



National Gallery Technical Bulletin

Volume 21, 2000

National Gallery Company
London

Distributed by
Yale University Press

Series editor **Ashok Roy**
Associate editor **Jo Kirby**

©National Gallery Company Limited 2000

All rights reserved. No part of this publication may be transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without the prior permission in writing of the publisher.

First published in Great Britain in 2000 by National Gallery Company Limited, St Vincent House, 30 Orange Street, London WC2H 7HH

British Library Cataloguing in Publication Data
A catalogue record for this journal is available from the British Library

ISBN 1 85709 251 1
ISSN 0140 7430
525457

Edited by **Diana Davies**
Project manager **Jan Green**
Typeset by **opta**
Printed in Italy by EBS

FRONT COVER

Lorenzo Monaco, *The Coronation of the Virgin*
(NG 215, 1897, 216) (detail of Plate 1, p. 44)

TITLE PAGE

Carlo Crivelli, *The Dead Christ supported by Two Angels*
(NG 602; detail), after cleaning and restoration

The Restoration of Two Panels by Cima da Conegliano from the Wallace Collection

JILL DUNKERTON

IN AUGUST 1859, at the sale of the collection of the 2nd Baron Northwick, the National Gallery was prepared to pay up to £600 for a panel of *Saint Catherine of Alexandria* by Cima da Conegliano (Plate 1). The Gallery was, however, outbid by Samuel Mawson, acting for the 4th Marquis of Hertford, who secured the painting for 800 guineas.¹ In 1897, on the death of the widow of Sir Richard Wallace, the Wallace Collection, incorporating the Hertford pictures, was left to the Nation, the *Saint Catherine* eventually being assigned the first number in the catalogue of paintings.² Meanwhile the National Gallery had managed to acquire several works by Cima, among them the large altarpiece of the *Incredulity of Saint Thomas*, which underwent a long and complicated restoration in the 1970s and 1980s.³ Although the Conservation Department of the National Gallery exists principally to care for paintings in the Collection, its facilities and accumulated experience – especially in the treatment of panel paintings – are a resource available, when necessary, to other national museums such as the Wallace Collection. Therefore in 1993 it was agreed that the *Saint Catherine*, together with its lunette, *The Virgin and Child with Saints Francis and Anthony of Padua*, also in the Wallace Collection, should be treated at the Gallery.

The *Saint Catherine* was originally at the centre of a triptych painted by Cima in about 1502 for the high altar of the Franciscan church of San Rocco at Mestre, on the Venetian mainland.⁴ It was almost certainly commissioned by the Scuola di San Rocco, a devotional confraternity particularly concerned with the plague, and on either side of *Saint Catherine* were panels showing *Saint Sebastian* and *Saint Roch*, now in the Musée des Beaux-Arts, Strasbourg (Plate 9). Above was the arch-topped panel of *The Virgin and Child with Saints Francis and Anthony of Padua*. The altarpiece seems to have remained in place until at least 1726 when the Scuola di San Rocco obtained permission to build a new stone altar on condition that the old altarpiece be hung on a back wall behind the altar. By 1769 it had been moved to

a side wall but plans were discussed for restoring it to its original position. Soon after, however, it was sold to John Strange, British Resident at Venice. It seems to have been replaced in the church by a copy, now in the Sacristy of the Duomo of San Lorenzo at Mestre (Fig. 1),⁵ and it was probably also at about this time that an engraving of the four panels (Fig. 2) was made by Antonio Baratti (who died in 1787). They are shown in an elaborate rococo frame, surely the engraver's invention and no reflection as to how they might have been framed at the time. It can be assumed that the original frame, if it survived the various movements of the altarpiece, was left in the church. The church was suppressed in 1806 and the copy, which no longer has a frame, was probably transferred to the Duomo at this date.

In 1799 the entire altarpiece was included in the London sale of the Strange collection, and it was sold again in 1832. By 1846 it had been dismembered and the *Saint Catherine* alone was to be seen in Lord Northwick's collection at Thirlestone House, Cheltenham, where in 1854 it was admired by Gustav Waagen as 'noble and dignified in head and figure, and painted in the artist's best style of colouring and drapery'.⁶ In 1857 it was included in the Manchester Art Treasures exhibition – Waagen was one of the organisers – and was among the paintings to be photographed.⁷ The photographic print was evidently much retouched but it shows that already there were differences between the state of the painting by 1857 and the image that appears in Baratti's engraving. Most of the upper part of the picture had been lost, leaving only a few centimetres of the architrave of the ceiling of the loggia or canopy that covered the saint; the landscape at the lower left had been simplified, with no sign of the rocky outcrop and the buildings to be seen in the print.

