatings in paintings.

Results from the experiments intend to act as a model for screening the remaining varnished Munch paintings.

The study also intends to establish a methodology for using pFTIR for the surface analysis of varnish coatings which can be adopted by other institutions.

Optical Coherence Tomography is planned for the stratigraphical characterisation of the more complex varnish layers.

Finally, the findings will assist the design and implementation of viable cleaning strategies for the removal of unoriginal surface coatings.

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References

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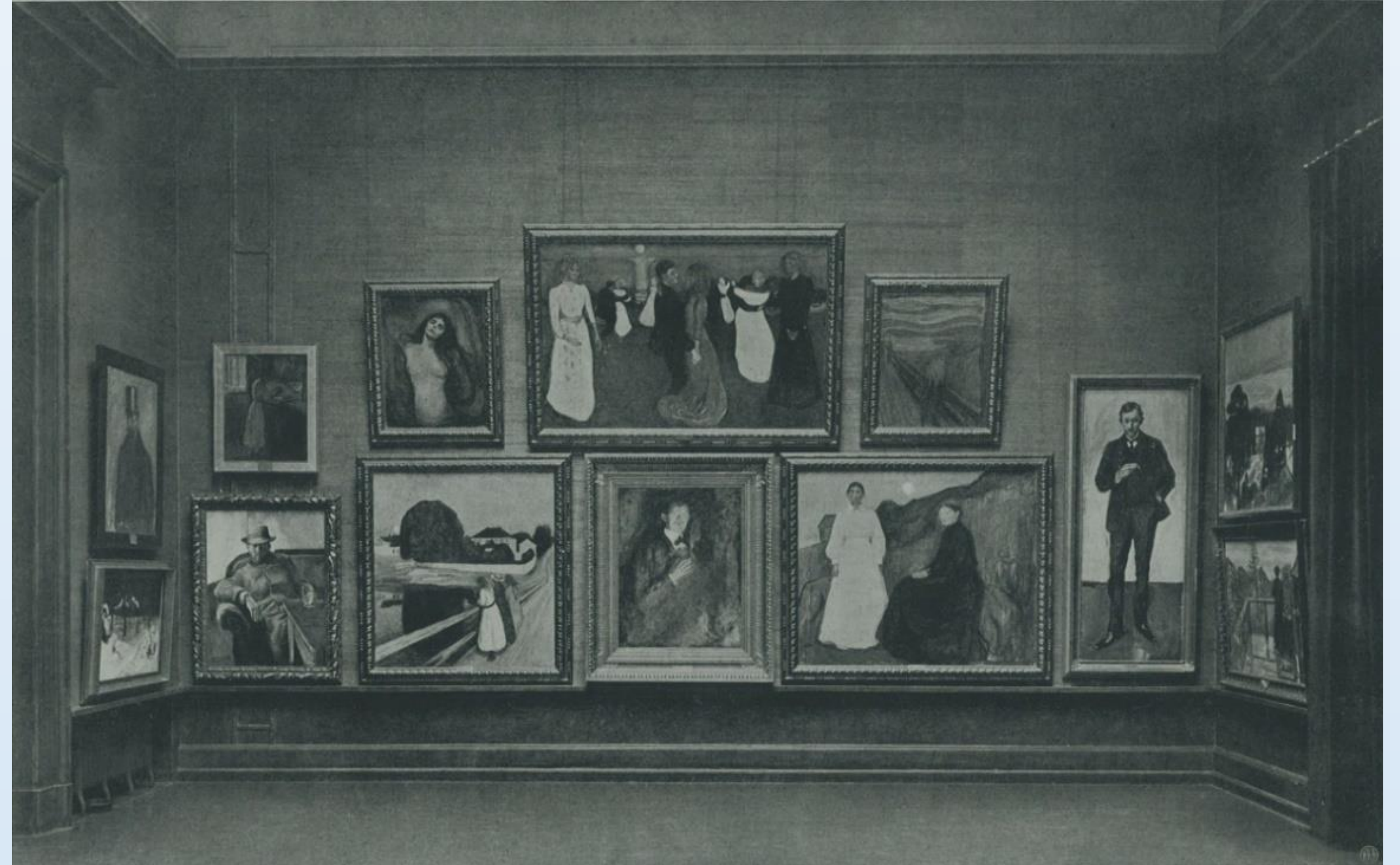


Fig. 1 The Munch Collection c.1912
The Munch paintings have always been displayed as a group, first on one wall and then as part of a room until the establishment of the Munch-Room in 1937.

