

Giovanni Bellini;
Experience and Experiment in Venetian
Painting, c. 1460 to 1516

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Abstract

Giovanni Bellini (b.1435/40- d.1516) has long been considered a dominant figure in the Venetian painting of the Early-High Renaissance, his main reputation being as a colourist. The distinctive optical and technical characteristics of his work have drawn substantial scholarly attention in the present century, but the studies in this subject have not been developed as a coherent theory with regard to changes in painting technique in the fifteenth-century Italy. The purpose of this dissertation, therefore, is to investigate Bellini's choice and application of painting materials, attempting to establish links between the technical qualities and the formal values of his work. In the process of establishing Bellini's position with regard to the use of paint media and support, this thesis also provides a substantial overview of the use of canvas and of oil paint in the later fifteenth century.

The study is encouraged by recent discoveries about Bellini's technique that have emerged from conservation of his paintings. As well as addressing published conservation results, the thesis includes new observations on four canvases attributed to Bellini's father Jacopo, and two Madonnas from Bellini's workshop scientifically examined at UCL Painting Analysis.

In order to investigate Bellini's colour and handling of paint within a broader socio-economic milieu, this study deals with the commercial documents such as tariffs, government records, and merchant account books, indicating that Venice was the centre of the international colour trade and that Venetians were widely engaged with this trade. The resulting advantages of Venetian painters who were active at this commercial heart, and the question of how deeply the pragmatic experience of colours that Venetian merchants obtained from the trade penetrated their aesthetic taste will be discussed.

Using both scientific and documentary analyses in combination with visual analysis which integrates these findings, this study examines Bellini's translation of the skills of tempera to oil paint and the stylistic changes that occurred with the extensive use of oil medium. It looks at how Bellini developed canvas as a support for mural painting and the technique he employed on such an unconventional support. It will also study the methods in which he established the predominance of colour as an element of composition at the early sixteenth century. In conclusion, it will argue that Bellini's increasing choice of canvas and corresponding use of oil on it changed the general concept of picture-making and became a new format of painting that was to exert a crucial influence on Cinquecento Venetian painting.

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TEXT

Introduction

1. Giovanni Bellini's Fortuna Critica

Giovanni Bellini was a dominant figure in the history of Venetian art for more than seven decades from the mid-fifteenth century. Born into the leading family of painters as the son of Jacopo Bellini around 1435, he produced hundreds of paintings until his death in 1516, while his workshop was consistently busy to meet orders flooding in from inside and outside Venice.¹ From 1479 he was responsible for the redecoration of the Hall of the Great Council in the Ducal Palace, the 'constitutional heart of the Venetian Republic'.² Later in 1483, he was appointed as state painter, 'pictor nostri Domini', of Venice for the next thirty three years.³ Towards the end of his life, his reputation reached beyond the territory of Venice. His name is found together with those of eminent contemporary artists such as Leonardo da Vinci and Andrea Mantegna with reference to Isabella d'Este's studiolo project at the turn of the century.⁴ Later in the early 1510s, Alfonso d'Este commissioned the aged Bellini for a painting for his camerino together with Titian.⁵ In January 1516, only a few months before his death, he was requested to work

¹ There is no direct documentation on Bellini's birth date, but from circumstantial evidence he seems to have been born in around 1435. See p.126 in Chapter 3, for detailed discussion of the date of his birth. His name may be a tribute to his uncle, Giovanni, who was recorded as working together with his brother Jacopo in 1440; G. Fiocco, 'Giovanni e la familia dei Bellini alla luce di nuovi documenti', *Vernice*, (33-34), 1949, p.4.

Marino Sanudo wrote in his Diary on 29 November 1516 that 'Se intese questa mattina esser morto Zuan Belin optimo pytor... havia anni la cui fama è nota per il mondo, et cussi vechio come l'era, dipenzeva per excellentia.'; M. Sanudo, *I Diarii*, ed. by R. Fulin et al., vol. xxiii, Venice, 1879-1903, p.256.

² In August 1479, the Great Council decreed that; '... Consilii, fidelis civis noster Johannes Belinus pictor egregius deputetur ad dictum opus instaurandum, renovandumque...'; G. Lorenzi, *Monumenti per servire alla storia del Palazzo Ducale di Venezia*, Venice, 1868, doc.192, pp. 88-89.

³ Bellini was summoned by the Venetian government to apply his outstanding artistic talent; '... Joannes Bellinus per egregium ingenium suum in arte picture, pictor nostri Domini est appellatus, et Ideo assumptus ad renovandam Salam Maioris Consilii et a nostro Dominio publice permiatus utque ad eam solam rem vacare possit liber ab omni alia cura...'; G. Lorenzi, *ibid.*, doc. 197, p.92.

⁴ The exchange of letters between Isabella d'Este and her Venetian mediators and Bellini himself from 1496 to 1506 are preserved in the Archivio dello Stato, Mantua, and have been published in C. Brown, *Isabella d'Este and Lorenzo da Pavia: Documents for the History of Art and Culture in Renaissance Mantua*, Geneva, 1982, pp. 149-167; J. Fletcher, "Isabella d'Este and Giovanni Bellini's 'Presepio'", *Burlington Magazine*, (113), 1971, pp.703-712.

⁵ G. Campori, 'Tiziano e gli estensi', *Nuova Antologia*,(27), 1874, p. 582; C. Hope, 'The Camerini d'Alabastra of Alfonso d'Este', *Burlington Magazine*, (113), 1971, p. 641.

hard to finish a picture for the sister of the King of France.⁶ Such a successful and privileged artistic career was unprecedented in the history of Venetian art.⁷

Any researcher attempting to look in depth at the work of such an important figure in Venetian art, however, meets grave difficulties. The first fundamental problem is the poor survival of contemporary documentation concerning his life and art. In contrast to the many surviving paintings from his seven-decades-long career, a handful of documents concerning him have come down to us. Only the afore-mentioned activities of Giovanni Bellini, which are supported by documentary evidence, have unequivocally been agreed upon by modern art historians. As for the chronology of the first four or five decades of Bellini's life and art -the time before he was closely associated with the government-, the problem of insufficient archival material is particularly critical; not even his birth date and the legitimacy of his birth are known.⁸ The earliest surviving painting which bears both his signature and a date is from 1487, when the artist was approaching his fifties.⁹ Historians of the present century have noted that Venetians were less scrupulous in their preservation of documents than were Central Italians of the period. Michael Hirst, for instance, has pointed to the case of Bellini as exemplifying this phenomenon.¹⁰ In 1989, Rona Goffen regretted that 'Giovanni Bellini was unconcerned about the eventual needs

⁶ On 15 January 1516 [1515 in Venetian style] Gaspara a Vidua wrote to Giovanni Badoer, Venetian Ambassador to Charles V that he had already urged Bellini to complete a picture for the sister of the French King; D. Chambers and B. Pullan, *Venice: a Documentary History 1450-1630*, Oxford, 1992, p. 407.

⁷ Contemporary humanists predictably proclaimed Bellini to be the 'Apelles' of their age; see Liburnio, *Opere gentile ed amorse*, Venice, 1502, p.8r, sonnet 30; R. Goffen, *Giovanni Bellini*, New Haven and London, 1989, pp. 1, 2, 293. The humanist Zovenzoni also compared Bellini to Apelles; See B. Zioliotto, *Raffaele Zovenzoni: La Vita, I carmi*, Trieste, 1950, p.78. Bellini's freer approach to subject matter was emphasized by the poet and humanist Pietro Bembo who applied a poetic model to Bellini's process of invention. In January 1506, he wrote to Isabella d'Este that Bellini preferred not to have limits placed on his imagination, but to let his fantasy run free in his paintings; '...il quale ha piacere che molto segnati termini non si dieno al suo stile, uso come dice di sempre vagare a sua voglia nella pitture, che quanto è in lui possano soddisfare a chi le mira...'; G. Gaye, *Carteggio inedito d'artisti dei secoli XIV, XV, XVI*, Florence, 1839-1840, pp. 71-82; C. D'Arco, *Delle arti e degli artefisi di Mantua*, Mantua, 1857, pp.57-64. For Bellini and his humanistic interest, see also G. Robertson, *Giovanni Bellini*, Oxford, 1968, pp.13 ff.

⁸ The name, Giovanni Bellini, is first found in a legal document dated 1459. He signed as a witness; 'Testis ser Johanes filis magistris Jacobi Belin S. Leonis'; P. Paoletti, *Raccolta di documenti inediti per servire alla storia della pittura veneziana nei Secoli XV e XVI*, Padua, 1894, p.II. This earliest surviving document shows Giovanni had already lived apart from his parents. Art historians have largely divided over the issue of whether Giovanni was an illegitimate son of Jacopo, as his name is not found in the will of Anna Rinversi, wife of Jacopo, written in 1471; see pp.126-8 in Chapter 3. Without further documents, this question will remain unsolved.

⁹ The Virgin and Child or *Madonna degli alberetti* (Galleria dell'Accademia, Venice). The inscription reads "IOANNES BELLINVS. P./ 1497".

¹⁰ M. Hirst, *Sebastiano del Piombo*, Oxford, 1981, p.3.

of art historians'¹¹. Indeed, it remains a difficult task under these circumstances to place much of his large surviving opus chronologically and to reconstruct his remarkably long career.