By 1902, when another photograph of the *Saint Catherine* was published,⁸ the upper edge had been trimmed further, leaving little more than a centimetre of paint from the architrave, the condition in which the painting survives today. It was, by then, displayed in a heavy and ornate gilt frame, typical of



Plate 1 Giovanni Battista Cima da Conegliano, *Saint Catherine of Alexandria and The Virgin and Child with Saints Francis and Anthony of Padua*, c. 1502. Main panel, 153 × 77 cm; lunette, 40 cm × 81.3 cm. London, Wallace Collection. Before cleaning.



Fig. 1 *Saint Catherine*, 18th-century copy. Panel, 173 × 77 cm. Mestre, Duomo di San Lorenzo.

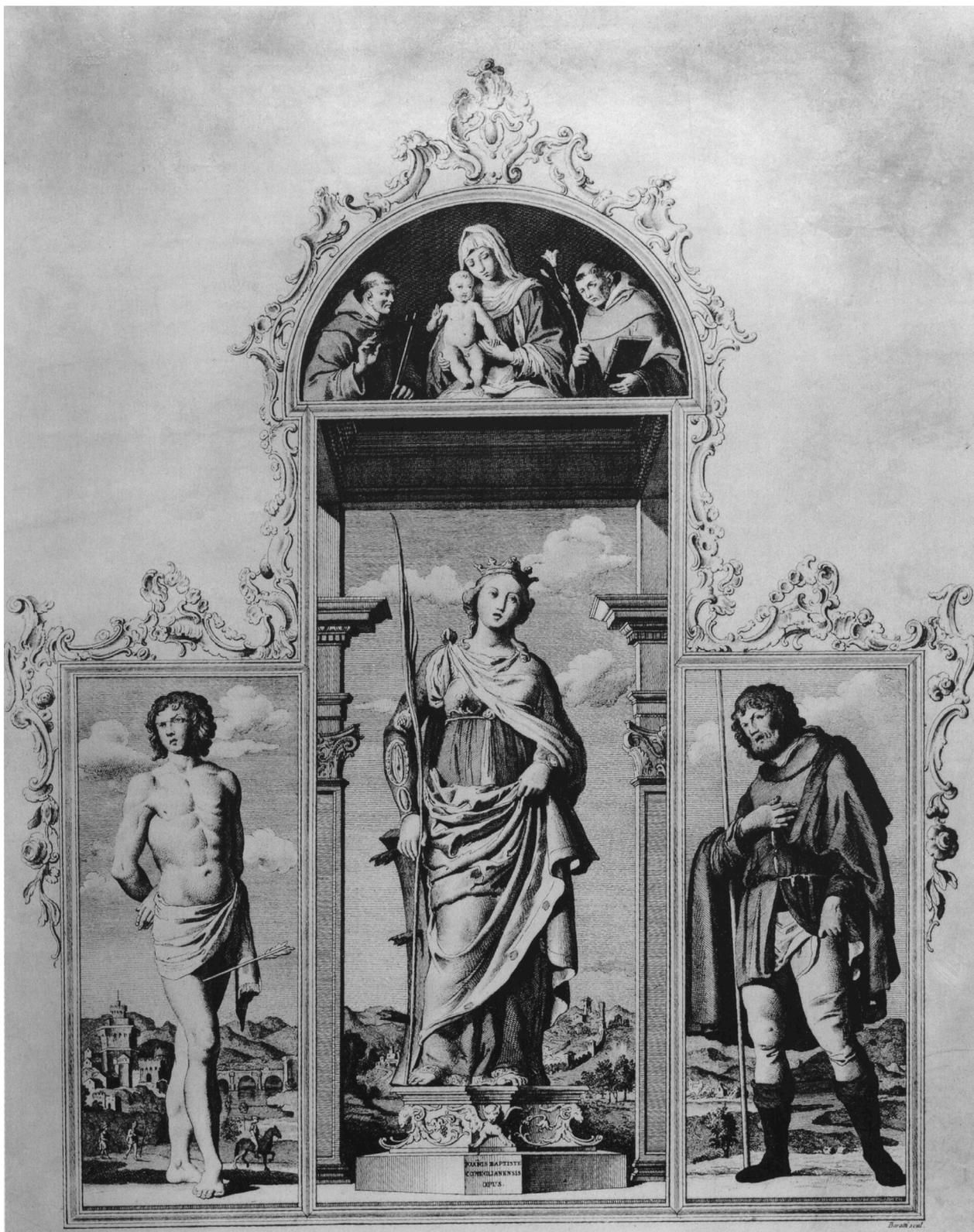


Fig. 2 Antonio Baratti, *The Mestre Altarpiece*, before 1787. Engraving.

those fitted by Sir Richard Wallace. In 1933 the lunette of *The Virgin and Child with Saints* was presented to the Wallace Collection,⁹ reuniting it with the *Saint Catherine* after a century of separation. This necessitated the making of a new frame in a fifteenth-century Venetian style (Fig. 4).¹⁰