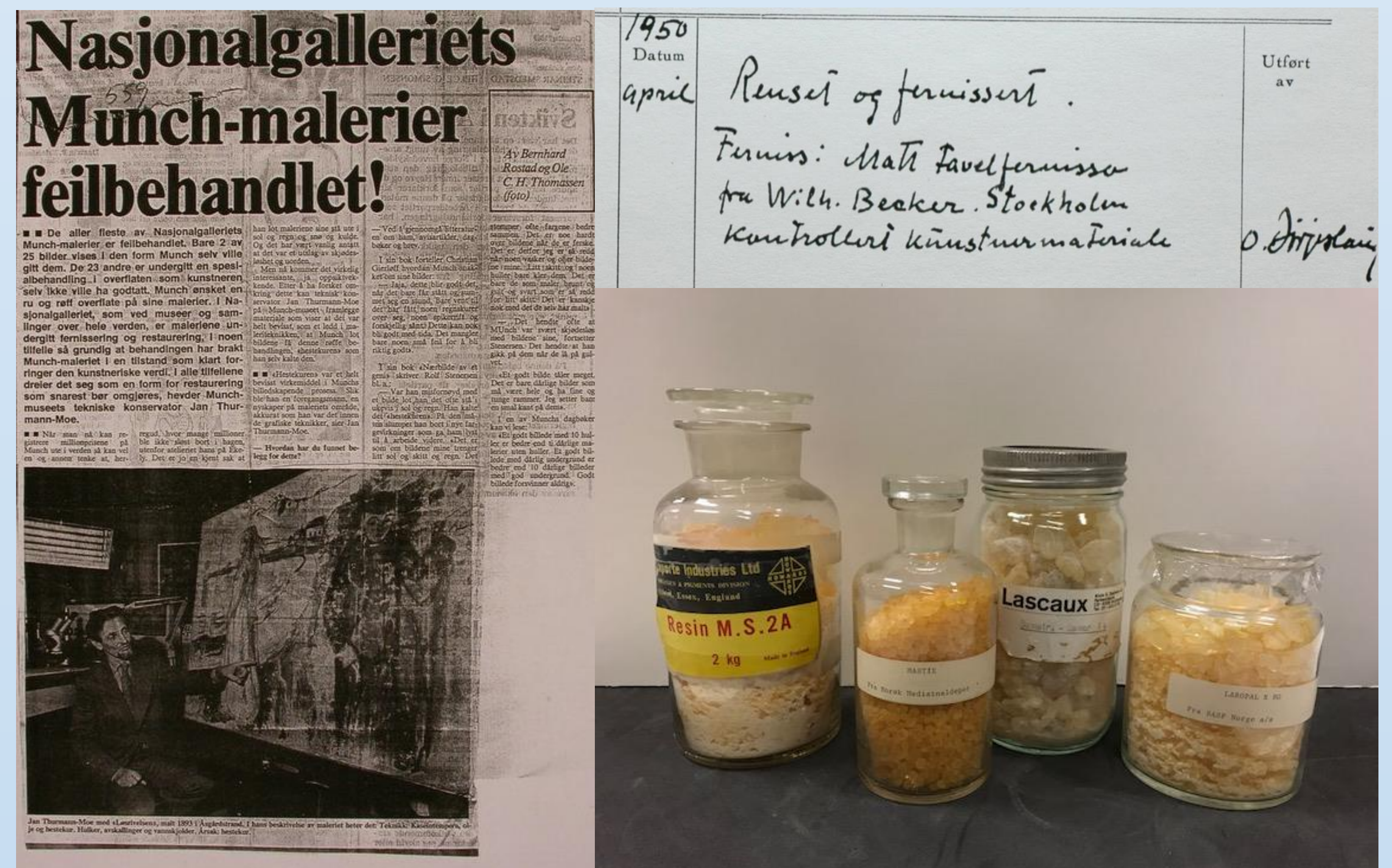


Fig. 2 Criticism for varnishing Munch’s paintings featured in the Norwegian press as early as 1909 and again in 1980.
Documentation of varnishing and varnish types only exists from the 1950s.
46 paintings were varnished with a variety of natural and synthetic resins over a period of 89 years.