In defining Bellini's legacy, researchers face a further dilemma which arises from the writings of the first historians of Giovanni Bellini, such as Vasari, Dolce, and Pino. It was Vasari who published the first biography of Bellini, but according to his *Lives of the Most Excellent Painters Sculptors and Architects*, first published in 1550, Bellini had already been overshadowed by Giorgione and Titian. He wrote in 1550 that Bellini's art was done 'in a dry, crude, and laborious manner'.¹² Vasari's negative view of Bellini is partly due to Vasari's preference for the 'terza maniera' of Tuscan art, coupled with a relative ignorance of Venetian art.¹³ When Vasari also criticised Titian, Venetian critics were quick to respond, but it seems, they were not as concerned about Vasari's negative view of Bellini. Dolce, a close associate of Titian for instance, willingly sacrificed Bellini in order to defend Venetian mid-sixteenth art from Tuscan criticism. Dolce wrote;

Da che si può comprendere agevolmente che il Bellino, per quanto comportava quella età, fu maestro buono e diligente. Ma egli è stato da poi vinto da Giorgio da Castelfranco; e Giorgio lasciato a dietro infinite miglia da Tiziano, il quale diede alle sue figure una eroica maestà, e trovò una maniera di colorito morbidissima, e nelle tinte cotanto simile al vero, che si può ben dire con verità ch'ella va di pari con la natura.¹⁴

The hostile assessment of Bellini by mid-sixteenth century Venetian critics may have been further generated by Titian himself. There are no direct words from Titian about Bellini, but an uneasy, competitive relationship between the two can be implied in Titian's petitions to the Venetian Senate in 1513 and 1516, which have been thought to show that the eagerness of Titian to take part in the Hall of the Great Council project was not

¹¹ R. Goffen, *op. cit.*, p.vii.

¹² Vasari wrote in the life of Titian that; 'E perché in quel tempo Gianbellino e gli altri pittori di quel paese, per non avere studio di cose antiche, usavano molto, anzi non altro, che il ritrarre qualunque cosa facevano dal vivo, ma con maniera secca, cruda, e stentata imparò anco Tiziano per allora quel modo'[author's italics]; Vasari, *le Vite...*, ed. by R. Bettarini and P. Barocchi, vol. 6, Florence, 1987, p.155.

¹³ R. Goffen, *op. cit.*, pp.1-3 ; C. Hope, 'The Historians of Venetian Painting', *The Genius of Venice 1500-1600*, London, 1983, pp. 38-40.

¹⁴ L. Dolce, *L'Areino: Dialogo della Pittura*, Florence, 1910, pp.8-9. Although Dolce here seems to be employing the same model of progressive movement as Vasari, his comments, as a Venetian, probably represent the changing opinion of Bellini in mid-sixteenth century Venice.

welcomed by the aged Giovanni Bellini.¹⁵ It appears unlikely that Titian was prepared to temper his criticism of Bellini even long after Bellini's death in 1516, as long as Bellini's major works were still in situ and his artistic reputation was in people's living memory.¹⁶ Titian may have had to continue to proclaim his artistic superiority. His unfriendly view of Bellini's art, consequently, influenced his associates, including Dolce.

Deserted by critics from inside and outside Venice, Bellini's artistic achievement became further obscured later in the seventeenth and eighteenth century. The historians of the seventeenth and eighteenth century were not free from the influence of Vasari and Dolce's view of Giovanni Bellini. Yet, two interesting observations were made about Bellini in this period.

In an effort to bring Vasari's account of Bellini up to date, the Venetian writer, Carlo Ridolfi put forward the idea in 1648 that Giovanni Bellini plagiarised the oil painting technique while Antonello da Messina was living in Venice in 1475-6. He wrote that Bellini gained access to Antonello's workshop in the guise of a gentleman and observed the technical secret of oil painting.¹⁷ Ridolfi's idea is rooted in Vasari who claimed earlier, in his 1550 edition of the *Vite*, that;

Ma ripigliando il primiero discorso, veduto che ebbe Giovanni quella nuova maniera di dipingere, nella quale appariva certa unione e sfumatezza di colori che non si praticava a tempera, nè sapendo imaginarsi il modo tenuto da Antonello, s'introdusse in sua casa sotto titolo di gentiluomo, con invenzione di farsi ritrarre, poichè vestendo la toga veneta restò facilmente quello ingannato, onde senza alcun

¹⁵ D. Chambers explains that Bellini may have managed to exert his influence with patrician admirers to quash Titian's first commission around 1513. However, Bellini's opponents were in part responsible for a report in December 1515 which criticised the slowness and expense of the Bellini's work, giving Titian another opportunity; D. Chambers, *Patrons and Artists in the Italian Renaissance*, London, 1971, pp.78-82; see also P. Brown, *Venetian Narrative Painting in the Age of Carpaccio*, New Haven and London, 1988, p. 276.

¹⁶ Though Dolce's writings may have exaggerated Titian's criticism of Bellini's work for his own argument, a sixteenth-century Venetian explained to a foreigner that Giovanni Bellini and Gentile were no less alive in their memories; see D. Chambers and B. Bullan, *op.cit.*, pp.391-392. Their fame came largely from their works in the Hall of the Great Council, which were displayed there until the fire of 1577 destroyed all of them.

¹⁷ C. Ridolfi, *Le Maraviglie dell'Arte...*(1648), Padua, 1835, p.87. Ridolfi is now criticized for confining himself to 'describing pictures and recounting anecdotes without giving his material any coherent shape'; C. Hope, *op. cit.*, p. 39. Nevertheless, Ridolfi made a few corrections of Vasari's account of Bellini. He said that Giovanni was the younger brother of Gentile, deliberately correcting Vasari's mistake; G. Robertson, *op. cit.*, pp. 9-12. In 1550 Vasari had described Giovanni as the elder brother of Gentile. In the the second edition, however, he did not specifically mention it; for the first and second edition of Vasari's account on the Bellini, see Vasari, *op. cit.*, vol. 3, pp.427-441.

riguardo pose mano al lavoro, ed osservando Giovanni che di quando in quando intingeva il pennello nell'olio di lino, venne in cognizione del modo da lui osservato...¹⁸

Vasari, both in the first and second edition of his work *Vite*, specified Domenico Veneziano as one of the Venetian painters who had learnt the oil technique from Antonello da Messina, but did not specifically mention his influence on Giovanni Bellini. Ridolfi's gossipy story, based on Vasari's earlier account, does not have any historical grounding, but was to be referred to again and again by later generations and was even believed by many to provide the most plausible explanation for the change of Bellini's art in the mid-fifteenth century.¹⁹

Another important but more positive view of Bellini in the seventeenth century is found in the writing of Marco Boschini, who appreciated Bellini's position in Venetian painting of the Renaissance.²⁰ Boschini praised Bellini's art in his sonnet in *La Carta del Navegar Pitoresco* in 1660, and commented;

Zambelin se puol dir la primavera
Del Mondo tuto, in ato de pitura,
Perché da lu deriva ogni verdura,
E senza lu l'arte un inverno giera.²¹

Boschini's emphasis on Bellini's pioneering role in the modernisation of Venetian art and in the formation of the Venetian school was further maintained by Lanzi in 1795-96 and Selvatico in 1836, and has been generally accepted by twentieth-century scholars.²²

It was in the nineteenth century that the artistic achievement of Giovanni Bellini began to be rediscovered. This rediscovery was led by the English connoisseurs John Ruskin and

¹⁸ 'Questa arte condusse poi in Italia Antonello da Messina che molti anni consumò in Fiandra, e, nel tornarsi di qua da' monti fermatosi ad abitare in Venezia, la insegnò quiri ad alcuni amici...'; Vasari, *op. cit.*, vol. 1, pp. 132-133; see also *ibid.*, vol.3, pp. 301-310.

¹⁹ G. Robertson, *op. cit.*, p.56 ff.; R. Palluchini, *Giovanni Bellini*, Venice, 1949, pp. 13-20; J. Wilde, *Venetian Art from Bellini to Titian*, Oxford, 1974, p.26; L. Coletti, 'Incontro spirituale con Antonello da Messina', *Vernice*, (33-34), 1949, pp.13-14.

²⁰ M. Boschini, *La Carta del Navegar Pitoresco*, ed. by A. Palluchini, Venice and Rome, 1966, p.665. M. Boschini's approach to the Venetian painter is said to be more perceptive than Ridolfi, and challenges Vasari's critical standpoint; see C. Hope, *op. cit.*, p. 39, for Boschini's emphasis on colour over design.

²¹ M. Boschini, *ibid.*, p.665.

²² L. Lanzi, *Storia pittorica della Italia dal risorgimento delle belle arti fin presso al fino del 18 sec.*, (5th ed.), 1834; P. Selvatico, *Storia estetico-critica delle arti del disegno*, 1836.

Charles Eastlake.²³ Eastlake who was preoccupied by 'the principle of Venetian colouring', attempted to analyze Bellini's oil painting technique in his book *Materials for a History of Oil Painting*, published in 1847.²⁴ Around the years he wrote this book, he was developing the National Gallery as its Keeper from 1844 until 1847 and at the same time he made the important acquisition of Bellini's *Portrait of Doge Leonardo Loredan*.²⁵ Eastlake continued to play an active role in collecting Bellini's works; other important works of Bellini were purchased during his directorship; the *Virgin and Child* (NG280) in 1855, the *Madonna of the Meadow* in 1858, the *Agony in the Garden* in 1863. One year before he became the first Director in 1855, Eastlake was in Venice where he purchased Bellini's *Assassination of St Peter Martyr*. This work remained in his private collection until bequeathed to the National Gallery in 1870.²⁶ As a result of his effort, the National Gallery now houses fourteen Bellinesque paintings, and represents the largest collection of Bellini's works outside Venice.

Ruskin shared Charles Eastlake's view of Bellini as master of colour and technique, but unlike Eastlake, who saw Bellini's art as a prelude to later Venetian painting, he expressed a more passionate admiration for Bellini. After a series of tours to Italy, Ruskin presented the view, at one of his lectures in Oxford as Slade Professor in May 1871, that Bellini's *San Zaccaria Altarpiece* was one of the best pictures in the world. The other best picture, he declared, was also by Bellini, his *Frari triptych* (S. Maria dei Frari, Venice).²⁷ It is of interest to note that Ruskin's admiration was, again, primarily based on his observation of Bellini's painting method. According to Ruskin, who championed the ideals of solid craftsmanship, the first essential of the greatest art is 'faultless and

²³ The pioneering appreciation by these English connoisseurs of Bellini's art can be partly attributed to the growing cultural relationship between England and Venice during the course of the nineteenth century; for a discussion of the cultural contacts between England and Venice, see J. Links, 'The British in Venice 1458-1966', *Vision of Venice*, London, pp.9-11. Byron visited Venice in 1816, Turner in 1819, Charles Eastlake in 1825, and Ruskin in 1835; J. Christian, 'The other 'Vision of Venice'', *Vision of Venice*, London, pp. 12-22.