Much of the nineteenth-century restoration history of the *Saint Catherine*, including the cutting of the top and the repainting of the landscape on the left, can be reconstructed, and, after the establishment of the Wallace Collection, a record of its deteriorating condition was kept.¹¹ Probably in about 1896 the panel was planed down and cradled by William Morrill, whose stamp is on the cradle and who also frequently fitted cradles to paintings in the National Gallery. In 1924 the condition of the painting was causing concern. Vertical cracks in the panel, blisters, large areas of repaint and a 'heavy oil varnish . . . degenerated into a dirty yellow tone' were all noted by the curator. In 1933, when it was about to be reframed, blisters were secured by Morrill, and some cleaning was carried out by William Holder, another restorer who worked regularly for the National Gallery. He seems to have removed some of the varnish and repaired any new losses, but he simply 'blended in' many of the old damages and repainting, including the landscape on the left. In 1946 blisters and discoloured restoration were observed. In 1962 an estimate was supplied by D.R. Vallance on behalf of W. Holder and Sons, 'to secure extensive blistering pigment, secure cracks in panel, slight clean, repair and varnish'. It is unclear whether this treatment was carried out, but, in any case, the same problems were again reported in 1976, when the general condition was described as 'poor' and the observation made that treatment to the paint and ground layers was of little value without treatment of the panel and, in particular, the removal of the cradle.

The panel, constructed from three vertical planks of poplar, had been planed to a thickness of no more than about 3 mm and a heavy mahogany cradle fitted. Many of the splits and cracks in the wood are likely to be old but others were clearly caused by the constriction of the cradle. Woodworm damage was considerable, especially in the left-hand plank. Restored and overpainted losses of paint and ground from this plank were extensive, the shape and distribution of the losses – revealed initially by X-radiography – confirming that huge blisters had formed and flaked off in the past. On the right side there were fewer losses, but many more blisters that needed to be secured. Panel paintings by Cima seem unusually prone to failure of adhesion between the support



Plate 2 *Saint Catherine*, after cleaning, before restoration.

and the preparation, presumably because of defects in the composition or in the application of the layers of gesso and size.¹² Although the *Virgin and Child with Saints* had a different history in the later part of the nineteenth century, it too had been planed and cradled. It has not suffered from the same flaking as the main panel, but the original wood was under some tension and horizontal splits in the panel had been clumsily repaired.

As is the usual practice, both paintings were cleaned before structural treatment. The condition of the *Saint Catherine* varied considerably in different areas and colours (Plate 2). In general, the red and green draperies were found to be well preserved, retaining much of their original richness and intensity of colour. Flake losses were mostly relatively

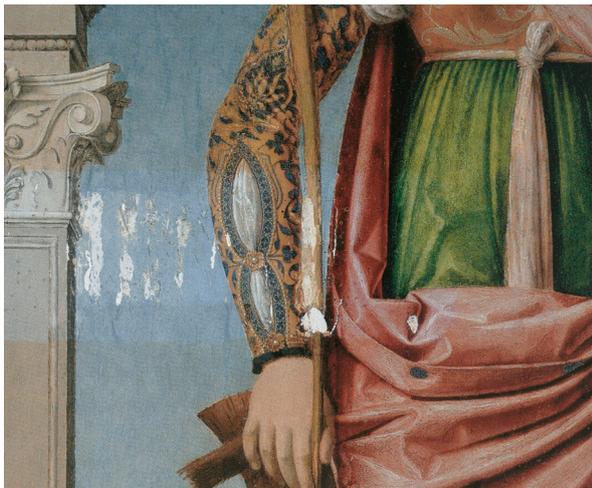


Plate 3 *Saint Catherine*, detail of the sky during cleaning.



Plate 4 *Saint Catherine*, detail of the same area under ultra-violet illumination during cleaning.

small and widely scattered. Areas of flesh painting had suffered from abrasion, losing some of the fine detail and most of the translucent brown glazing in the shadows which is seen in better preserved paintings by Cima. A long chain of losses from blistering runs through the face of the saint, from the corner of her right eye, down the shadowed side of her nose and through to her chin; and most of the back of her right hand has been lost. Other large losses are in the pedestal and along the lower edge of the panel, but by far the worst affected areas are the sky and landscape on the left.

The varnish, which was fairly thin and only moderately discoloured, must have been applied in the restoration made by Holder in 1933 and could be removed without difficulty (Plate 3). The varnish also incorporated some retouchings, mainly over small losses or along ridges of raised paint. These had discoloured to a greenish colour and showed dark in infra-red and so they were probably executed using Prussian blue. The much older and harder repainting that had been scumbled over the entire sky was opaque and heavy in tone and of a slight purple hue. It was found to contain artificial ultramarine.¹³ In ultra-violet light (Plate 4) it showed as dark, once the fluorescent varnish had been removed, whereas the original paint is light and reflective. The effect of this overpainting was to destroy the illusion of air and space behind the saint, an essential element of Cima's great altarpieces showing figures in a landscape setting, and still evident in the *Saint Catherine* despite its very damaged condition.