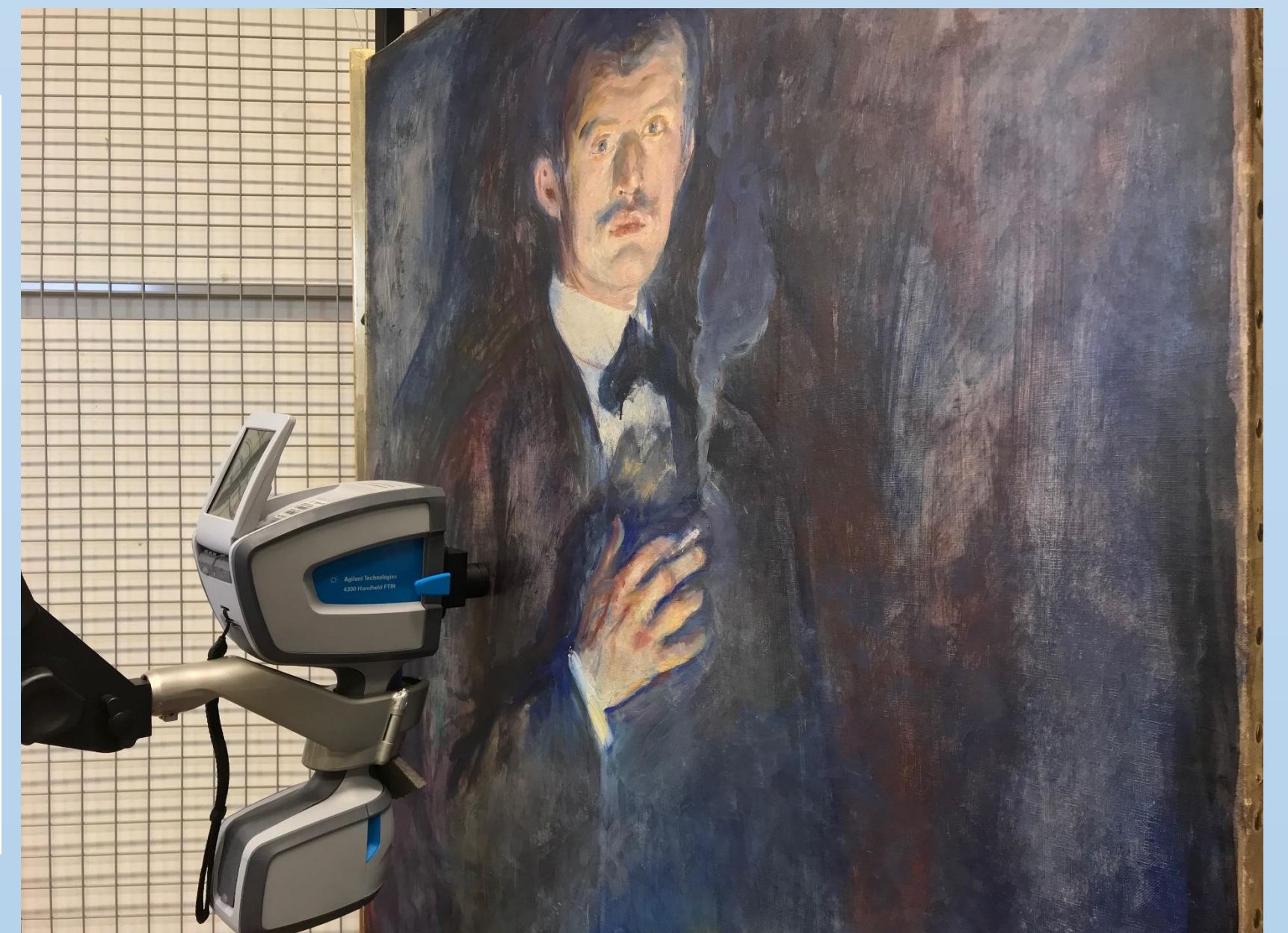


Fig. 3 A 4300 handheld FTIR spectrometer by Agilent, equipped with a deuterated triglycine sulfate detector, will be tested on 6 paintings dating from a similar period.