²⁴ For Eastlake's view of Bellini's oil painting method, see C. Eastlake, *The Method and the Materials of Painting of the Great Schools and Masters*, vol.2, London, 1847, pp.272-96, 358-9.

²⁵ D. Gordon, *100 Great Paintings; Duccio to Picasso*, London, 1981, p. 13.

²⁶ For the acquisition of Bellini's work in the National Gallery, see M. Davies, *The National Gallery Catalogue of the Earlier Italian Schools*, London, 1961, pp.53-72.

²⁷ J. Ruskin, *The Works of John Ruskin*, vol. 22, London, 1903-1912, pp. 83-85. John Ruskin made a total of eleven visits to Venice in his life, and, through these visits, developed his interest in Bellini's works *in situ*. Ruskin's view seems to have been related to his earlier support of the Pre-Raphaelite movement.

permanent workmanship'.²⁸ Ruskin and Eastlake's admiration was later to be shared by another influential English critic, the formalist Roger Fry, who wrote the first comprehensive and thorough monograph on Bellini outside Italy.²⁹

Research on Giovanni Bellini has steadily proliferated during the present century, culminating in the 1949 exhibition in the Ducal Palace in Venice, but I would rather question whether the present day researcher has successfully overcome two inherent problems in the study of Giovanni Bellini; that is to say, the lack of contemporary documents and, to a lesser extent, the prejudice of the early critics. First of all, modern scholarship, obstructed by the problems arising from the former, have largely limited their interest to the area of authorship. A substantial number of his major works have been attributed and reattributed, and dated forwards and backwards more than once.³⁰

Another important subject which occupies a large portion of the modern discussion on Bellini is the problem of who were the influential figures for each development of his art. Unlike Mantegna, Bellini made at least three significant leaps in terms of the development of his formal language. His work is initially related to decorative 'late Gothic art' and with a structural emphasis on line. From the 1470s, he then places more emphasis on soft modelling and naturalistic three-dimensional form. Finally, in his late years, his forms become simpler and he aims at subtle chromatic effects. The possible causes of these changes may be various, but, in this matter, modern historians predominantly remain faithful to Vasarian explanations; they have viewed the influence of an artist of higher skills or reputation as a critical source of Bellini's artistic development. Therefore, it has been argued that Giovanni Bellini in his formative years depended on his father Jacopo and his prodigious brother-in-law Andrea Mantegna. Then, the direction of Bellini's art is supposed to have been changed by his contact with the art of Piero della Francesca and

²⁸ Ruskin said that 'First, they are both wrought in entirely consistent and permanent material. ... And painting is so secure, that four hundred years have produced on it, of any kind'; *ibid.*, p. 84. Together with technical perfect, he also emphasized that the peaceful calmness of Bellini's works is 'the attribute of the entirely highest class of art'; *ibid.*, p. 84.

²⁹ R. Fry, *Giovanni Bellini*, London, 1899. Fry's appreciation was largely based on the formal qualities of Bellini's work; see especially p.29ff in his book.

³⁰ For the discussion of the dating and attribution of Bellini's early works, see pp. 126-8 in Chapter 3. For the *Pesaro Altarpiece*, see pp. 147-8 in Chapter 4. See Goffen's 'Attributions and other Dilemmas' in her book, *Giovanni*

Antonello da Messina in the 1470s.³¹ In the early sixteenth century, Bellini's work is said to have been influenced by the younger Venetian painters, Giorgione and Titian. In various recent studies of Bellini it has been said that Bellini was overshadowed by Mantegna at the beginning of his career, and by Giorgione and Titian towards the end.³² However, as to the exact timing of such changes and the degree of influence from one artist to the other, their discussions, which largely depend on their subjective reading of Bellini's style, have again not drawn any conclusion.

The discovery of new documents can be extremely helpful, but progress is slow and the findings are not substantial enough to reconstruct Bellini's artistic life.³³ Although Giovanni Bellini and his period is now attracting the attention of art historians more than ever as increasing emphasis is placed on fifteenth and sixteenth-century Venetian art in the study of the Italian Renaissance, the reconstruction of most of his life and the changes in his art still remains hypothetical. Alternative methods need to be found to further the investigation of Bellini's art and, by extension, the beginning of Venetian Renaissance painting.

Bellini, especially for the literature of the attribution of the triptych in San Giovanni e Paolo; R. Goffen, *op. cit.*, 1989, pp. 275-277.

³¹ The influence of Bellini's family, of Jacopo and of Mantegna seems natural; see pp.126-130 in Chapter 3. For a detailed discussion of Antonello's influence, see pp.163-9 in Chapter 4. It was Roberto Longhi who suggested Piero della Francesca's effect on Bellini in the 1470s; R. Longhi, 'Piero dei Franceschi e lo sviluppo della pittura veneziana', *L'Arte*, (17), 1914, pp. 198-221, 241-256. See G. Robertson, *op. cit.*, 1968, pp.68-70. For a discussion of cultural interchange between Florence and Venice in painting in the fifteenth century, see C. Smyth, 'Venice and the Emergence of the High Renaissance in Florence: Observation and Questions', *Florence and Venice: Comparison and Relations*, vol.1, 1979, pp.209-249.

³² For a critical review of Bellini's early art, see Goffen, *op. cit.*, 1989, p. 293. Charles Hope agrees saying that 'Giorgione's innovations in technique led to decisive break with the hard, linear manner of Bellini...'; C. Hope, *op. cit.*, 1983, p. 40.

³³ P. Molmenti, 'I Pittori Bellini: Documenti e ricerche', *Archivio veneto*, (36), 1888, pp. 219-34; P. Paoletti, *op. cit.*; G. Lorenzi, *op. cit.*; D'Arco, *op. cit.*; J. Fletcher, *op. cit.*, 1971; J. Fletcher, 'The Provenance of Bellini's Frick "St.

2. Research Purpose and Methodological Questions

The present study is concerned with the traditional subject of Giovanni Bellini as a painter but I intend to adopt a fresh approach to the fundamental problems of Bellini scholarship. This approach will focus specifically on the painting materials and methods used in his work. Questions of attribution and dating are not the primary interest of this study, but it is my intention here to prove that by looking into the connection between technique and the formal and institutional principles of Bellini's art, we will be in a better position to re-assess his artistic development. Moreover, this study will propose that the technical qualities of Bellini's art can be used as a basis for investigation into fundamental aspects of meaning in his paintings.

This dissertation is divided into two sections. The most important themes of the present research - colours, media, and supports - will be discussed in Part I; Experience and Experiment in Venetian Painting. This will serve as a background for the later discussion of Bellini's technique in Part II, but is equally intended to stand as an independent study in its own right, providing a substantial overview of the use of pigments, oil paint and canvas in Italy in the second half of the fifteenth century. Part II, Bellini's Painting Methods; the Case Study, is constructed in a chronological order to assess the development of Bellini's technique. The subjects of individual chapters are divided into specific questions on the basis of the examination of Bellini's major works at each period.

Scientific Study

The theme of this dissertation has been inspired by the distinctive technical and optical characteristics of Bellini's work, and his consequent reputation as a colourist since his own time.³⁴ It is the increasing amount of new data about Bellini's technique, resulting from modern methods of conservation, that have particularly motivated this investigation.

Francis", *Burlington Magazine*, (114), 1972, pp. 206-214; C. Wilson, *Giovanni Bellini's Pesaro Altarpiece, Studies in its Context and Meaning*, Ph.D. diss., Institute of Fine Art, New York, 1976.

³⁴ Modern art historians have defined his work using formulations such as 'delicate light effect', 'subtle change in tonality', and 'the brilliant application of colour'; for instance, Bellini's later style is described as representing those most important aspects of Venetian painting such as 'colour, texture, and surface pattern' in J. Steer, *A History of Venetian Painting*, London, 1970, p.78. For Bellini's sophisticated approach to light in the 1460s and its discussion in the literature, see pp.128-33 in Chapter 3. For the intensive controversy over the paint medium of the *Pesaro Altarpiece*, see following footnote 35 in this Chapter and pp.147-151 in Chapter 4. Regarding colour and its

In a bibliographical survey, it is evident that scientific research has been the fastest growing area in the study of Giovanni Bellini during the last two decades [Table 1]. Modern methods of conservation which investigate the technical qualities of the art work through microphotographic and microchemical study, such as cross-sections, infrared- and x-radiography, and media analysis, have been applied to a number of Bellini's works, and have, in a sense, produced 'objective data'.

Comprehension of the structure of paint and identification of materials permits an understanding of Bellini's painting methods and these methods can help us to answer formerly unsolved questions. Such questions include for example, when he began to adopt oil and how he established the predominance of colour as a compositional element in his late years. These kinds of questions, recognised by art historians including Vasari, have been written about extensively, but in the absence of both adequate documentation and scientific methodology, art historical research has produced a wide range of views, none of which has generated a consensus.³⁵ On the question of oil for instance, support for either one opinion or another has been called 'a matter of person inclination' without the possibility of objective methods.³⁶ It is fortunate that the yardsticks to measure such questions have been developed in the course of the present century; cross-section study in the 1910s; infrared- and x-radiography in the 1920s; media analysis in the 1970s.³⁷ As for

application, the literature on the San Zaccaria Altarpiece, dated c.1505, is particularly extensive; 'rich nuance and delicate tonality' are referred to in N. Huse, *Studien zu Giovanni Bellini*, Berlin, 1972, p.76; 'tone-values of pure colour' in J. Wilde, *op. cit.*, 1974, p. 46; 'the mellowness and richness of colour' in E. Gombrich, *The Story of Art*, London, 1984, p.248. See also footnote 27 in p.15 above, for Ruskin's view on Bellini's methods.

