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Angels* (NG 6282), detail of plate 26, page 73

The Use of Gilded Tin in Giotto's *Pentecost*

RACHEL BILLINGE AND DILLIAN GORDON

The technique of Giotto's panel painting of the *Pentecost* (NG 5360, PLATE 1) was the subject of a detailed study in the exhibition catalogue *Art in the Making* in 1989.¹ Subsequent examination under a more powerful stereobinocular microscope has revealed the use of gilded tin, rarely found on thirteenth- or fourteenth-century Italian panel paintings.² The making and use of gilded tin (*stagno dorato*) is discussed by Cennino Cennini in his *Libro dell'Arte* where it is related particularly to wall painting, for stars, haloes and drapery patterns.³ It was presumably Giotto's experience as a fresco painter which led him to use gilded tin on panels; a study of the materials used in the frescoes in the Scrovegni Chapel in Padua has shown that Giotto used four different types of metal leaf: gold, tin, gold/silver and gold on tin.⁴ Gilded tin has also been found on the cosmati throne decoration of Giotto's *Virgin and Child* in San Giorgio alla Costa, Florence.⁵

Giotto's *Pentecost* shows the twelve apostles gathered together in a room with tongues of fire on their heads; the Holy Spirit descends in the form of a white dove. Outside the room are a man and two youths, representing the multitude of different nations, each man marvelling at hearing the apostles speak in his own language. This panel is one of seven which formed a horizontal dossal, whose original location is unknown: the *Epiphany* (New York, Metropolitan Museum; PLATE 8); the *Presentation* (Boston, Isabella Stewart Gardner Museum); the *Last Supper* and *Crucifixion* (both Munich, Alte Pinakothek); the *Entombment* (Setignano, Villa i Tatti, Berenson Collection); the *Descent into Limbo* (Munich, Alte Pinakothek).⁶ The seven paintings are linked by their subject-matter, style, dimensions and technique: all have the rare and distinctive *terra verde* beneath the gold leaf background rather than the usual bole.⁷

The attribution and the date of the series are problematic. The extent of the involvement of Giotto in the series has been the subject of disagreement, and numerous combinations of circumstances have been proposed:⁸ for example, the panels have been attributed to Giotto himself by Roberto Longhi, and by Ferdinando Bologna;⁹ they have been said to have been

designed by Giotto and executed by his assistants by Cesare Gnudi,¹⁰ and they have also been considered purely workshop product by Bernard Berenson, and by Francesca Flores d'Arcais.¹¹ Most recently the series has been described by Giorgio Bonsanti as a general diffused collaboration.¹² Their dating has varied from soon after 1305,¹³ to about 1330.¹⁴

Three significant changes have been made to the *Pentecost* at different stages in its history. The earliest change concerns the apostle at the extreme left. His face, of which only the forehead and eyes are visible, is painted over gold (PLATE 2), suggesting that he was omitted from the underdrawn composition. But the gilding of his halo is consistent with that of the other apostles, implying that he was inserted at an early stage.¹⁵

Another original revision concerns the white dove (PLATE 4). The dove has been considerably repainted. However, original white paint is visible beneath the repainting. Curiously, this paint is over the mordant gilding of the coffered ceiling. Since mordant gilding was done in the final stages of the execution,¹⁶ it seems that the dove was originally omitted, and inserted at a late stage.

