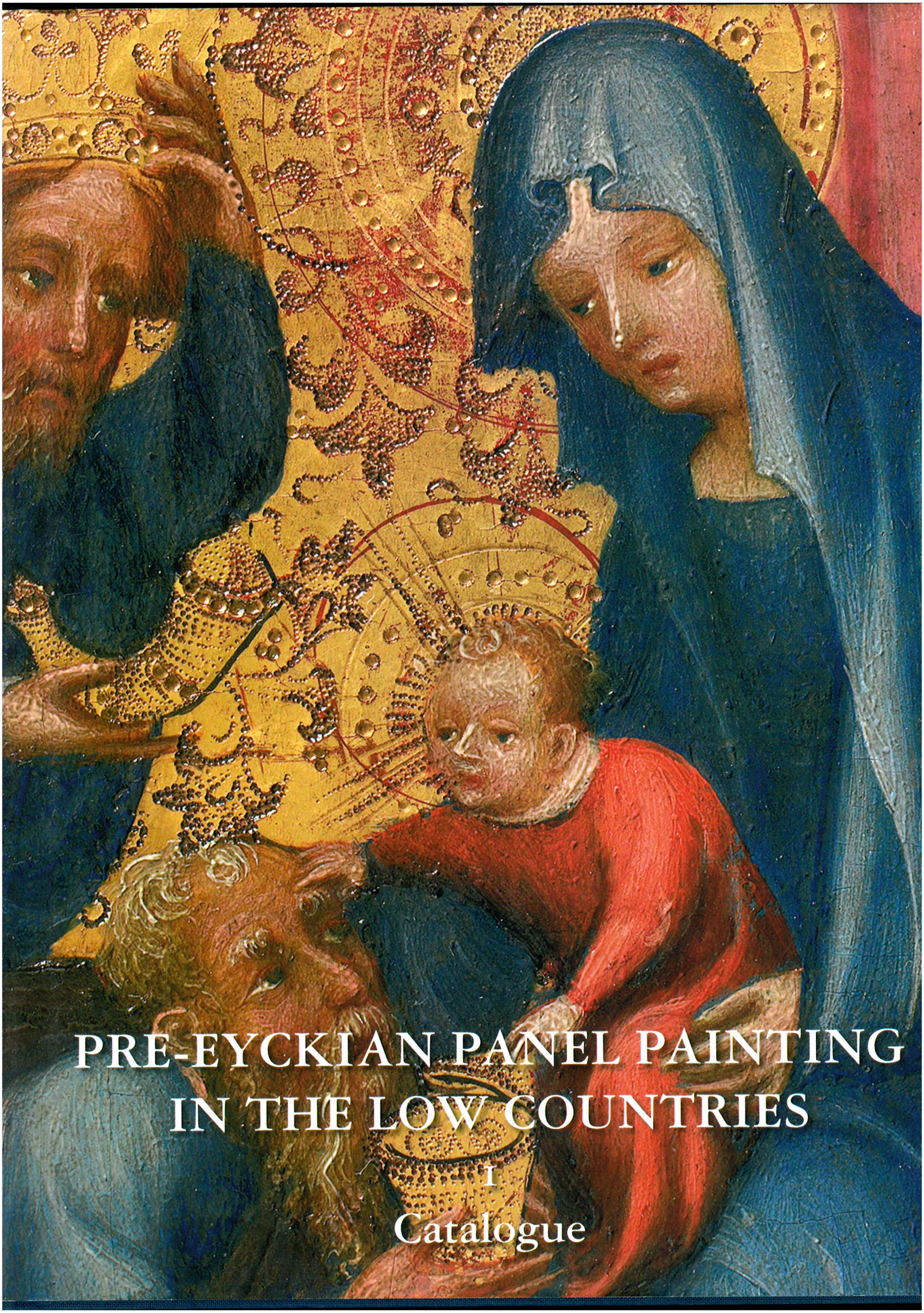

PRE-EYCKIAN PANEL PAINTING IN THE LOW COUNTRIES

I

Catalogue

Examination of Paintings in Infrared at the Royal Institute for Cultural Heritage