Bellini's mastery over colour and the way it was handled in the early sixteenth century seems to have been well appreciated by his peers. In July 16, 1504, Lorenzo di Pavia sent a letter to Isabella d'Este, praising Bellini's command of colouring; J. Fletcher, *op. cit.*, 1971, p.710; C. Brown, *op. cit.*, 1982, doc. 92, p.84. Bellini's painting technique at the turn of the century is the subject of Chapter 6.

35 The most intensive discussion of Bellini's art in the 1470s concerns his handling of oil medium and the precise time of its beginning, since the application of this new painting medium has been regarded as a decisive stimulus to his career. As to the medium of the *Pesaro Altarpiece*, Fry, Meiss, and Dussler believe that it was mostly painted in tempera, while Crowe and Cavalcaselle, Wilde, and Robertson suggest the medium as oil; see C. Wilson, *op. cit.*, 1976, p.312-316.

36 Giles Robertson made this comment with reference to the dispute over the paint medium of Bellini's *Pesaro Altarpiece*; G. Robertson, *op. cit.*, p. 68.

37 A. P. Laurie, *The Pigments and mediums of the Oil Masters*, London, 1914; A. Burroughs, 'Notes on the principles and process of X-ray examination of paintings', *The Smithsonian Institution Report*, 1927, pp. 529-533; M. Toch, 'Photography of pigments by infra-red rays only', *American Photographer*, (24), 1932, pp.432-434. During the 1930s, training and research institutes were founded, and the increasing number of articles concerning new findings by these scientific methods appeared in journals such as *Technical Studies in the Field of Art* (the Fogg Art Museum, Harvard University) and *Mouseion* (Bulletin de l'Office International des Musées, Paris); For the detailed

the work of Giovanni Bellini, scientific analysis has been increasingly employed since 1966 [Table 1 and 2].³⁸ Thus, it can be said that researchers of the present day are in a better position to deal with questions concerning Bellini's painting techniques than at any time previously.

Limitations of Scientific Tools

The study of Bellini's painting technique gathers momentum by the application of these scientific tools, but there are a number of hurdles to be aware of in approaching this type of research. The limitations of analytic methods themselves pose certain dilemmas. One of the practical difficulties which art historians meet when they try to understand the scientific data is the diversity of analytic tools used in conservation centres around the world. Cross-section and x-ray and infra-red radiography now constitute the general basis of scientific analysis, but some testing methods are not widely used. Gas-liquid Chromatography [or GLC hereafter], one of the advanced technologies employed to identify paint media, for instance, is available in only a limited number of laboratories. Alternative media analyses by staining of paint samples [staining methods hereafter] have been adopted more widely, but their reliability is rather problematic.³⁹ There is some reassurance to be had from the fact that the findings based on staining methods are generally confirmed by more sophisticated GLC,⁴⁰ but researchers have to be aware that the results obtained from these different analytical methods have various degrees of accuracy.

history of modern conservation, see H. Ruhemann, *The Cleaning of Painting*, London, 1968, p.369ff. This trend was interrupted during the Second World War. It was after the war that the study of painting method based on scientific data appeared more regularly. The most important professional association of picture restorers, the International Council of Museums (ICOM) was founded in 1946. The formal training of conservators began at the Courtauld Institute of Art in London and the Conservation Center of the Institute of Fine Arts in New York after the war. The journal *Studies in Conservation*, that has been regarded as an academic liaison between the professional conservators, was first issued in 1952.

³⁸ The disastrous flood on 4 November 1966 marred a number of Venetian artefacts including Bellini's *Barbarigo Canvas* (San Pietro Martire, Murano). Soon after this, international conservation projects 'Save Venice!' supported by UNESCO were launched to rescue them.

³⁹ The questions arising from these different methods of media analysis and other recent analytical methods such as FTIR and Mass Spectrometry are separately discussed in Appendix-1.

⁴⁰ J. Dunkerton, 'Modifications of traditional egg tempera techniques in Italy', *Early Italian Paintings Techniques and Analysis*, 1997, p.29.

Sampling is a chronic problem in present scientific studies of painting. To examine a painting using a cross-section of paint and chemical studies such as staining methods or GLC, samples of the size up to a square millimetre must be removed from the paint film. It can be argued that the appearance of a painting remains virtually unchanged by sampling, but no matter how negligible it is, the method does cause damage to paintings. In general this means that the number of samples taken from any one painting has to be very limited and mostly taken from damaged areas; the more damaged the examined painting is, the more chance there is to obtain samples. Ideally, to obtain the relevant information for art historical research, samples must be taken from what could be termed 'historically sensitive areas': i.e. each different area of paint. In practice, however, it is often difficult to do this since these 'historically sensitive areas' do not always correspond with damaged areas, and taking samples from undamaged areas is undesirable.

As the layer structure of paint film and employed paint media in the period in question emerge as more complicated than hitherto understood, the limited number of samples for scientific study could result in what might be called a statistical hazard. In other words, it cannot be absolutely guaranteed that a square millimetre or less of a painting is representative of the area under study, even though to the eye the area may be uniform in colour and texture.⁴¹

There are further aspects of scientific study that could be peripheral to art historical study. At the moment, laboratory examinations are not arranged primarily to answer academic questions, but for practical reasons such as the preliminary assessment of damage, conservation, for condition reports prior to sale or auction, or travelling for exhibition. Thus, the technological methods, including cross-sections and media analysis have been first adapted to assist such practical purposes and the resulting data has been viewed as a by-product useful to art historians.

One of the aims of this study is a conscious attempt to investigate Bellini's painting practice on the basis of recent scientific results, but it does not overlook the present

⁴¹ J. Plesters, 'Cross section and Chemical Analysis of Paint Samples', *Studies in Conservation*, (3), 1955, p.112.

limitations of these data. Avoiding the trap of claiming to find the secret recipe of Bellini's painting practices or generalizing the techniques individual to him, this study has limited the range of its research questions.

Documentary Studies and Visual Analysis

Traditional documentary research does not necessarily lose its value in the study of Bellini's painting technique at a time when the scientific analysis of his paintings is advancing. The present study will attempt to show that surviving documents provide information relevant to this subject and that their meaning can be re-read in the light of a new understanding of Renaissance painting practice provided by scientific examinations. This documentary approach is particularly useful in Part I [Chapter 1 and 2], in which Bellini's colour and handling of other materials will be discussed within a broader socio-economic milieu. Commercial documents such as tariffs, government records, and merchant account books will be discussed in Chapter 1 to indicate that Venice was the centre of the international trade of pigment and dye and that Venetians were widely engaged with this trade. The resulting advantages to Venetian painters who were active at this commercial centre, and the question of how deeply Venetian merchants' practical experience of colour materials penetrated their pictorial taste will be discussed. Various documentary sources will be carefully dealt with in Chapter 2 to address the changing taste in painting partially brought into being by the increasingly innovative use of painting materials.

The documents associated with Bellini himself are limited, but will be reviewed with an awareness of recent scientific findings on Bellini's technique in Part II, that provides case studies of Bellini's painting material and methods. Fundamental questions such as Bellini's contemporaries' estimate of the technical quality of his works, for instance, will be assisted by examining surviving documents relating to him.

Scientific findings and documentary studies can be further enriched and to some extent integrated with visual analysis, the third tool of the present study. As visual analysis of colours and handling of paint can be subjective and often misguided without scientific

research, similarly scientific research untouched by visual analysis can be isolated and peripheral to art historical study.⁴² This study will show that scientific data can provide a basis for the description of colours, while the significance of scientific findings can be empirically gauged by visual analysis. If some ambitious hypotheses have been made in this thesis on the basis of my own visual analysis, expanding upon the results of the scientific examination, this is not to challenge the scientific results, but to try to explain the unusual features or passages of paint on the painted surface.

Using both scientific and documentary analyses in combination with visual analysis, this study will discuss a variety of specific questions concerning Bellini's methods and materials. Chapter 3 will detail how Bellini accomplished a sophisticated approach to the use of light in the 1460s. Chapter 4 will look into how similar or dissimilar is Bellini's use of oil paint to that of Antonello da Messina and what stylistic changes occurred as a result of the extensive use of such a different paint medium. The study also addresses the questions of how Bellini was able to meet major state commissions in terms of technique and what is meant by 'tonality' in terms of the use of materials in Chapter 5 and 6. Chapter 7 will discuss what different processes were used for his highly marketable small devotional pictures as compared to his other major autograph works. These questions do not represent a comprehensive coverage of all the issues that arise concerning Bellini's painting technique, but the analytical investigation of these specific questions will provide a key to the study of his art.

⁴² The present study was encouraged by recent art historical moves to come to terms with technical examination and need for collaboration such as the Raphael Symposium in 1983, 'Meaning and Making' exhibitions in the National Gallery of London and more recently Sharon Fermor's study on Raphael Tapestry Cartoons. The National Gallery of London is writing its current catalogue of Early Netherlandish painting, and has been making a systematic technical examination of every painting, involving conservators and art historians working together; J. Shearman and M. Hall (ed.), *Princeton Raphael Symposium; Science in the Service of Art History*, 1990; M. Hirst and J. Dunkerton, *Making and Meaning: The Young Michelangelo*, London, 1994; S. Fermor and A. Derbyshire, 'Raphael tapestry Cartoons Re-examined', *Burlington Magazine*, (140), 1998, pp.236-250.