At a considerably later and likewise unknown date this crucial part of the composition was radically altered. Not only has the dove been repainted, but the short golden rays emanating from below its breast and wings (PLATE 3) are not original: they have been applied over cracks in the paint surface. Originally long rays emanated from the dove to fall on the head of each apostle beside each tongue of flame (PLATE 5). These lines have all but disappeared; some of the incised lines used as guidance are just visible in raking light (PLATE 6), and in the X-radiograph, passing across haloes and cutting into the pale green background. Analysis has shown that these rays were originally of gilded tin. The tin has been identified by Marika Spring by EDX analysis.¹⁷ Examination with a stereobinocular microscope has revealed traces of gilding on one very small remnant (PLATE 9); a line of decayed tin, black in colour, can still be seen in the hair of the apostle third from the left, in the back row (PLATE 7), and tiny sporadic traces of tin are still to be found in the green background and



PLATE 1 Giotto and workshop, *Pentecost* (NG 5360). Egg tempera on poplar, 45.5 × 44 cm.

elsewhere. A tiny speck of tin and an incised line (PLATE 10) show that the ray directed towards the apostle seen from the back sitting in the front row, second from the left, was originally at an angle which crossed the face of the apostle in red and was therefore moved to a different position.

When they were first applied, the relatively thick raised lines of gilded tin would have stood out with dramatic effect against the pale green of the wall and the plain gold of the apostles' burnished haloes. In his treatise, Cennini refers to *stagno dorato* as a cheap substitute for gold,¹⁸ but as Leonetto Tintori has noted, gilded tin (as opposed to tin foil tinted to look like gold)

would not have been used by painters on account of its cheapness: he cites a document of 1366 showing that the price of *stagno dorato* was higher than that of gold leaf, and suggests that they used it because of its greater thickness and malleability.¹⁹ What was required in the *Pentecost* were relatively long, narrow, sharp-edged strips for the rays, which would have been relatively easy to cut out of a foil of gilded tin, giving a cleaner, neater result than would have been possible with mordant gilding.

It may be that the mordant used to apply the tin was not particularly effective: elsewhere the mordanted gold is noticeably thin and worn.²⁰ Or with time the tin may



PLATE 2 *Pentecost*. Digital macrophotograph showing the face of the apostle at the extreme left, painted over gold.

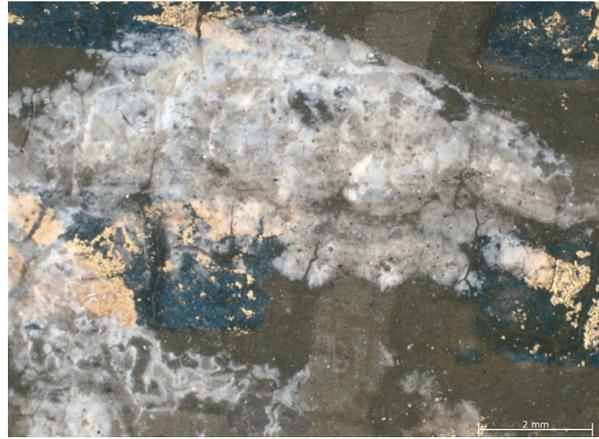


PLATE 4 *Pentecost*. Digital macrophotograph showing the right wing of the dove repainted over original white paint.

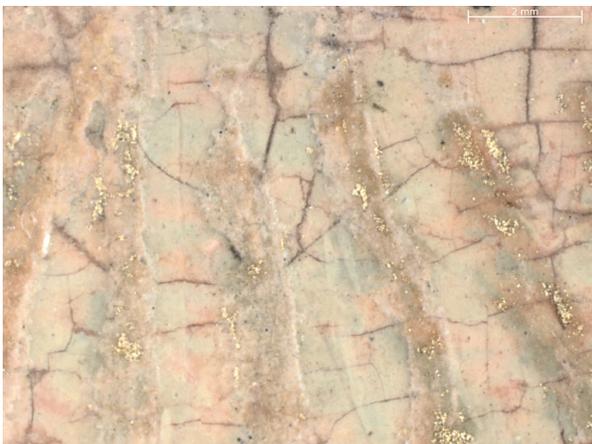


PLATE 3 *Pentecost*. Digital macrophotograph showing the new rays emanating from the dove, crossing cracks in the paint surface.

