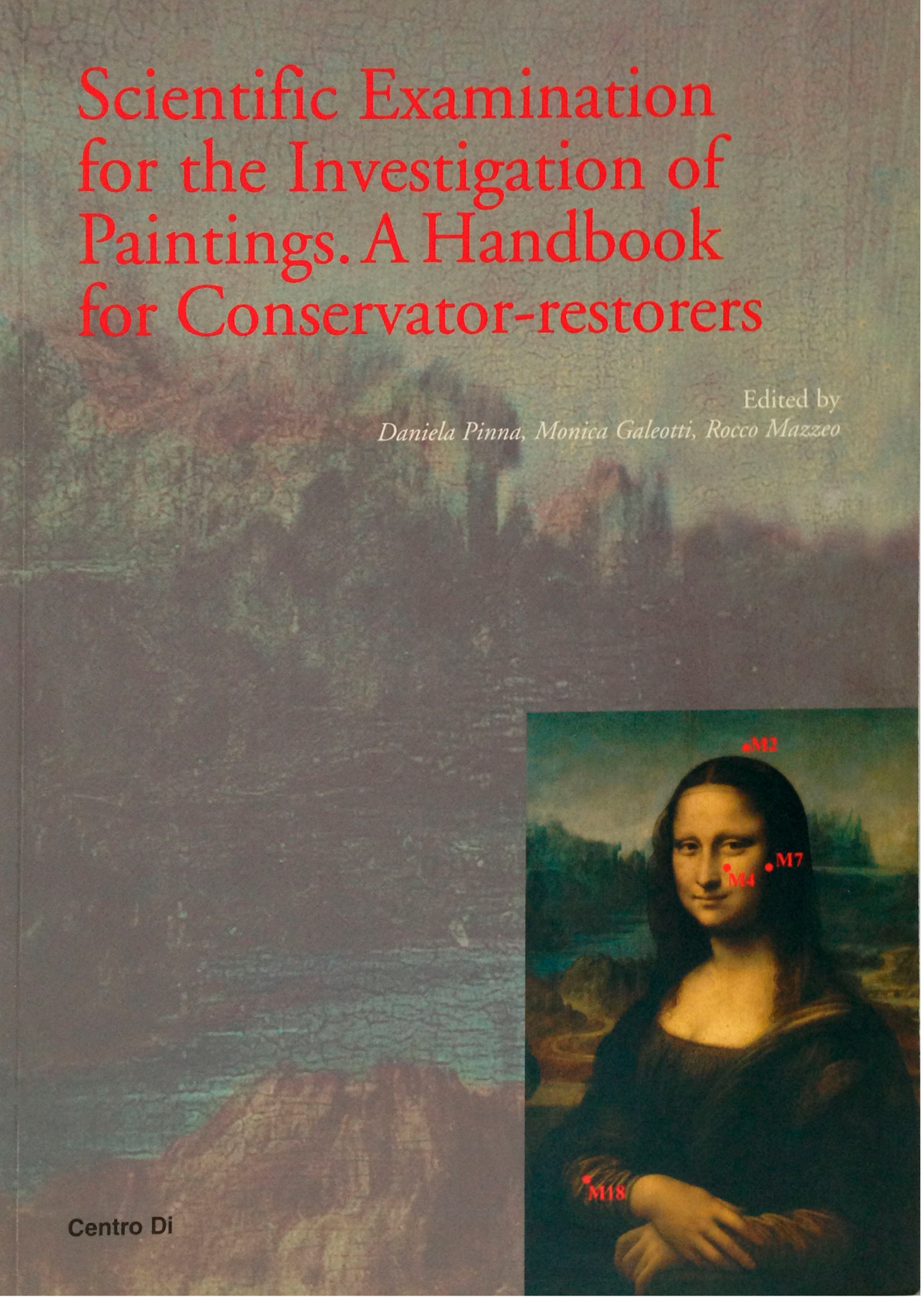

Figure 15. P. P. Rubens, 'Nympheas and satyrs', Palatina Gallery, Firenze (Italy). a) Visible image and b) X-Ray radiograph showing the assembling of several pieces of canvas.

3.3.3 *X-ray radiography*

For Rubens's 'Nympheas and satyrs' (Figure 15), X-ray radiography allowed to visualize the original canvas, composed for this considerable painting by several pieces sewed together around a large one, corresponding to the main group of figures painted in the centre. When X-radiography was performed, the original canvas was hidden in the back of the painting by another lining canvas. In this case X-ray radiography allowed to precisely visualize the original support's features, the canvas junction lines, and all those areas where the original canvas is missing, due to borders slipping for mechanical tensions. The areas where the canvas is absent appear whiter for the presence of a higher thickness of preparation and pictorial layers. Moreover, the white stripes having an irregular path are connected to the way the ground layer was applied. It was likely spread by the painter with an instrument similar to a sort of 'knife', used as a spatula. The use of such an instrument by Rubens has been shown in others of his paintings.