Part I

Experience and Experiment

Chapter 1

Experience: Venice, A Merchant Republic

The aim of the present chapter is to investigate the fundamentals of 'Venetian colourism' from the perspective of its socio-economic environments with an awareness of recent scientific findings. Intense chromatic beauty and virtuoso handling of paint have long been attributed as characteristics of Venetian Renaissance paintings, and modern art historians have frequently attributed Venice's atmospheric and poetic lagoon settings as a main contributor to this quality.¹ Certainly anyone who walks through Venetian streets at sunrise or sunset may encounter emerging or defusing forms through the filter of the changing atmosphere and the chromatic shift of these forms with the interplay of subtle light through dense sea air. It may seem convincing that this natural environment influenced the formal and colouristic perception of local painters. The present chapter, however, aims to address critical questions regarding one of the practical cores of Venetian colourism; artists' pigments, as something more objectively verifiable and probably more revealing.

It is important to note that most of the colours used in the artist's workshop in fifteenth-century Italy fell into the category of *spezie* and, as the term *spezie* (literally 'spices') implies, a number of pigments in this period had Oriental and African origin like other imported luxury goods such as seasonings, perfumes, dyestuffs and medicines.² Eastern colour materials flowed into the West through the trade routes of the Mediterranean and since the thirteenth century Venice more or less monopolized their trade on the basis of the systematic organisation of sea power. This chapter will attempt to assess the practical

¹ For a recent explanation of Venetian colourism with reference to its natural environment, see M. Hall, *Color and Meaning: Practice and Theory in Renaissance Painting*, Cambridge, 1992, pp.199-200.

² The pigments were obtained from apothecaries, *Arte degli Spezieri da Grosso* which were separated from the *Spezieri da Medicina* in the fourteenth century in Venice. M. Gabbiato, *Scuole di Arti Mestieri e Devozione a Venezia*, Venice, 1981, pp.93-94.

advantage of Venetian painters who were active at this commercial heart of the international colour trade, individually reviewing the major pigments identified in paintings.

The dominance of Venice in Mediterranean trade has other significant implications for the discussion of Venetian painting, since the merchants with a trained eye on diverse merchandise including colour materials consisted in large part of both the clients and spectators of Venetian painters. The pragmatic experience of colours Venetian merchants obtained from their engagement with international trade is likely to have penetrated deeply into their aesthetic taste. Therefore, this chapter addresses fundamental questions such as the Venetian concern with colour and how Venetian painters colouristically met the requirements of their clients. The painting materials and socio-economic background of Venice have not been totally neglected in the previous studies of Venetian colourism³, but this subject has never been discussed in detail. This study, carried out in three directions - visual, documentary, and scientific - will not only lead to a deeper understanding of the characteristics of Venetian painting, but also create a good starting point for further investigation of the materials and techniques of Giovanni Bellini.

Core Works

The net cast by this thesis needs to be wider than the time and place in which Giovanni Bellini lived, since it is important to assess his painting materials and methods within the development of Italian painting techniques in general. This chapter will consider a range of works produced by his predecessors and contemporaries, but the main discussion is based on the one hundred selected works consisting of Venetian and other Italian paintings dated from 1300 to 1550; [Appendix 3].⁴ These are works which have received modern laboratory analysis in the past three decades and with the exception of the works

³ The late Joyce Plesters was a leading scholar of Venetian colours, and this study owes much to her work on individual Venetian paintings executed by Giovanni Bellini, Titian, and Tintoretto. This study is also indebted to Dr. Lazzarini's discussion of pigments in Venetian painting; L. Lazzarini, 'Il colore nei pittori veneziani tra il 1480 e il 1580', *Bolletino d'Arte*, Supplemento 5, 1983, pp. 135-44; L. Lazzarini, 'The Use of Color by Venetian Painters, 1480-1580: Materials and Technique', *Color and Technique in Renaissance Painting; Italy and North*, (ed.) M. Hall, New York, 1991

examined at the UCL Painting Analysis Unit, their technical reports are published. The examples are selected primarily to set the discussion of colours and materials in a broader perspective, rather than to provide a comprehensive list of scientifically examined Italian works in this period.

In order to analyse the Venetian public's concern with colour and the response of their local painters to it, the final section of the present chapter focuses on the colouristic compositions of several Venetian paintings dating from the mid fifteenth century to the early sixteenth century such as Bartolomeo Vivarini's *St Ambrose Altarpiece* (c.1477, Accademia, Venice), Giovanni Bellini's *Virgin and Child with a Donor* (Private Collection) and *Barbarigo Canvas* (1488, San Pietro Martire, Murano), and Titian's *Ca' Pesaro Altarpiece* (1519-26, Frari, Venice). These images have been chosen because they are the works which have received modern conservation treatments to approximate their original condition, and one can clarify their commissioning parties either by documentation or the pictorial composition including a donor portrait.

Commercial Sources

As the subject of the present study remains under-investigated, so do the documentary sources related to it. A large part of previous discussion of the materials and methods of Medieval and Renaissance paintings has centred around early recipe books for picture-making, including Cennino Cennini's *Il Libro dell'Arte*. These literary sources will remain a major consideration in the present discussion, but this study is also based on other documentary sources, such as tariffs, government records and merchant account books. These sources relating to commerce, and the care which is needed to interpret them, will be discussed, since they are rarely studied with reference to pigments.

⁴ Catalogue number within brackets, cat. 1 for instance, in the text and footnote refers to the entry number of the core works in Appendix 3.

Three surviving Venetian tariffs form an important group of documents in this study; (1) the *Zibaldone da Canal* (henceforward Da Canal Tariffa)⁵; (2) the *Tarifa zoè noticia dy pexi e mexure di Luogi e Tere che s'adovra marcadantia per el mondo*, (henceforward Marciana Tariffa)⁶; (3) the *Tariffa de pesi, e misure, quasi di tutte le parti di mondo* (henceforward, Pasi's Tariffa)⁷. These Venetian 'Tariffas', or merchant manuals, will be examined along with other surviving contemporary tariffs in particular one written by a Florentine, Balducci Pegolotti (henceforward, Pegolotti's Tariffa).⁸ These Tariffas, that were originally compiled to deal with the differences of taxation, currency, measures and weights between various localities, are also useful for their descriptions of markets and trade routes, which include the trade in pigments in the Mediterranean.⁹ Emphasis is given to Pasi's Tariffa, which is exceptional in that it comments on the specific origins of some colours as well as the methods by which they were traded.¹⁰

The Tariffas in consideration span over two centuries, but they are comparable in the sense that there were few changes in trade patterns from the fourteenth century up to the early sixteenth century. A series of historical events and geographical discoveries in the second half of the fifteenth century led to the decline of Mediterranean trade and eventually of the Venetian Republic, but this process was slower.¹¹ The dramatic change

⁵ The manuscript of the *Zibaldone da Canal*, dated to c.1320, is in the Beinecke Rare Book Library at Yale University. It was published in Italy in 1967; A. Stussi, *Zibaldone da Canal: manoscritto mercantile del secolo XIV*, Venice, 1967. It was recently translated into English; J. Dotson, *Merchant Culture in Fourteenth Century Venice: The Zibaldone da Canal*, New York, 1994. The page number referred to here is the Stussi's version.

⁶ '*Tarifa zoè noticia dy pexi e mexure...*' was dated to ca. 1345 and its manuscripts are kept in the Marciana; Archivio di Stato, Venezia (Hereafter ASV), Busta dei Procuratori di San Marco, and was published by the Università di Pavia in 1925.

⁷ B. Pasi's *Tariffa de pesi, e misure, quasi di tutte le parti di mondo* was first published in Venice in 1503, and reprinted afterwards. The British Library has the four different editions including Pasi's own original version. Paolo Gherardo's 1557 edition has pagination and is referred to in the present study.

⁸ A copy of Pegolotti's fourteenth-century manuscript is presently in the Biblioteca Riccardiana, Ms.2441. Allan Evans published it in 1936 and corrected thoroughly the seventeenth-century printed edition; F. Pegolotti, *La Pratica della Mercatura*, (ed.) A. Evans, Cambridge Mass., 1936.

⁹ For discussion of the surviving Tariffas in terms of economic history, see U. Tucci's 'Tariffe Veneziane e Libri Toscani di Mercatura', *Studi Veneziani*, (10), 1968, pp.65-108.

¹⁰ The descriptions of the other surviving Tariffas are often not specific enough to define the origin of raw materials. Many colours were described to be marketed in a specific place, but remain undefined as to which of these materials are native and imported materials.

¹¹ In 1453 the Byzantine Empire fell to the hands of Ottoman Turks, whose power was rapidly expanding in the eastern Mediterranean during the period. Vasco da Gama's voyage to India through the Cape of Good Hope five years after Columbus's discovery of America in 1492 posed an imminent threat to the Venetian monopoly of the spice trade. Vasco da Gama returned from India with pepper, the single most important item of the East-West trade in that period. Venice

in the trade in colour materials happened during the sixteenth century when inexpensive alternatives were increasingly imported from the Americas.

Our knowledge of the sources of colours and the trade in pigments in the Levant is further enhanced by reading fourteenth- and fifteenth- century commercial documents. This is a vast subject, and this study restricts itself to the documents concerning the price of pigments.¹² Accurate information regarding the price of trading items including colour materials was crucial to international trade and was frequently surveyed by merchants and government. By examining the price differences of pigments between Venice and other cities, this study will assess Venetian painters' advantage in colour in terms of price. The price survey of merchandise marketed in Venice found in a letter from Zanobi di Gaddi to Francesco Datini in 1393 will be referred to frequently [Hereafter 1393 Datini letter].¹³ Apart from price surveys,¹³ various sources which recorded the trade in colour materials and their prices will be considered.