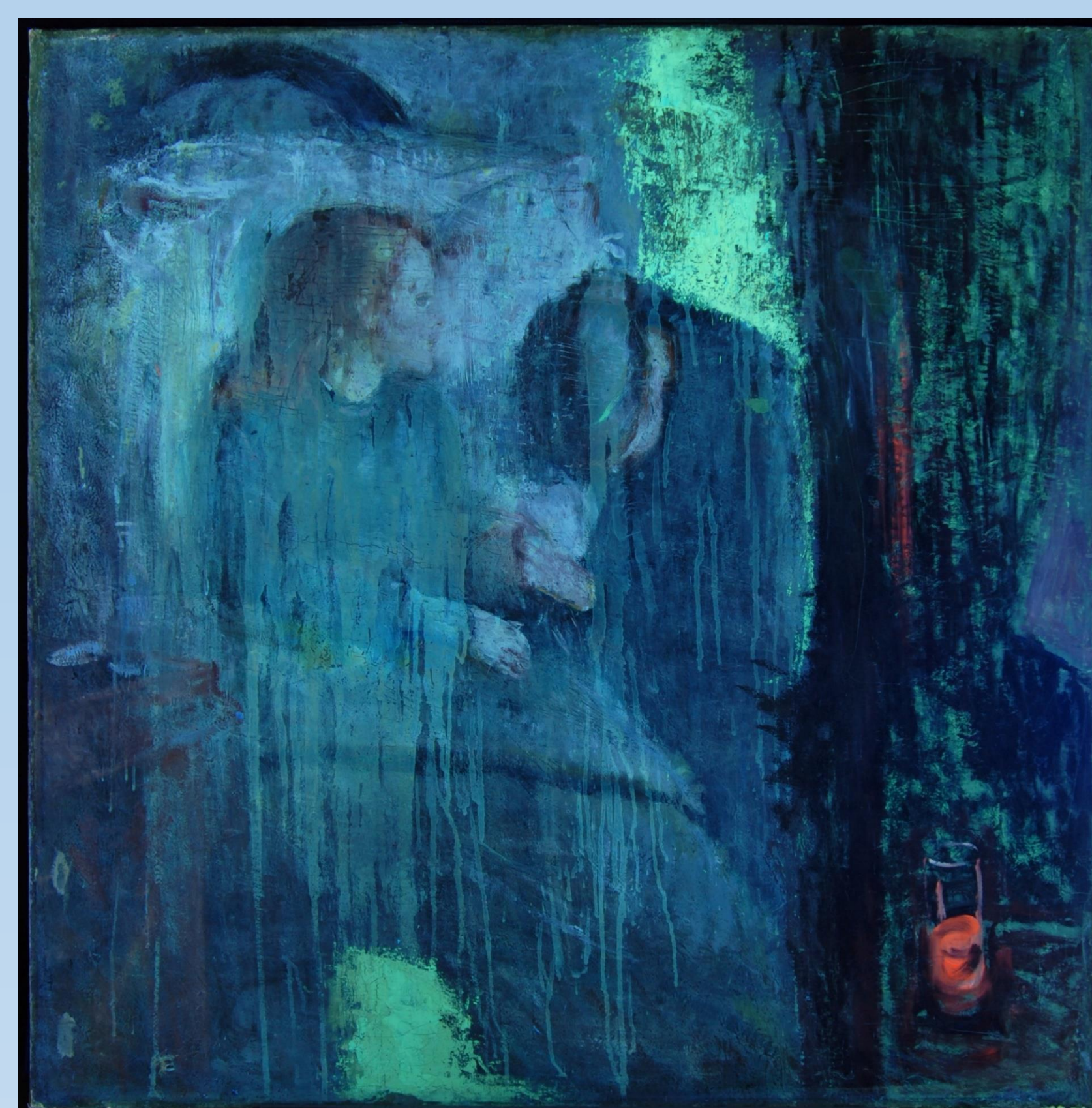


Fig. 4 UV fluorescence images showing the distribution of varnish resins in Munch’s Sick Child 1885/6 (Left. NG.M.00839) & Self Portrait with Cigarette, 1895 (Right. NG.M.00470).