The same retouching paint, only much more thickly applied, covered the large losses in the sky. These had first been made level with a lead-white and oil mixture that also filled many of the losses in



Plate 5 *Saint Catherine*, detail of the landscape on the left during cleaning.

the overpainted landscape (Plate 5). Since the landscape had been repainted by 1857 it can be deduced that the panel must have flaked badly at some time before that date, but after the introduction of artificial ultramarine (first manufactured in 1828) and probably after the separation of the altarpiece, since there were no fillings of this type on the lunette panel. Instead, losses from this panel were filled with gesso or with coloured putties applied over areas of wood that had been scored with crosshatched lines to improve the adhesion. Some losses on the *Saint*

Catherine had also been treated in this way, and so these repairs would appear to date from an earlier campaign when the panels were still together, perhaps in the later part of the eighteenth century. The cleaning of the *Virgin and Child with Saints* was relatively straightforward (Plate 6). Since it had not been cleaned in 1933, the varnish was considerably more discoloured and contained a great deal of resinous retouching to disguise the damage and abrasion to the paint, in some areas so worn that little more than the underdrawing survives. The high finish to the restoration made the modelling of the figures, especially the two saints, appear hard and wooden, leading to suggestions of workshop participation.¹⁴ However, removal of the retouching has revealed painting of great delicacy and sensitivity. Cima was surely responsible for the execution of the entire altarpiece.

Once the areas of blistering paint (Fig. 3) were free of the thick overpaint, they could be secured by introducing sturgeon glue and applying gentle pressure with an electrically heated spatula. This treatment was even more successful following removal of the cradle, since the panel was then able to adopt a convex warp, and was no longer causing compression of the paint and ground layers. Although the panel proved to be surprisingly robust once the splits and cracks had been joined, the extreme thinness of the remaining wood (no more than 3 mm) meant that the construction of an auxiliary support of balsa wood was necessary.¹⁵ The lunette panel had also been planed down to a thickness of 3–4mm and so it too was reinforced in this way.

The restoration of the *Saint Catherine* (Plate 2) involved three main issues: the large losses caused by blistering and flaking; the severe abrasion to the paint of the sky, and, to a lesser extent, to areas of flesh painting and architectural detail; and, thirdly, the damage to the spatial construction caused by the cutting of the upper part of the panel. In general, the large losses did not present any particular difficulties as to how missing areas should be reconstructed. Little paint remains of the landscape on the left, but the surviving fragments indicate that the Baratti engraving is a reasonably faithful reproduction. By referring to this, and to landscapes in other paintings by Cima, it was possible to fill in the losses and to reintegrate the landscape to the extent that it now recedes behind the figure and architecture. It has deliberately been left a little blurred and indistinct in contrast to the well-preserved landscape on the other side.

The abraded condition of the paint of the sky was more problematic. The entire altarpiece, including



Fig. 3 *Saint Catherine*, detail of blisters photographed in raking light.

the side panels now in Strasbourg,¹⁶ was evidently badly over-cleaned at some point, probably when it was still together in the original frame (discussed below). On the *Saint Catherine*, the modelling of the clouds is almost completely lost, leaving only cloud-shaped areas of the azurite blue that was employed as an overall underpainting for the sky.

Much of the final layer of ultramarine in the blue areas is missing;¹⁷ it has survived undamaged only where it was protected by the mouldings of the frame. In retouching the sky thin glazes of ultramarine were



Plate 7 *The Virgin and Child with Saints Francis and Anthony of Padua*, after cleaning, before restoration.

applied more with the aim of reducing the unevenness rather than attempting to restore the colour to its presumed original density. It was considered important to retain the sense of space behind the figure gained by the removal of the heavy overpainting. In the case of the clouds, little more could be done other than to apply sufficient retouching to link the surviving patches of modelling and to indicate that they had once been clouds.

The large loss and the abrasions on the saint's face have been restored fully and the disturbing visibility of a pentimento in her eyes has been reduced. Most of the glazes on her draperies were in remarkably good condition, and retouching was necessary only to some abrasion of the thinnest glazes over the highlights of the green dress. In these lighter areas the green glazes have discoloured slightly, but in the shadows they have retained their original deep green colour. Areas of green drapery on paintings by Cima are often well preserved, and here, as elsewhere, they have been built up carefully with glazes of verdigris in oil over substantial underpaintings based on verdigris, lead-tin yellow and lead white.