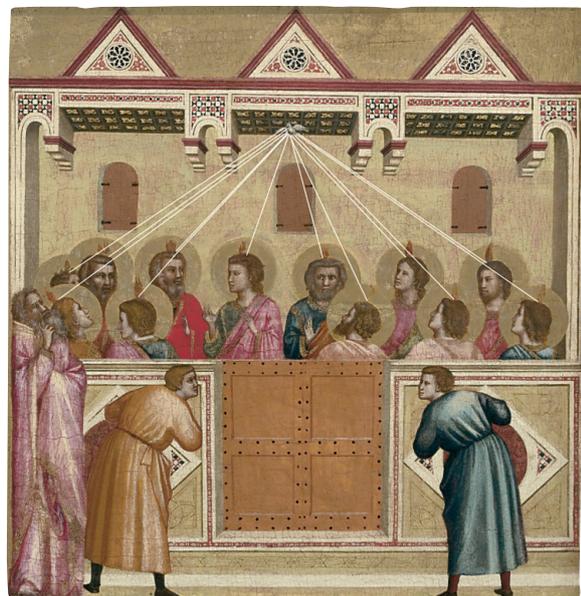


PLATE 5 Diagram of the *Pentecost* showing where the rays originally were.

have tarnished and have been considered disfiguring and so was removed. The shorter rays done with a thick yellowish mordant gilding resemble the short golden rays emanating from the dove in the *Pentecost* (Staatliche Museen zu Berlin, Gemäldegalerie) from the series showing scenes from the lives of Christ and of Saint Francis painted c.1335–40 for Santa Croce, Florence, by Giotto's pupil Taddeo Gaddi, and may even have been copied from them.²¹

It seems that a similar alteration has occurred in the *Epiphany* (PLATE 8). The star in the sky above the hill is of gilded tin, which has tarnished (PLATE 11).²² It was probably at the same time as the dove was repainted, and the golden rays inserted in the *Pentecost* that the second star, which resembles the new rays in the *Pente-*

cost, was painted over the hill: as with the rays, the star with its tail is painted over cracks. The two panels were together until 1839 when they were sold out of the Poniatowski Collection, along with the *Presentation* and *Entombment*.²³

The rays of the Holy Spirit leading directly to each apostle are found in other versions,²⁴ but it is unusual to omit the Virgin from among the apostles, although Giotto does so in his fresco of the *Pentecost* in the Scrovegni Chapel (PLATE 12); there the rays representing the Holy Spirit splayed over the back wall appear in illustrations to be tarnished metal with some gold and may likewise have been made of gilded tin.²⁵ In the fresco Giotto omits the dove entirely, and it is possible that the dove was added to the panel paint-



PLATE 6 *Pentecost*. Digital macrophotograph showing an incision made for one of the gilded tin rays.

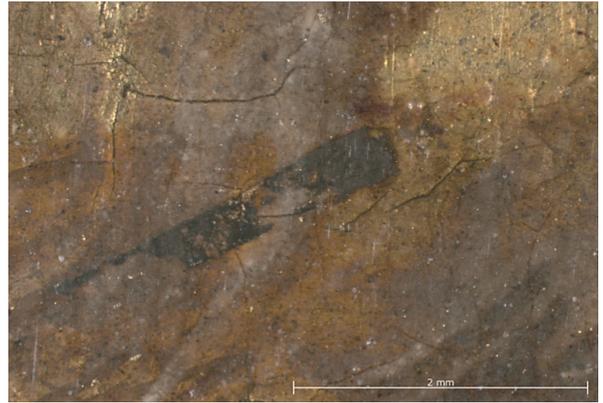


PLATE 9 *Pentecost*. Digital macrophotograph showing fragment of gilded tin in the hair of the apostle on the extreme left.



PLATE 7 *Pentecost*. Digital macrophotograph showing decayed tin in the hair of the apostle third from the left (the red is a modern restoration).



PLATE 10 *Pentecost*. Detail showing misplaced ray on apostles fourth and fifth from left.



