Analysis of the Munch’s paintings by scanning multispectral infrared reflectography: Anxiety (1894), Puberty (1894) and Vampire (1895)

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This paper presents the diagnostic campaign carried out at the Munch Museum in the framework of the transnational EU access program MOLAB. The group of Munch’s paintings, Anxiety, 1894 (Woll 363), Puberty, 1894 (Woll 346) and Vampire, 1895 (Woll 377), has been investigated by Scanning Multispectral Infrared Reflectography, an advanced technique for performing multi-band reflectography, based on a prototype device specifically designed for this task. This interdisciplinary paper will focus on the main aspects of the experimental technique, and on the results of the campaign.

The multispectral approach, consisting of acquiring the images in narrow-bands, considerably improves the traditional wide band reflectography because it enables the simultaneous collection of spectral data and high resolution images. Multispectral reflectography has been shown to have a great potential in the analysis of early Italian paintings, where the transparency of pigments and their reflectance changes over the near infrared allow the detection of many technical characteristics. The multi-band option improves the visualization of the different underneath features, such as underdrawings or changes (pentimenti), which can be detected in optimal spectral bands according to paint layers transparency and matter absorbency. Multispectral reflectography has shown to be effective also in difficult cases, allowing the detection of underdrawing also on dark coloured grounds and in correspondence of dark pigments layers. Its application to modern paintings, where acrylic and industrialized pigments are widely expected to be used, is much less explored.

During the Munch Museum campaign, multispectral reflectography was performed using a multi-band scanner operating in the extended near infrared range 800-2300 nm. The device simultaneously collects a set of images at different wavelengths, with a spectral step of 100 nm. The images are calibrated, spatially aligned and free of any geometrical distortion, thanks to the point-by-point sampling of the scanning method. The resulting dataset is an image cube, that can be sliced in multi-band reflectograms or can be analysed along the wavelength, as a sequence of spectra.

Multispectral reflectography was effective in the analysis of Munch’s paintings because of the plurality of materials used by the artist and their variegate response over the near infrared spectral region. The use of narrow-band imaging at longer wavelengths, e.g. beyond the limit of 1.8 micron, typical of the traditional devices, improves the visualization of the underdrawings and of the pentimenti. By comparing the results in the different wavelengths, we can evaluate how complex and differentiated is Munch’s painting practice. Multi-band reflectograms allows us to discriminate different traces of underdrawing, especially in Puberty, 1894 and in Vampire, 1895, where Munch, after sketching the figures with a charcoal or a graphite pencil, refines the composition in wash, using a brush. This is particularly outstandingly evident in Puberty, where the position of the girl is defined by tracing several times the edges, as we can appreciate thanks to the numerous corrections in the placing of the head and of the knees. Concerning the study of pentimenti, a surprising result has been obtained in the background of Vampire, 1895, where in the long wavelengths it is possible to visualize some shapes, probably a group of figures that the artist cancelled thereafter covering them with a dark brown colour.
In this MOLAB campaign, multispectral imaging and spectroscopy in the near infrared were performed in a joint use as a first attempt of mapping materials across the extended painting surface. The set of multi-band infrared images can be used to outline areas of different reflectance in order to guide the punctual sampling by infrared spectroscopy for a more effective exploration of the different regions. The task of a spectral mapping is still a challenge, especially in the near infrared range, where the information is collected from a multi-layered artwork, because of the strong penetration of the near infrared wavelengths in the painting layers. The integration of multispectral imagery and analytical techniques should be further investigated in this direction.