The layer structure of the saint's red mantle (and the dress of the Virgin in the lunette) is also typically complex. The whole area was first blocked in with a bright opaque red, consisting principally of vermilion (with some red lake). Although covered by the upper paint layers, it is unlikely to represent a change of colour from a warm to a cool red. More probably it was intended to contribute to the final effect. Over this underpainting the highlights were modelled with

red lake and white and the shadows built up to a sumptuous intensity with multiple layers of red lake, the dyestuff identified as derived from kermes.¹⁸ Kermes was the most expensive of the dyestuffs, and the ultramarine used for the picture is also likely to have been costly.

Unfortunately when ultramarine is used, as here, in an oil medium (identified as linseed oil)¹⁹ and mixed with little or no lead white, it can degrade badly, resulting in a blached and chalky appearance.²⁰ On the *Saint Catherine* the effect is most evident on the roundels decorating the border of the red cloak. In the shadowed folds the roundels were glazed with pure ultramarine, but the colour has become so blached that they are now lighter in tone than the roundels painted over the highlights. To correct this reversal of the artist's intentions the roundels in the shadows have been slightly toned, but little could be done to the blached ultramarine of the Virgin's mantle in the lunette (Plate 7). Except for a narrow strip along the lower edge, protected by the frame, the tonal variations in the modelling of the drapery folds are no longer apparent. In places the greenish blue colour of the azurite used to underpaint the ultramarine is now exposed. Since it gives some structure to the drapery folds it has not been suppressed by retouching. Scratch marks in the exposed gesso of the very damaged lining of the Virgin's mantle indicate that the paint was scraped off deliberately before repainting. The examination of a sample from one of the surviving fragments of orange paint identified the presence of realgar, a pig-



Fig. 4 *Saint Catherine of Alexandria and The Virgin and Child with Saints Francis and Anthony of Padua*, in the frame made in 1933 (photographed during restoration of the paintings).

ment vulnerable to deterioration and damage, mixed probably with some earth pigment and perhaps a translucent brown.²¹ On this evidence, the area of lining was re-glazed with an orange-brown colour, but no real attempt was made to suggest folds.

The final stage of the restoration was to consider the detrimental consequences of the cutting of the ceiling of the canopy or loggia above Saint Catherine. If the panels are positioned as they were in the frame made for them in 1933, the lunette is uncomfortably close to the top of the saint's head (Fig. 4). Furthermore, when looking at the upper part of the picture,

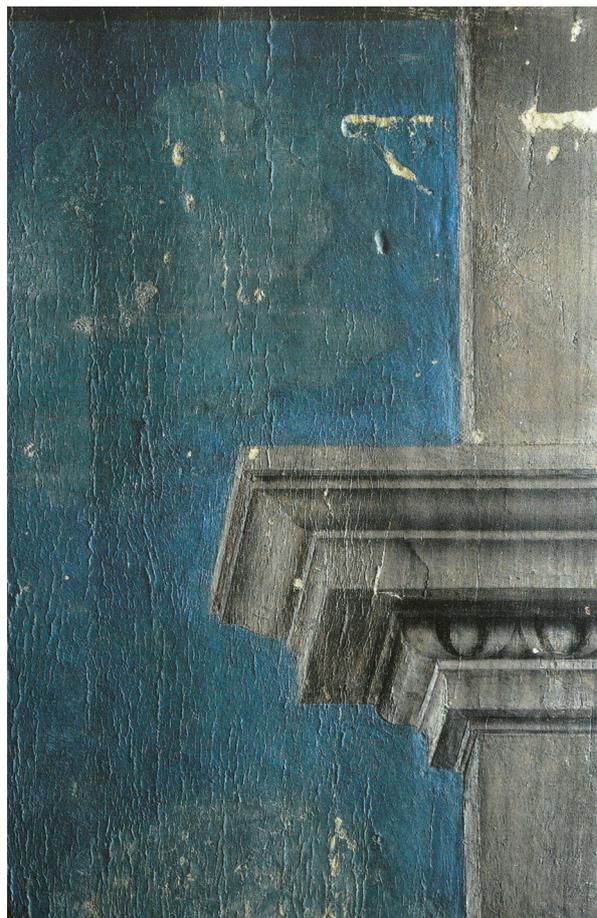


Plate 8 *Saint Catherine*, detail of the upper right corner photographed in raking light, after cleaning, before restoration.

because of the absence of the receding orthogonals of the ceiling, the viewer tends to read the large projecting cornices of the painted architecture as being in front of the figure. Only when the eye travels down to the lower part of the image and locates the bases of the pilasters does it become apparent that they are supposed to be behind her. This makes the relationship between figure and architecture disconcertingly unstable.