In Pasi's Tariffa and the 1393 Datini letter, the colours traded by Venetian merchants were listed along with other commodities.¹⁴ It is important to note that the colours mentioned in these sources do not cover the entire range of pigments known to have been used in the Renaissance painter's workshop. The share of the market for pigments devoted to what we now call the fine arts was quite small. Dyeing industries absorbed a greater proportion of pigments as did medical practice. Thus, the colours best described in the commercial records such as Tariffas and public records, are mostly related to these sister industries.

survived well as a commercial centre in the next century, but those events led to the eventual decline of the Venetian republic.

¹² A majority of these documents referred to in this chapter are from Federigo Melis's documentary survey, *Documenti per la Storia Economica dei Secoli XIII-XVI*, Firenze, 1972.

¹³ Archivio di Stato, Prato (ASP), D, n.1171; F. Melis, *ibid.*, Doc. 86, pp.298-9.

¹⁴ They matched with virtually all the pigments now known to have been used in that period. Pasi named 'Terra rossa; cioè ambulo/ terra negra, zala/ Bianca biave e zesso crudo/ Grana, e polvere di grana/ Cremese, Roza e verzin/Endego, Oro pimento/ Cenabrio, Risalgallo & Arsenico/ terra verde'; Pasi, *op. cit.*, p.2. Pasi intended here to give a brief list of merchandise marketed in Venice, and the other two Venetian Tariffas are similar in this respect. To understand the wider range of the colours which were traded in Venice, Pasi's short-list should be complemented with other documents. The 1393 Datini letter reported some 150 items and their prices. One can find among them a group of pigments which consists

Some of the pigments marketed in Venice were local or European products, whereas others were of non-European origin, most of which came to Venice only through long-distant trade from the East. The present study shows that colours were, together with pepper and other Oriental luxuries, one of the most important items on the shopping list for Venetian merchants travelling in the East. What emerges also from the sources related to commerce is that the trade in colour in the Mediterranean was not a one-way traffic from the East to the West. As the West needed exotic colours from the East, so people in the East were customers for European colours. Discussion of the European colours traded in the Venetian markets for export is also relevant, since they may have further enhanced local painters' premium in the choice of diverse pigments.

Contracts

The price of pigments found in the documents was variable, presumably depending on their availability as well as qualities and suppliers, but it seems that the overall cost of pigments was generally high. Surviving documents of payment show that it was one of the major expenses of any pictorial project.¹⁵ Because of this, surviving Renaissance contracts carefully stipulated the provision and expense of pigments along with gold and the frame.¹⁶ Therefore, it can be hypothesized that the cost and relative value of pigments were one of the critical factors which influenced the painting practice of Venetian and Italian Renaissance painters, and ultimately a matter of concern to the parties which commissioned the project. The question as to how the mechanism of the choice of colours worked between artists and patrons is a complicated matter, but this study will

of verdigris, vermilion, lac, brazil wood, ultramarine, and azurite. This business letter written by T. Gaddi to Datini is in ASP, D., n.1171; Melis, *op.cit.*, Doc. 86, pp.298-299.

¹⁵ The proportion of the cost of pigment to the overall cost varied depending on the nature of pictorial projects, but seems generally very high. To carry out the fresco decoration of Prato Cathedral, Fra Filippo Lippi was paid 312 ducats for his colours between 1452 and 1465; E. Borsook, *The Mural Painters of Tuscany: from Cimabue to Andrea del Sarto*, Oxford, 1975. In Venice, Jacopo Tintoretto was paid 100 ducats solely for the expense of pigments for his canvases of the Scuola di San Rocco in 1577 and further paid 16 ducats each in 1579, 1581, and 1583; R. Berliner, 'Die Tätigkeit Tintoretto's in der Scuola di S. Rocco', *Kunstchronik und Kunstmarkt*, 1920, p.496.

¹⁶ For the study of Italian Renaissance contracts, see H. Glasser, *Artists' Contracts of the Early Renaissance*, London and New York, 1977; M. O'Malley, *The Business of Art- Contracts and Payment Documents for Fourteenth- and Fifteenth-Century Italian Altarpiece and Frescoes*, Ph.D.diss., Warburg Institute, London, 1994.; M. Baxandall, *Painting and*

attempt to shed some light on it by analyzing surviving Venetian contracts and payment documents, particularly their stipulations of materials and their provision .

This study is based on thirty Venetian contracts dated from 1440 to 1520 [Appendix 4]. In contrast to the relative poverty of the surviving documentation relating to Venetian altarpieces, canvas cycles for mural decorations, which were the Venetian equivalent of fresco in Central Italy, have been well documented and constitute the basis of the present study. Among thirty examples, sixteen are contracts commissioning canvas narrative cycles, along with two which concern banners and twelve altarpiece contracts. The distinctive aspects of Venetian contracts concerning their stipulation on pigments will be dealt with later in this chapter.

Monetary System

The monetary system of Renaissance Italy referred to in this study is based on the Venetian gold coin, the 'ducat'. The Venetian ducat, first issued in 1284, was kept at 3.5g of almost pure gold (0.997fine), the same as the Florentine 'fiorino' and Genoese 'genovino'.¹⁷ The trade in colour materials was an international business. That these gold currencies were considered equal in exchange throughout Italy and Europe is relevant in the discussion of their absolute value between Venice and inland cities. In addition, since the value of gold coins did not distinctively decrease as that of silver coins did during the period, one can compare the prices of pigments in different periods on the basis of gold coinage.

Commercial documents and payment documents referred to lire and soldi based on silver penny 'denari'; 240 denari=20 soldi=1 lira. This study uses 'soldi' or 'soldi di piccoli', 12 denari, as the representative of silver coinage. The exchange rate of denari against ducat varied between the cities, but were devalued. In Venice, one ducat was worth 64

Experience in Fifteenth Century Italian Painting, Oxford, 1990. See also Martin Kemp's *Behind the Picture; Art and Evidence in the Italian Renaissance* (London, 1997), particularly its section on contracts.

¹⁷ I shall use the term 'ducat' to indicate gold money throughout the study, unless it is necessary to indicate another coin of gold. For the discussion of the monetary system of medieval Italy and Europe, see F. Lane, *Venice, A Maritime Republic*,

soldi (L. 3 s.4) in 1310, but 124 soldi (L.6 s.4) in 1455 when the Venetian government made the official legal tender of denari to ducat.¹⁸ The ducat/lira equation will be given on the basis of the local rate.

1.1 Venetian Colour

This section will focus on the major pigments scientifically identified to have been used by Venetian painters and their applications. The pigments which had low commercial values in international trade such as various earth colours, and yellow lakes, which have not been generally assessed by scientific tools are excluded from this discussion. The present chapter is concerned solely with the use and value of pigments. The interference of binding media to the colouristic value of pigments will be discussed later in Chapter 2.

1.1.1 Blue

Blue colour is liturgically and iconographically highly respected in Christianity. As a celestial colour, it was conventionally reserved for the representation of the Supreme Heavenly Beings, Christ and his mother the Virgin Mary, and often serves as a chromatic focal point of pictorial composition. Pigment analysis has identified ultramarine, azurite, smalt, and indigo for the blue colour in Venetian Renaissance paintings. Ultramarine, the finest blue pigment and the most precious colour at that time, was dominant among the blues. The slightly more greenish blue azurite was used, but its role was subordinate to ultramarine.¹⁹ The use of smalt and indigo appear to be peripheral in painting practice, but the reports of their presence have increased and thus deserve our attention.

Ultramarine

Amongst the blue pigments, ultramarine gave the most desirable blue which competed with brilliant red and yellow colours both in easel and fresco works and thus was one of the indispensable elements of Medieval and Renaissance painted work. The extensive

Baltimore, 1973, pp.148-150; F. Lane, *The Venetian Money Market: Bank, Panics, and Public debt, 1200-1500*, Baltimore, 1997.

¹⁸ This governmental rate was kept to the sixteenth century; see *ibid* and F. Lane, *Money and Banking in Medieval and Renaissance Venice*, Baltimore, 1985.

¹⁹ For blue colour in Venetian paintings in general, see Lazzarini, *op.cit.*, 1983, p.135.

application of ultramarine is now identified in the blue areas of Venetian paintings of the fifteenth and sixteenth centuries. It is dominant especially in the garments of the Virgin and saints, in both half-length Madonna and Child and altarpieces, and serves as the chromatic focus of composition. The role played by ultramarine will be discussed in the ensuing section dedicated to the development of Venetian colourism.²⁰

The popularity of ultramarine as a colour was counter-balanced by its price. It was a costly material, which was only extracted from a rare mineral stone, *lapis lazuli*, singularly found at that time in an ancient mine near modern day Afghanistan. It reached Europe after a long and arduous journey either overland to the Mediterranean or south to India, and then by sea to the Europe.²¹ Sources show Damascus and Acr to be the main markets of ultramarine in the East, and Venetian Tariffas describe its trade in Damascus. The Marciana Tariffa, for instance, reported that '*azuro*' was marketed in Damascus in a local measurement '*cento de deremi*', that was one Venetian light pound.²² A similar statement is found in Pegolotti's Tariffa.²³ It seems reasonable that '*azuro*' in these texts was referring to '*azuro oltramare*' since it was listed with other precious spices from the Orient like saffron and traded in minute quantities. Another blue colour, azurite, has a western origin, whereas indigo was reported separately as '*endego*'.²⁴ The trade in ultramarine in Acr may once have been prominent since ultramarine was referred to as '*Acr blu*' in fifteenth-century Spanish artists' contracts.²⁵

The principal destination of lapis lazuli from East to West was probably Venice. Until 1500 Venice held control of half of the pepper trade, the single most important

²⁰ For chromatic composition of Venetian works, see following pp.66-78.

²¹ For the general discussion of ultramarine and the scientific methods of its identification, see J. Plesters, 'Ultramarine Blue, Natural and Artificial', *Artists' Pigments* (ed. by A. Roy), vol.2, Washington, 1992, pp.37-66.