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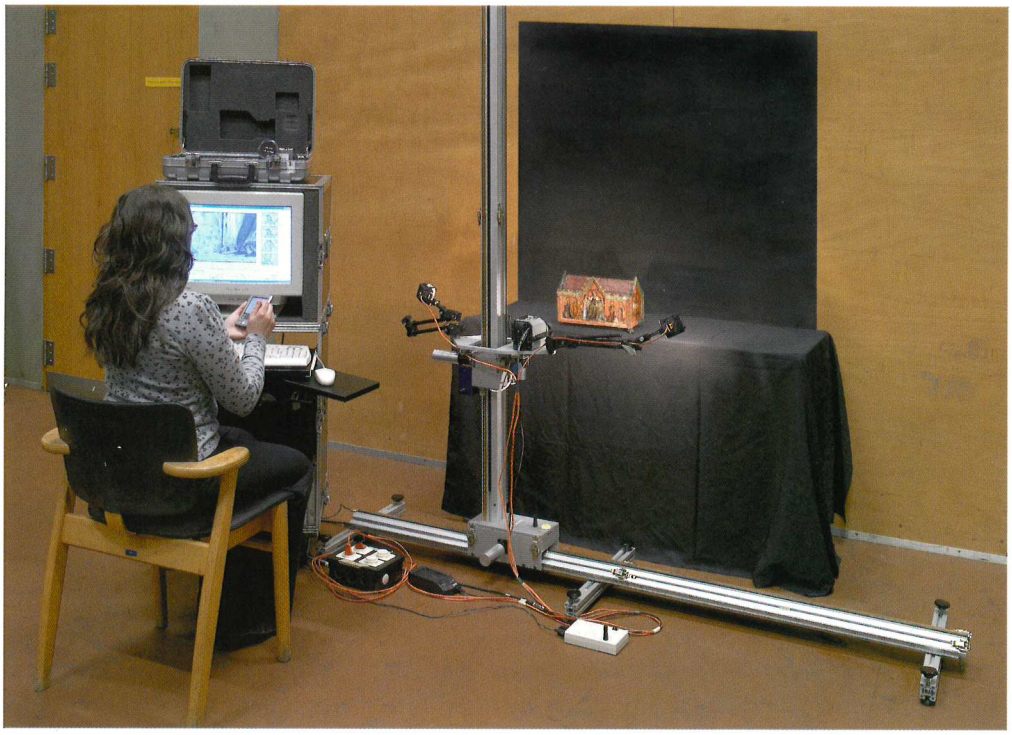
Infrared examination has been practiced since the early days of the Institute to reveal underdrawings, changes of composition and the true condition of paintings. It was one of the techniques employed for Paul Coremans's pioneering study of Van Eyck's *Adoration of the Lamb Altarpiece*.[1] For many years, infrared imaging was limited to infrared photography using infrared film covering the 0.7-0.9 µ range of the electromagnetic spectrum. This gave high resolution images, but the technique was restricted to paintings with thin paint layers and to areas with low infrared absorbing pigments such as reds, yellows, ochres and whites. In 1985, IRPA/KIK acquired a Hamamatsu infrared vidicon, extending the spectral range to around 2.2 µ. The vidicon enabled the visualisation of underlying drawing lines through a much wider range of pigments than previously possible. The resulting images have come to be referred to as infrared reflectograms to distinguish them from infrared photographs.

Infrared Reflectography at the Institute Today

Since 1999, infrared reflectography of paintings has been carried out at the Institute with a platinum silicide focal plane array (FPA) video camera with a spectral range of 1.1-2.5 µ (Inframetrics InfraCAM-SWIR™, fig. 1). Like the infrared vidicon, this thermal camera detects infrared radiation in the area of the electromagnetic spectrum likely to reveal underdrawings and underlayers in paintings. The infrared source is provided by two small low-level halogen lamps that produce the necessary wavelengths in the near infrared but do not emit significant heat. The focal plane array is cooled with a closed-cycle Stirling cooler.