Drawn lines and incisions into the gesso ground (Plate 8) indicate that originally the altarpiece had an architectural frame with pilasters, capitals and



Plate 9 *Saint Catherine of Alexandria and The Virgin and Child with Saints Francis and Anthony of Padua* in the adapted frame. On the left (as a photomontage), *Saint Sebastian*, on the right, *Saint Roch*. Left panel 116.3 × 47.6 cm, right panel 116 × 47.2 cm, both Strasbourg, Musée des Beaux-Arts.

cornices of the same design and proportions as those of Cima's painted architecture. In fact the pilasters and entablature of the frame supply the front of the canopy that covers the saint. The ledge on which the Strasbourg saints stand is a continuation of the floor of Saint Catherine's loggia, but they are placed in the open air. These panels have not been cut down, as has sometimes been suggested,²² and their upper edges must have been level with the mouldings immediately above the capitals of the lost frame (as indicated by the incisions into the panel). These mouldings would then have continued across to form the base of an entablature over the side compartments. The entablature was surmounted perhaps by carved volutes, vases or other such elements as can be seen on wooden and stone frames of the period.

Similarly, the lunette is likely to have been separated from the main panel by an entablature of the same width as the painted one – known from the eighteenth-century copy and the print. As is often the case with contemporary Venetian frames – and also buildings – the mouldings of the arch were not as wide as the pilasters and so the panel of the lunette is slightly wider than that of the *Saint Catherine*. A crescent-shaped area around the curved upper edge of the lunette was found to have been made up, the black paint overlying a greenish-blue coloured filling (Plate 6) applied to bare wood that had been scored in the same way as some of the flake losses on this and the main panel. It is possible that this area may once have contained a fictive stone arch, painted with the intention of pushing the figure group back into their space. A suggestion of such an arch appears on the copy at Mestre and a similar device was employed by Cima for the lunette of an altarpiece now in the Museo Civico at Feltre. However, no trace of paint from any arch has survived on the Wallace Collection picture and it was decided that the area should again be painted black.

Since both the frame and the lost ceiling had such an important function in defining the painted space, the possibility was considered of attempting a reconstruction of the missing area. Baratti's engraving had proved in other details to be reliable, and by placing a tracing taken from the Wallace panel over that in Mestre, it could be shown that the copy, although crude and clumsily painted, had been made from a careful tracing of the original painting.²³ More accurate measurements of the height of the entablature and ceiling could therefore be obtained than would have been possible by calculation from the print alone. Moreover, it was discovered that the frame made in 1933 could be adapted without great diffi-

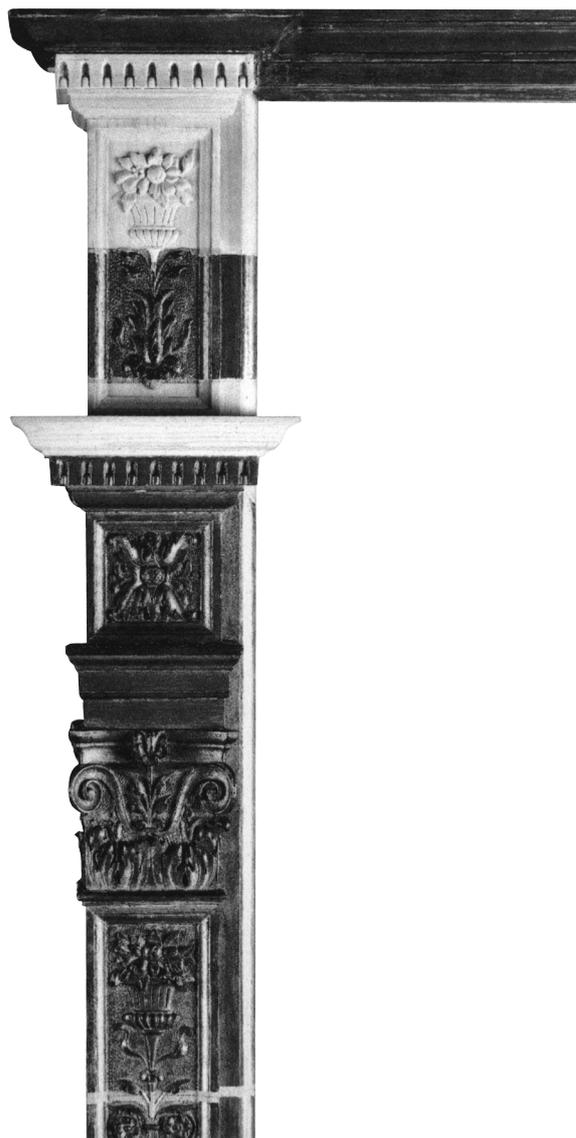


Fig. 5 Detail of the frame during alteration.

culty to accommodate the reconstruction and also to position the capitals and projecting cornices of the sides at exactly the same levels as those of the original frame (as indicated by the incisions into the gesso).