PLATE 8 Giotto, *Epiphany*, c.1310–20. Tempera on poplar, 44.9 × 43.7 cm. New York, Metropolitan Museum of Art, II.126.I.



PLATE 11 Detail of PLATE 8 showing original gilded tin star and added mordant gilded star.



PLATE 12 Giotto, *Pentecost*, c.1305. Fresco. Padua, Scrovegni (Arena) Chapel.

ing at a late stage at the request of the patrons.²⁶ The patrons, presumably the man and woman shown kneeling opposite Saint Francis at the foot of the cross in the *Crucifixion*, remain unidentified.

Notes

- 1 D. Bomford *et al.*, *Art in the Making. Italian Painting before 1400*, National Gallery, London 1989, pp. 64–71.
- 2 Gilded tin decoration has been found on Christ's perizoma on a Tuscan thirteenth-century sculpture of a wooden Crucifix (London, Victoria and Albert Museum, A.2-1986). See J.A. Darrach, 'White and Golden Tin Foil in Applied Relief Decoration: 1240–1530', *Looking Through Paintings. The Study of Painting Techniques and Materials in Support of Art Historical Research*, ed. E. Hermens, *Leids Kunsthistorisch Jaarboek*, XI, Leiden and London 1998, pp. 49–80, esp. pp. 52–3.
- 3 Cennino d'Andrea Cennini, *Il Libro dell'Arte, The Craftsman's Handbook*, trans. Daniel V. Thompson, New York, paperback reprint of 1933 edition, pp. 60–3, 78, 89; and F. Brunello, ed., *Cennino d'Andrea Cennini, Il Libro dell'Arte*, Vicenza 1971, pp. 103–8 and 146.
- 4 See M. Marabelli *et al.*, 'Le lamine metalliche utilizzate nella decorazione dei dipinti murali giotteschi', in G. Basile ed., *Giotto nella Cappella Scrovegni: Materiali per la Tecnica Pittorica. Studi e ricerche dell'Istituto Centrale per il Restauro* (Italian/English text), *Bollettino d'Arte*, Volume Speciale 2005, pp. 121–44.
- 5 See M. Ciatti and C. Frosinini eds, *La Madonna di San Giorgio alla Costa di Giotto*, Florence 1995, p. 73, and Plates XIII–XV, although here the metal leaf attached to the tin is described as 'oro-argento in foglia', not pure gold leaf. Gilded tin has also been found in the Annunciation scene of the *Virgin and Child* in Santa Maria Maggiore, Florence. See M. Ciatti and C. Frosinini eds, 'L'Immagine antica'. *The Madonna and Child of Santa Maria Maggiore. Studies and Restoration*, Florence 2003, p. 154, Table 1, and p. 156. We are extremely grateful to Claudio Seccaroni and Pietro Moiola for both these references.
- 6 For a discussion of this series see most recently G. Bonsanti in the exhibition catalogue *Giotto. Bilancio critico di sessant'anni di studi e ricerche*, ed. A. Tartuferi, Galleria dell'Accademia, Florence 2000, pp. 174–7.
- 7 *Art in the Making* 1989 (cited in note 1), p. 69.
- 8 See M. Davies, revised D. Gordon, *National Gallery Catalogues. The Early Italian Schools before 1400*, London 1988, pp. 29–34. For a full list of attributions see F. Zeri with E.E. Gardner, *Italian Paintings. A Catalogue of the Collection of the Metropolitan Museum of Art. Florentine School*, New York 1971; reprinted 1979, pp. 48–9; and P. Hendy, *European and American Paintings in the Isabella Stewart Gardner Museum*, Boston 1974, pp. 105–6.
- 9 R. Longhi, 'Giudizio sul Duecento', *Proporzioni*, II, 1948, p. 51, reprinted in