The platinum silicide FPA camera has several advantages over the vidicon. Improved geometric properties facilitate mosaicing of captured images and superior modular transfer function gives improved visualisation of fine underdrawing lines. The FPA camera also has a wider and more even range of grey levels enabling easier detection of fine lines.

Narrow bandpass filters are selected according to the paint thickness and the types of pigment present to obtain stable and focused images (1.1-1.4 µ, 1.5-1.8 µ and 1.5-1.73 µ).



1. Infrared reflectography (IRR) with a platinum silicide focal plane array video camera, mounted on a Scannix remote controlled rail system.

Since only small areas of the painting can be captured at a time – usually 4.5 cm^2 of surface – due to the camera's relatively small focal plane array (256 × 256 detectors), the camera is attached to a platform on a motorised rail system for image acquisition.[2] The platform moves vertically, horizontally and diagonally and has a laser-guided forwards/backwards feature to maintain a constant distance between the camera and the painting. Warps or irregularities in the painting's surface are thus accommodated, ensuring that images are focused and remain the same size. The video images are captured onto computer via a frame grabber, digitised and assembled using Adobe Photoshop. Full mosaics are made of most paintings. The final image is processed with sharpness and contrast filters to increase legibility. Infrared reflectograms are usually composites of tens or hundreds of smaller images, for example, Melchior Broederlam's painted wings of the *Crucifixion Altarpiece* (Dijon), which required 1,211 images (see detail of this, fig. 2).

Digital Infrared Photography: a Complementary Technique

In the case of very small paintings and for close-up details of larger works, a Phase One LightPhase digital camera back on a Mamiya RZ67 body and an extension tube is used (fig. 3). Although the charged coupled device (CCD) is only sensitive to infrared radiation to approximately 1.1 μ – much less than the Hamamatsu vidicon or the platinum silicide FPA video camera – the Phase One LightPhase camera provides extremely high resolution images which can reveal details of underdrawings imperceptible with the aforementioned devices. It gives excellent results where the paint is