The proposal to replace the lost ceiling was made first to the Board of Trustees of the Wallace Collection and then to its Picture Conservation Panel, an international advisory panel comprising art historians, museum curators and conservators. Towards the end of the treatment, and before any alterations were made to the frame, the restored panels were returned temporarily to Hertford House, so that they could be tried in the position where they are to be displayed. The proposed alterations to the frame had been worked out by cutting and pasting actual size photographic prints and these were assembled around

the panels, allowing the Conservation Panel to judge and approve the likely outcome.

To adapt the frame a section needed to be cut out of each of the over-tall pilasters, but this could be relocated above the first projecting cornice (Fig. 5). The sides could then be completed with new pieces, copying the carved flower-filled urns from those at the tops of the pilasters and repeating the mouldings and dentils of the cornice.²⁴ The reconstruction of the ceiling is painted on a separate piece of gessoed wood, not attached physically to the original panel. The slight gap, and the fact that the new gesso has been left smooth, without any attempt to imitate craquelure, should make its modern origin evident.²⁵

The restitution of the orthogonals means that there is no longer any confusion as to the saint's relationship with the architecture, and the alterations to the frame complete the illusion of a figure set in a defined space (Plate 9). As a result, the figure – in fact painted on a relatively small scale – gains in dignity and monumentality. The clarity of Cima's design enables it to command a vista in the same way that it must have done when it was still on the high altar of the church of San Rocco. It shares this distinction with the National Gallery's *Incredulity of Saint Thomas*.

Acknowledgements

In the early stages of the project the panels were under the curatorship of Richard Beresford. For an interim period following his departure they were in the care of Stephen Duffy, and then eventually Joanne Hedley. I am very grateful to them and to Rosalind Savill, Director of the Wallace Collection, both for their enthusiastic support and for their patience in the course of a long and complicated treatment.

Notes and References

- 1 Details concerning the acquisition of the painting by the Marquis of Hertford and its subsequent history at the Wallace Collection are taken from notes made by Richard Beresford from files held at the Wallace Collection.
- 2 Although there had been previous lists of the Collection they were unnumbered. The first proper catalogue was that made by the first Keeper, Sir Claude Phillips, and published in 1900.
- 3 See M. Wyld and J. Dunkerton, 'The Transfer of Cima's "The Incredulity of Saint Thomas"', *National Gallery Gallery Technical Bulletin*, 9, 1985, pp. 38–59, and J. Dunkerton and A. Roy, 'The Technique and Restoration of Cima's "The Incredulity of Saint Thomas"', *National Gallery Gallery Technical Bulletin*, 10, 1985, pp. 4–27.

- 4 For a summary of the early history of the altarpiece see P. Humfrey, *Cima da Conegliano*, Cambridge 1983, pp. 115–16.
- 5 See A. Perissa Torrini, 'Il Polittico del Duomo di Mestre', *Quaderni della Soprintendenza per i Beni Artistici e Storici di Venezia*, 19, 1994, pp. 131–3.
- 6 G. Waagen, *The Treasures of Art in Great Britain*, Vol. III, London 1854, p. 201.
- 7 The photograph, taken by Caldesi and Montecchi, was published as No. 88 in *Gems of the Art Treasures Exhibition, Manchester, 1857*, London and Manchester 1858.
- 8 A.G. Temple, *The Wallace Collection (Paintings) at Hertford House*, 1902.
- 9 It was presented by Mr and Mrs George Blumenthal of New York. Although the terms of Lady Wallace's Bequest stipulated that the Collection should be 'kept together, unmixed with other objects of art', the Trustees of the Collection accepted the lunette on the grounds that it was part of the same work as the *Saint Catherine*. The whereabouts of the lunette for most of the nineteenth century is not known. It reappeared in the Taylor sale of 1912, when it was bought by Langton Douglas.
- 10 The frame was supplied by the frame-maker Pierre Coulette, with funding provided by Lord Duveen.
- 11 This account of the more recent conservation history of the painting is based on notes made by Richard Beresford from files held at the Wallace Collection.
- 12 See Wyld and Dunkerton, cited in note 3, p. 51.
- 13 Scrapings from the layers of overpaint were examined for pigment identification by Ashok Roy. The different retouchings could also be distinguished in false colour infra-red photographs. The varnish and the retouchings assumed to be those applied by Holder in 1933 were readily soluble in acetone. The older, harder retouchings could be softened by the application of a solvent gel and then scraped off with the scalpel. The lead white fillings were often raised and lumpy, and tended to spread over original paint. Where necessary they were softened by repeated application of methylene chloride in a solvent gel and gradually scraped down.
- 14 See, for example Humfrey, cited in note 4, p. 116. The fact that Berenson, in 1916, believed that it was not fully autograph suggests that the heavy retouching was already present (see B. Berenson, *The Study and Criticism of Italian Art*, III, London 1916, pp. 200–1).
- 15 The blisters were secured by David Thomas, who also carried out the panel treatment with Anthony Reeve. The cradle was removed with chisels and saws in the normal way, and open and weak splits and cracks joined. The panel immediately took up a convex warp. Following moisture treatment to reduce the convex warp to an acceptable degree of curvature, the first stage was to attach an isolating layer of polyester fabric impregnated with 'Beva-371' heat-seal adhesive to the reverse of the panel. The 'Beva-371' was applied to the polyester only, the aim being to avoid any impregnation of the original wood. The isolating layer is present both to assist in the future reversibility of the treatment and to ensure that the panel is not impregnated with the