3.4 How can the stretcher and its physical-mechanical parameters (tension, dilation, deformation etc.) be identified?

NON-DESTRUCTIVE TECHNIQUES

3.4.1 *Observation by transillumination*

Imperfections or damages of the canvas support can be easily observed, recorded and characterized by transillumination. Figures 16, 17 and 18 show the most common features.

3.5 How can the inscriptions, stamps, drawing or other historically relevant elements on the backside of the canvas support be identified?

NON-DESTRUCTIVE TECHNIQUES

3.5.1 *Observation by transillumination*

For this kind of identifications, transillumination is most suitable for other kinds of support, such as paper. In some particular cases, however, when an extremely thin canvas underwent a thin relining, some elements covered by the new relining canvas can be highlighted.

or staining test is applied, in order to save a useful documentation for further studies and as reference material.

Availability
Most of the dyes and reagent solutions used for spot and staining test methods are widely available, cheap and quite easy to be prepared, if compared with the preparation methods necessary for other types of more sophisticated bulk or surface analyses. It must be underlined that most reagents should be freshly prepared in order to ensure their best performance and sensitivity.

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Transillumination of the textile support

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What kind of analysis?
This particular investigation is qualitative and based on the transmitted light. It is possible to perform it on paints with an even partially transparent support.
Applied to paints on canvas, paper, glass or handmade fabrics, this technique can highlight some features about the conservation state of the inner structural layers that are not directly visible by reflected light observation.

Basic principle
This analysis requires that visible light pass through an object, generally a painting on canvas. Photography then points out, through imaging, the non-homogeneities of the object's constituent layers. The images obtained offer a view of the different materials related to their density.

Destructive or not destructive?
This technique is non destructive. Nevertheless, considering the illumination power required, it is suggested to carefully assess the exposition time and the distance between the lamp and the artwork.

What are the limits of the technique?
The investigation by transillumination is not possible if the layers density does not leave the light pass through. It can be particularly difficult to obtain a satisfactory global view when it is applied to large size objects, considering that it is not easy to correctly set the illumination source. In this case it is advisable to collect various enlarged images of details, in order to take advantage of the intrinsic capabilities of the technique.

What are the advantages of the analysis?
The observation by transillumination generates an image that looks very similar to a radiograph. Even though transillumination cannot substitute radiography, RX information can be integrated by transillumination results, especially when producing a digital image that can be investigated in detail by specific software.
In case the support (e.g. a canvas) and the preparation layers are homogeneous, transillumination produces information about the thickness differences of the pictorial layers. The image examination can also highlight the course and the kind of a crack not visible at the naked eye, offering useful information about the conservation state of the object. Transillumination images combined with images obtained with raking light can better describe the mechanism of formation of the spatial dishomogeneities due to the artwork's natural ageing. Moreover, the advantage of its relatively low cost, suggests the application of this diagnostic technique to a large number of cases.

Availability
Qualified staff, practiced in documenting restoration steps, can easily perform this kind of investigation using common photographical equipment, either digital or analogical.

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Ultraviolet, Visible, Near Infrared fiber optic reflectance spectroscopy (FORS)

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What kind of analysis?
Fibre optic reflectance spectroscopy (FORS) in the ultraviolet (UV), visible (Vis) and near infrared (NIR) regions is a non-invasive methodology and a useful technique for analysing works of art. In this spectral range (UV-Vis-NIR), electronic and vibrational transitions can be observed. In the latter case, the transitions are multiple or combination of transitions that are commonly observed in the mid-IR.
FORS is primarily used to identify pigments and dyes, evaluate colour and colour changes, and to detect alteration in products.
In some cases, it may be necessary to integrate other analytical techniques. However, FORS can also be a very useful tool, in conjunction with other techniques for locating areas for micro-sampling, or in extending local data from micro-analyses to a broader scale, thus reducing the extent of micro-sampling.

Basic principle
UV-VIS-NIR reflectance spectroscopy is based on the analysis of the radiation diffused by the surface in the 230-2500 nm range (in the present chapter, case studies are usually reported in the 350-1700 nm range) when compared with a highly reflecting reference standard, such as Spectralon® or barium sulphate plates. The reflectance spectrum of the analysed surface (paint) is reported as the percentage of reflected radiation versus the wavelength (Figure 28).
FORS instrumentation includes spectrophotometers and spectroanalysers. Thanks to a spectroanalyser, the radiation is sent to the sample by means of a fibre optic bundle. The backscattered light is then collected using fibre optics, and first is directed to a dispersive element (grating) and subsequently to a suitable detector. The fibre optic bundles consist of two extended coaxial cylinders: the inner one ('core') has a high refractive index, while the exterior