²² 'zafaran e l'azuro, e ambro se vende in Damasco a cento de pexi de deremi e lo dicto cento geta a veniexia livra 1 a sotil'; the Marciana Tariffa, pp.56-57. One Venetian light pound weighs 300g; R. Zucko, *Italian Weights and Measures from the Middle Ages to the Nineteenth Century*, Philadelphia, 1981.

²³ 'zafran, l'azuro e ambro se vende in Damasco a Cento de deremi'; Pegolotti's Tariffa, p.77.

²⁴ 'zenzevero, verzij, chanela, lacha, endego, inzenso e tute altre spezie grosse, e zuchary se vende a kanter soprascrito, lo qual geta a veniexia livre 600 a sotile.'; Pegolotti's Tariffa, p.77.

²⁵ J. Dunkerton et al., *Giotto to Dürer*, London, 1991, p.184.

commodity from the East imported to Europe at that time.²⁶ Thus it seems reasonable to assume that Venice controlled a substantial proportion of ultramarine imported from the East. Venice's position as the capital supplier of ultramarine can be implied from the alternative names given to it. Renaissance painters and patrons generally bought their pigments including ultramarine from *speziali*, and they were either aware of the place of purchase or confused it with the origin of the colour. Both south and north of the Alps, ultramarine was referred to as 'ultramarine of Venice' ('*oltramare di Venecia*' in Italy or '*ultramarine of Venice*' in England).²⁷

Lapis lazuli which arrived in Venice was further purified and refined for re-export all over Europe.²⁸ The complicated and lengthy process of its purification is one of the factors that further served to raise its cost.

Ultramarine was certainly traded in major ports and cities other than Venice. Genoa, Venice's arch-rival sea power in the Levantine trade, was an alternative destination of lapis lazuli. A price survey of Genoa in 1396 reported that ultramarine was sold in Genoa.²⁹ Florence also appears to have been an important centre for the supply of ultramarine. Pegolotti's Florentine Tariffa listed it as a trading item alongside other Oriental luxuries and perfumes. In Florence, the Gesuati in San Giusto alle Mura was one of its major suppliers.³⁰ The ultramarine used for the decoration of the Chapel of San Jacopo, Pistoia Cathedral, is known to have been obtained from Florence in 1347.³¹

²⁶ The other half was divided into merchants from Genoa, Florence, France and Spain. For trade of *spezie* in this period, see G. Luzzatto, *Storia economica di Venezia*, Padua, 1961; F. Lane, 'The Mediterranean Spice Trade; Its Revival in the Sixteenth Century', *American Historical Review*, (45), 1940, pp.581-90.

²⁷ For a reference to '*ultramarine of Venice*' in an English document of 1600, see N. Hilliard, *A Treatise concerning the Arte of Limning together with A More Compendious Discourse concerning ye Art of Liming by Edward Norgate*, (eds.) R. Thornton and T. Cain, Manchester, 1981. For a reference to '*Oltramare di Venecia*', see Merrifields, *Original treatises dating from the XIIth to the XVIIth centuries on the arts of painting*, 2 vols., London, 1849, (Dover print, New York and London, 1967).

²⁸ In personal conversation, Lazzarini pointed out that the Gesuati in Venice played an important role in the purification of ultramarine and its trade in Europe, as such they did in Florence. For the Gesuati's activity in the colour trade in Florence, see P. Bensi, 'Gli Arnesi dell'Arte. I Gesuati di San Giusto alle Mura e la Pittura del Rinascimento a Firenze', *Studi di Storia delle Arti*, 1980, pp.33-47.

²⁹ Melis, *op.cit.*, pp.304-5.

³⁰ Bensi, *op. cit.*, pp.33-47.

³¹ S. Ciampi, *Notizie inedite della della Sagrestia pistoiese de' belli arredi del Campo Santo pisano*, Florence, 1810, doc.29, p.147; D. Bomford et al., *Art in the Making: Italian Painting Before 1400*, London, 1989, pp.201-3.

Nevertheless, painters and patrons in inland Italy seem often to have had difficulty in obtaining a satisfactory quality of ultramarine in local areas. Surviving documents show that they ordered ultramarine blue directly from Venetian merchants to carry out pictorial commissions with the desire to obtain better quality and possibly a better deal. The accounts for a chapel at Brescia records that Giovachion bought ultramarine in Venice in July 1415 for Gentile da Fabriano. The high quality of ultramarine which has been reported to be found in the works commissioned by the members of the d'Este family in Ferrara and Mantua seems to have been from Venice.³² Benozzo Gozzoli reminded his patron Piero de' Medici of the necessity to purchase ultramarine from Venice in 1459.³³ Even in Venice, the best quality of ultramarine was not always available on the market. In response to her agent who had difficulty in finding the finest quality she requested, Isabella d'Este wrote in 1496 to allow him to buy the blue of lesser quality, but still the best in the Venetian market; 'il più bello che in Venice se trova'.³⁴ Painters in the sixteenth century such as Raphael and Jacopo Bassano continued to seek Venetian ultramarine.³⁵

In Venice ultramarine was the most expensive colour among the traded pigments, although considerably cheaper when comparing its price to that in other cities. The price survey of Venice in the Datini letter of 1393 shows that it was marketed at 2 ducats per one Venetian pound which weighs now around 300g; four times higher than the medium quality of the other type of blue, azurite '*azzurro de la Magna*', and '*verzino mondo*', one of the sources of fine red lake, and six to eight times dearer than other colours from the Levant such as lac and indigo, traded in Venice.³⁶ It seems that for this reason, surviving

³² J. Dunkerton et al., 'The Unmasking of Tura's Allegorical Figure', NGTB, (11), 1987, p.34.

³³ In a letter written by Gozzoli during the decoration of the Medici Palace in Florence; G. Gaye, *Carteggio inedito d'artisti dei secoli XIV, XV, XVI*, vol. 1, Florence, 1839-40, pp.192-3, and 583.

³⁴ E. Verheyen, *The Paintings in the Studiolo of Isabella d'Este at Mantua*, New York, 1971, p.12. The term azzuro was used in the document. It seems to refer to ultramarine in this case.

³⁵ Raphael sent his assistant from Rome to Venice to purchase his pigments in 1518; G. Campori, *Notizie inedite da Raffaello da Urbino tratte da documenti dell'Archivio Palatino di Modena*, Modena, 1863, p.12. The account book of Jacopo Basano shows a number of purchases of pigments from Venice; see M. Muraro, *Il Libro Secondo di Francesco e Jacopo da Ponte*, Venice, 1992.

³⁶ The 1393 Datini letter shows that *laccha mature* was sold in duc. 35, *verzino cholombino* in duc. 30 to 35, and *indaco bachadeo* in duc. 24 per 100 pound in Venice. The price of orpiment was duc. 17 to 18 and that of realgar was duc. 5 in hundredweight, lower than the manufactured colours, vermilion and vedigris; see Melis, *op. cit.*, Doc. 86, pp.298-9.

Venetian contracts and payment documents, like those from the rest of Italy, also stated its use in commissioned works.³⁷

The re-sale price of ultramarine outside Venice rose sharply with the addition of custom taxes, freight and dealer's profit, making the trading price of ultramarine in Venice look modest. Apart from Genoa which may have offered a competitive price, 8 to 10 soldi per ounce, 1.5 to 2 ducats per pound,³⁸ the price of ultramarine was around one to three ducats per ounce in fourteenth- and fifteenth- century documents. The ultramarine used in Pistoia Cathedral was around one ducat per ounce, then 12 ducats per pound. In Prato, ultramarine was priced around 14 to 20 ducats per pound in 1394, one year after the 1393 Venetian price survey.³⁹ This wide price range may imply the varying quality of ultramarine on the market. Cennini referred to six different grade of ultramarines after purification. He advised that only the first two grades were worth eight ducats per ounce.⁴⁰ If the ultramarines recorded in the price survey of Venice in 1393 and in Prato and Pistoia were of marketable quality, the price difference between Venice and central Italy is significant. The ultramarines purchased in Florence for Pistoia Cathedral in 1347 and in Prato in 1394 is as much as six to ten times higher than that in Venice. Then, one ounce, 25g, of ultramarine, which can fill the medium-size tube of modern oil colour container, were marketed at around one to two ducats in central Italy in the fourteenth century. The price of ultramarine in Central Italy virtually remains unchanged in the first half of the fifteenth century, but increased to 4 to 5 ducat per ounce in the late fifteenth century. It appears that the price to a foreign buyer was not favourable in the Venetian market as was the case with Giovachion buying ultramarine in Venice for Gentile da Fabriano, then working in Brescia. In July 1415, he paid the Venetian *speziale* Armanino da Nola 45 ducats for 2 pounds and 6 ounces of ultramarine; 18 ducats for one pound,

³⁷ However, the stipulation of its quality is not as rigorous as those found in the central Italian examples; see pp.35-6, for detailed analysis.

³⁸ According to its price survey in 1396; F. Melis, *op. cit.*, Doc. 87, pp.304-6. Unlike in Venice, ultramarine was priced in ounces in Genoa. This implies the lesser scale of the trade of ultramarine in Genoa.

³⁹ Florentine pound weighs 340g and is heavier than Venetian pound, 300g.

⁴⁰ C. Cennini, *Il Libro dell'Arte*, Vicenza (Neri Pozza edition), 1971, Chapter 62. Cennini seems to exaggerate the value of high quality ultramarine. The most expensive example known for the price of ultramarine is a value of five ducats per

then 1.5 ducat per ounce.⁴¹ In 1472, the d'Este family purchased ultramarine in Venice at the rate of 36 ducats per pound.⁴² Nevertheless, the purchase of ultramarine from Venice was cheaper. In Venice Vespasiano da Bisticci purchased ultramarine on behalf of Pius II for one ducat per ounce, but Andrea Castagno had to pay three and a half ducats per ounce, three times more than Vespasiano to the Gesuati in Florence for his ultramarine.⁴³

The dreadfully high cost of ultramarine in central Italy can be further indicated in the payment documents of the chapel of San Jacopo in Pistoia Cathedral in 1347 which shows that one ounce of ultramarine was at least 1 ducat, that was 61 to 62 soldi, while a master painter was paid 12 soldi per day and his assistant was paid 8 soldi for their works.⁴⁴ Thus, mathematically, the master in this commission had to save the wage he earned for five days if he wanted to have the 25g of ultramarine for himself, and in the case of the assistant he would need to work eight days.