- wax-resin used in the next stage of the process. The back of the panel was then built up with two layers of balsa-wood planks, embedded in wax-resin bulked up with sawdust. The planks of the first layer of balsa wood are laid running in the same direction as the grain of the original panel and those of the second layer run across the grain. To reduce further the strength of the balsa (already a soft and weak wood), cuts were made across the planks at regular intervals, the grooves extending to about half their thickness. To give protection to the back and edges of the auxiliary panel, a wax-impregnated canvas was then applied. For an account of the method, long in use at the National Gallery, but with various modifications introduced over the years, see A. Reeve, 'Structural Conservation of Panel Paintings at the National Gallery, London', *The Structural Conservation of Panel Paintings, Proceedings of a Symposium at the J. Paul Getty Museum 24–28 April 1995*, Los Angeles 1998, pp. 410–17. Following treatment, the panel has maintained its slight convex warp. Its condition would appear to be stable and should remain so, providing that it continues to be kept in a suitable environment.
- 16 The poor condition of the panels in Strasbourg has been thought to be a result of their having been in a fire at the museum in 1947. However, examination of the panels – made available by M. Jean-Louis Faure, Conservateur en Chef of the Musée des Beaux-Arts – confirms that they are in similar condition to the London panels. The lighter colours are equally abraded, also in places rubbed down to the underdrawing and gesso, and they would appear to have suffered from the same drastic cleaning, very probably with an abrasive substance.
- 17 This technique for painting skies features in many paintings by Cima. The thinness and translucency of the final layers of ultramarine give them a remarkable luminosity but also make them vulnerable to cleaning damage. Consequently the skies in many of his works now appear worn and patchy.
- 18 The dyestuff was identified by Jo Kirby using HPLC. Paint samples for pigment identification and for study as cross-sections were examined by Ashok Roy.
- 19 Samples for medium identification were analysed using GC–MS by Raymond White. A sample from a white or almost white area was found to contain linseed oil with no evidence for pre-polymerisation and brushmarks are clearly evident in the more bodied lighter colours, for example the architecture. The red lake and verdigris green glazes, however, contain partially heat-bodied linseed oil and have consequently dried with a smoother, more glassy finish. Although some pine resin was detected in the red lake sample, none was found in the green and so the glaze is not a so-called 'copper resinate'.
- 20 The precise causes of the blanching of natural ultramarine when used in an oil medium have not yet been established but it is known to be very vulnerable to acidic environments or possibly cleaning agents such as vinegar (acetic acid).
- 21 Realgar, highlighted with orpiment and glazed with a translucent brown pigment based on a softwood tar, occurs on the orange robe of Saint Peter in the National Gallery's *Incredulity of Saint Thomas* (see Dunkerton and Roy, cited in note 3, p. 17).
- 22 See Humfrey, cited in note 4, p. 115.
- 23 We are very grateful to Dr Annalisa Perissa Torini of the Soprintendenza per i beni artistici e storici di Venezia for arranging for Joanne Hedley and myself to have access to the copy of the polyptych.
- 24 The alterations to the frame were carried out by Clare Keller of the National Gallery Framing Department.
- 25 The reconstruction of missing sections of paintings on separate and clearly detached pieces of wood is a solution that has been used on several paintings in the National Gallery, most notably Pesellino's fragmented altarpiece of *The Trinity with Saints* reassembled in 1930, but missing the lower right section, or more recently *The Coronation of the Virgin* by Lorenzo Monaco discussed on pp. 43–57 of this *Bulletin*. The panel for the ceiling, which had to be shaped to follow the slight warp of the original panel, was made and prepared with gesso by Isabella Kocum of the Framing Department. The painting of the reconstruction and the restoration of Cima's panels were executed principally with pigments ground in 'Paraloid B-72'. Some final glazes, and especially the patination of the reconstruction, were applied using 'Gamblin' aldehyde resin colours. For the deepest red lake glazes on the cloak, the pigments were ground in 'Laropal K-80'. The preliminary and final varnishes were of 'Laropal K-80'.