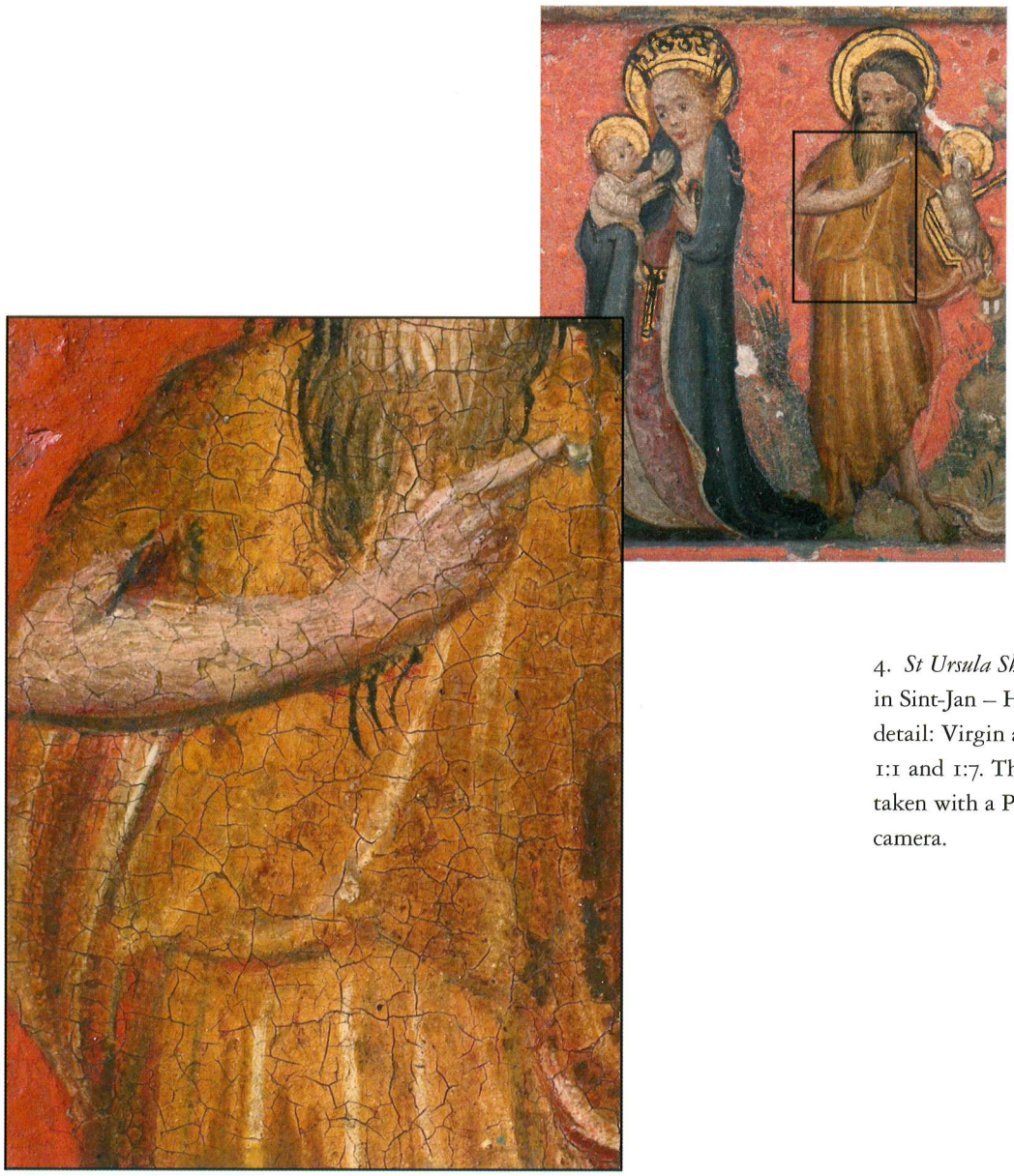
2. Melchior Broederlam, *Presentation in the Temple* (*Crucifixion Altarpiece*, Dijon, Musée des Beaux-Arts), detail from infrared reflectogram (IRR).
In this 1:1 image, a series of ruled outlines can be seen to situate the main angles of the building, overshooting the actual forms somewhat; these have been followed by freehand outlines for architectural ornamentation, as well as loose hatched strokes and shading for shadows. A non-friable dry drawing medium has been used.

relatively thin and when the pigments are not strong infrared absorbers.