- Giudizio sul Duecento*, Florence 1974, p. 49; *idem*, 'Presenza di Masaccio nel trittico della Neve', *Paragone*, 1952, no. 25, p. 8; F. Bologna, *Novità su Giotto*, Turin 1969, pp. 97–9.
- 10 C. Gnudi, *Giotto*, Milan 1958, pp. 220–4.
- 11 B. Berenson, *Italian Pictures of the Renaissance. Florentine School*, I, London 1963, p. 82; Flores d'Arcais, *Giotto*, New York, London and Paris 1995, pp. 212–18.
- 12 Bonsanti 2000 (cited in note 6), p. 175.
- 13 Flores d'Arcais 1995 (cited in note 11).
- 14 A. Tartuferi, *Giotto. Guida alla Mostra e itinerario fiorentino*, Florence 2000, p. 74, dates them c.1325. Cesare Brandi, *Giotto*, Milan 1983, p. 187, is the only critic to date them as late as c.1330.
- 15 This suggests that the patron was shown the drawn composition and was able to rectify the omission of a twelfth apostle which presumably arose from the assumption that the apostles numbered eleven after the departure of Judas. However, the Bible (Acts, I, 23, and II, 1ff) makes it clear that before Pentecost the apostles had been joined by Matthias.
- 16 For the technique of mordant gilding see *Art in the Making* 1989 (cited in note 1), pp. 43–6.
- 17 Energy dispersive X-ray analysis (EDX) was carried out in the scanning electron microscope (SEM) on a very small sample from a fragment of one of the rays. Only tin was detected, identifying the metal as tin leaf.
- 18 Cennini trans. Thompson 1933, p. 60; and Brunello 1971, p. 103 (both cited in note 3).
- 19 L. Tintori, '“Golden tin” in Siene murals of the early trecento', *Burlington Magazine*, vol. 124, no. 947, 1982, pp. 94–5.
- 20 For the mordant in NG 5360 made up of a drying oil with some lead white, see Table 1, *Art in the Making* 1989 (cited in note 1), p. 47.
- 21 For the series painted for Santa Croce, Florence, see most recently S. Chiodo in A. Tartuferi, *Dipinti dal Duecento a Giovanni da Milano, Cataloghi della Galleria dell'Accademia di Firenze*, Florence and Milan 2003, cat. no. 48, pp. 251–84, and Fig. 149. See also the exhibition catalogue *Fantasia und Handwerk. Cennino Cennini und die Tradition der toskanischen Malerei von Giotto bis Lorenzo Monaco*, W-D. Löhr and S. Weppelmann eds, Berlin 2008, cat. no. 6, pp. 266–9, esp. Abb. 2.
- 22 K. Christiansen, 'Fourteenth-Century Italian Altarpieces', *Metropolitan Museum of Art Bulletin*, XL, no. 1, 1982, pp. 50–7, ill. p. 51. Analysis of a micro-sample from the star using SEM-EDX revealed that the metal foil, approximately 10–40 microns thick, contains nearly pure tin. The analysis was conducted by Silvia Centeno and Mark Wypyski, research scientists in the Department of Scientific Research at the Metropolitan Museum. We are extremely grateful to them and to Keith Christiansen (Jayne Wrightsman Curator of European Paintings) and Charlotte Hale (Paintings Conservator) for studying the painting at our request.
- 23 Prince Stanislas Poniatowski of Florence Sale, Christie's, London, 9 February 1839, lots 101–4.
- 24 For example, in Duccio's *Maestà* completed in 1311.
- 25 For illustrations of the Scrovegni (Arena) Chapel *Pentecost* see G. Basile, ed., *Giotto. La Cappella degli Scrovegni*, Milan 1992, p. 199, and details pp. 209 and 269. The rays appear not to have been specifically sampled by Marabelli *et al.* (cited in note 4), however, they do report the presence of tin, not this time associated with gold, in the rays from Christ in the *Ascension* (table p. 130).
- 26 Although it is difficult to explain why the omission of the dove should not have been rectified at the same time as the omission of the twelfth apostle.