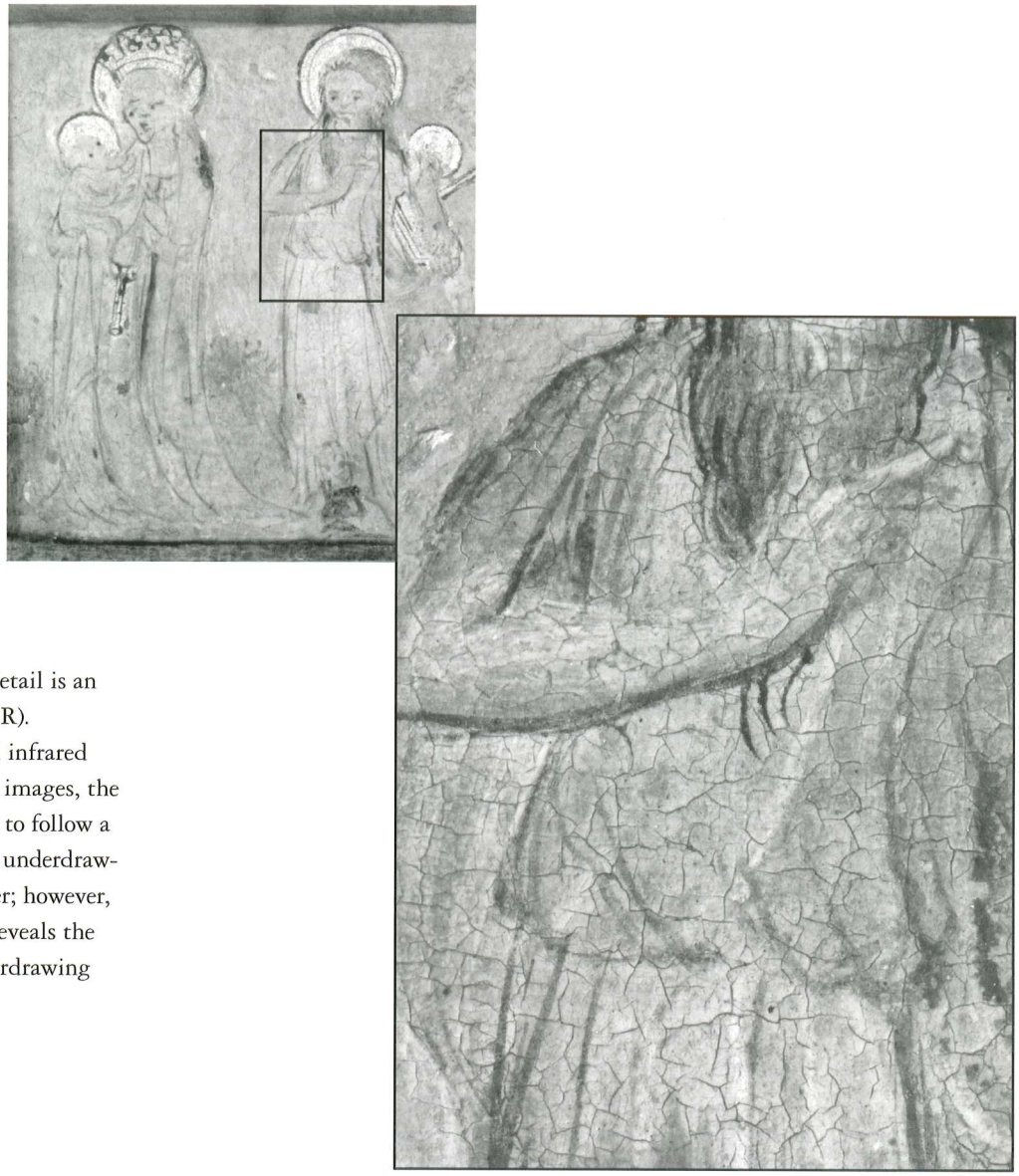
The Phase One LightPhase camera is mounted on a manually operated rail attached to a Linhof tripod. A Kodak Wratten Gelatin Filter no. 87 is used to filter out normal light. Small areas are captured at any one time for maximum resolution and images are later stitched together and processed using Adobe Photoshop, as with infrared reflectograms.

Digital infrared photography was particularly useful in the case of the *Shrine of St Ursula* (Bruges) (see cat. no. 3) where magnification of the underdrawing lines was necessary to determine whether a liquid or dry medium was used (figs. 4-5). In the case of Melchior Broederlam's *Crucifixion Altarpiece*, close-up infrared examination reveals differences in the character of the underdrawing lines in the architecture suggesting two distinct phases of execution, both employing a dry medium.[3] In most cases, the same zones are taken in infrared and normal light with the Phase One camera for comparative purposes.

3. Digital infrared photography (IR) with a Phase One LightPhase camera, mounted on a manually operated rail on a Linhof tripod.



4. *St Ursula Shrine* (Bruges, Memling in Sint-Jan – Hospitaalmuseum), detail: Virgin and John the Baptist, 1:1 and 1:7. The close-up detail was taken with a Phase One LightPhase camera.



5. As in fig. 4. The 1:1 detail is an infrared reflectogram (IRR). The 1:7 detail is a digital infrared photograph (IR). In both images, the drapery folds can be seen to follow a different direction in the underdrawing to the final paint layer; however, only the close-up detail reveals the liquid nature of the underdrawing lines.

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Notes

1. 'L'Agneau mystique au Laboratoire. Examen et Traitement', directed by Paul Coremans, in *Les Primitifs Flamands*, 3. *Contributions à l'étude des Primitifs flamands*, 2, Brussels, 1953.
2. The rail system was custom designed by the Institut de physique nucléaire, atomique et de spectroscopie at Liège University. The design is now owned and distributed by Scannix.
3. See vol. 2, fig. 10, from the article on this altarpiece by Christina Currie.