Can one tell the practical advantage of Venetian painters within the home market in the application of such a precious pigment in picture-making? In the employment of ultramarine, a certain difference has been established between Italian and Northern European paintings. Although ultramarine was reported to be more widely used in prestigious commissions by major painters than before, the major blue in Northern Europe was azurite.⁴⁵ This is understandable, considering the costliness and rarity of ultramarine in Northern Europe. Its price in Northern Europe reached an almost prohibitive level. Dürer wrote that one ounce of ultramarine cost around 12 ducats in Antwerp, two to three times as much as that in contemporary Central Italy. In the application of ultramarine, the contrast between Venetian and central Italian paintings is

ounce found in the contract made between Andera del Sarto and San Salvi in Florence in 1515; J. Shearman, *Andrea del Sarto*, London, 1965, pp.391-393.

⁴¹ K. Christiansen, *Gentile da Fabriano*, London, 1982, Doc.3, pp. 150-159.

⁴² Dunkerton et al., *op. cit.*, 1987, p.34.

⁴³ A. de la Mare, *Vespasiano da Bisticci, historian and bookseller*, PhD diss. Warburg Institute, London, 1965, n. 36, p.180; A. Thomas, *The Renaissance's Practice in Renaissance Tuscany*, Cambridge, 1995, p. 170. It can be assumed that the quality of ultramarine was very high as it was destined for the Pope.

⁴⁴ Ciampi, *op.cit.*, doc.29, p.147

⁴⁵ For examples, see L. Campbell, S. Foister and A. Roy (eds.), 'The methods and materials of Northern European Painting 1400-1550', NGTB, (18), 1997, pp.34-5.

less distinctive. Amongst 100 core works, ultramarine was found in almost every Venetian example, and with equally similar frequency in Italian examples produced outside Venice [Appendix 3].⁴⁶

In Central Italy, ultramarine was frequently used even in the execution of domestic devotional images of modest price, in which the use of cheaper colours was a better option to painters in order to resolve their balance sheet.⁴⁷ Ultramarine is found in all four Florentine Madonna and Child paintings of the fifteenth century, examined by J. Dunkerton in 1995-6. It was exclusively used in all the blue areas such as the Virgin's mantle and sky in David Ghirlandaio's Madonna (78.8x46.5cm, National Gallery, London) and that of the Imitator of Fra Filippo Lippi (69.9x48.3cm, National Gallery, London). Nevertheless, Central Italian painters' effort to economise on ultramarine may be hinted at in Domenico Ghirlandaio's Madonna in which azurite was used in the Virgin's blue mantle.⁴⁸ Ultramarine is reported to be found in the sky mixed with lead white, but it is azurite that was used as an underpaint and glaze in the blue mantle of the Madonna. Such an extensive use of azurite for the representation of key religious figures like the Madonna is not the case in Venetian religious paintings. Amongst the 55 Venetian works in which ultramarine was identified in the Core Works, azurite is very seldom used as the final glaze for the blue costume.⁴⁹

In prestigious commissions like altarpieces and frescoes, Central Italian painter show little effort to save on the use of ultramarine. The extensive use of ultramarine was

⁴⁶ Ultramarine is found 42 out of 66 Venetian works (c.76%) considered in this study. This percentage significantly increases if we exclude late sixteenth century examples. Similar frequency is found in Central Italian examples (c.70%).

⁴⁷ In spite of the high cost of raw materials, the overall price of these images in central Italian cities is unlikely to have been different from those in Venice. In 1474 a local Venetian painter Lazzaro Bastiani was paid six ducats for a painting of Christ the size of half a small sheet of paper. In the early fifteenth century, Francesco Datini namely the Merchant of Prato when in Avignon asked a friend in Italy to supply him with a triptych depicting the Crucifixion or the Madona and Child, which cost around six ducats. If these images were circulated in a similar price range, the use of cheaper colours was more a sensible option for central Italian painters in order to resolve their balance sheet.

⁴⁸ See cat. 92 in Appendix 3.

⁴⁹ There are some exceptions in Venetian works; Lotto's *Holy Family* (National Gallery, London), for instance. See cat.43 in Appendix 3.

reported in Central Italian altarpieces and frescoes.⁵⁰ A fundamental question, then, arises as to why the use of ultramarine is comparable given the sharp contrast of the accessibility and price of ultramarine between Venice and Central Italy? Surviving artists' contracts indicate that it was the clients' wish that bridged the price gap between Venice and Central Italy. It was a common practice to stipulate the application of high grade ultramarine using terms such as 'maxime azurro ultramarine' and 'azuro finissimo oltramarino' in the altarpiece and fresco contracts of the period in Central Italy.⁵¹ In the 12 Venetian altarpiece contracts which the author has surveyed, the stipulations over the use of ultramarine and its quality is much relaxed.⁵² Two cases are found amongst the 16 Venetian contracts for narrative canvas cycles, alongside the four examples which broadly termed the use of good 'azuro' or 'azuri'.⁵³ The contrast between Venetian and Central Italian contracts referring to blue and other colours provides one of the critical clues to examine the Venetian concept of colour and will be further discussed later in this chapter.⁵⁴

Azurite

The other important blue, azurite, comes from a mineral called *lapis Armenius*, whose deposits were scattered around Europe. This ore was reported to be found in Italy, France, and Spain, but its main supplier was mountainous regions in Germany and

⁵⁰ There were examples which suggest that azurite was the only blue employed in the altarpieces. Ultramarine was not reported in the fragments from Ugolino di Nerio's *Santa Croce Altarpiece*; Bomford et al., *op. cit.*, 1989, pp.98-123. However, the lost central panel made it difficult to gauge the range of pigments employed in this commission.

⁵¹ M. O'Malley reports that the use of blue colour was stipulated in 45 out of the 181 Italian contracts and payments records for fresco and altarpiece dated to fourteenth and fifteenth centuries; M. O'Malley, *op. cit.*, fn.96, pp.59-60. The number of the cases which termed ultramarine is up to 18. Her analysis includes the Venetian examples. Amongst the 30 Venetian contracts the author surveyed, the specific use of ultramarine is noted for 4 commissions. Since two of them are contracts for banners, it seems that the stipulation of ultramarine was much rarer in Venetian contracts.

⁵² The term ultramarine is not found in the Venetian contracts. Instead, two contracts stipulated the use of 'azuro', which can be interpreted either as ultramarine or azurite; see Doc. 24 and 25 in Appendix 4. The 'optimo azuro' in the contract between Cima and the Scuola dei Battuti for the execution of the *Conegliano Altarpiece* (Conegliano, Duomo) is the most restricted condition of blue colour in the Venetian examples.

⁵³ For the use of ultramarine, see Doc. 3 and 13 in Appendix 4. Its quality was not mentioned. The stipulation of the good quality of 'azzuro' is found in Doc. 1, 2, 4, and 11. Its condition is defined with other colour. In the case of Jacopo Bellini, it was termed as 'cholori perfeti de azuro e de altri cholori ubligandose...' [Doc.1]. Gentile promised to use 'boni coloru azuro e horo chome achadra' [Doc.2]. Bastiani's payment includes all the necessary expenses 'colori, ori, azuri et ogni altra cosa sopra dicti', which must be in perfect condition [Doc.4]. It is interesting to note that all the two Venetian banner contracts stipulated the use of ultramarine [Doc. 17 and 18]. This seems to suggest the importance of public display in Venetian confraternity; see pp.178-179 in Chapter 5, for discussion of Venetian banners.

Hungary, which gave it its alternative names such as *azuro ongaro*, *azuro tedesco*, and *azuro della Magna*.⁵⁵ As such, the main dealers in azurite were Central European. Baldovinetti records the purchase of azurite from German and Polish merchants in the accounts for the frescoes for the Gianfigliuzzi Chapel in Santa Trinita, Florence.⁵⁶ This document also shows that further supplies of azurite in the commission came from Venice through a local glazer, Giovanni d'Andrea. The commercial activity of merchants from Central Europe was strong in Venice and it is probable that azurite was brought by them to barter for Oriental *spezie* and other goods.⁵⁷

Compared to ultramarine, azurite is not a strong blue. Even in its highest quality azurite tends to have a slightly greenish or grey tone.⁵⁸ Moreover, it has some restriction as pigment. Its copper-based chemical component responds to water, which could cause it to change colour to green.⁵⁹ It is, therefore, not a desirable material for fresco, and is found amongst the colours which were advised not to be used in this medium by Cennini.⁶⁰ Nevertheless, it was an important pigment in panel painting, primarily as a less expensive alternative to ultramarine. In 1393, it was marketed in Venice at about a quarter of the price of ultramarine, around 8 to 16 gross per one Venetian pound.⁶¹ Its wide price

⁵⁴ The most significant difference between Central and Venetian contracts is found in the stipulation of azurite. See ensuing discussion of azurite.

⁵⁵ This ore also gives an major green colour, malachite. The general discussion of azurite and its identifying method, see R. Gettens and E. Fitzhugh, 'Azurite and Blue Verditer', *Artists' Pigments*, vol.2, Washington, 1993, pp.23-35.

⁵⁶ Dunkerton et al., *op. cit.*, 1991, p.184.

⁵⁷ Azurite from Central Europe seems to have been exported to the East from Venice. Pegolotti reported that *azzurro della Magna* was measured in *cantera forfori* in Alexandria; Pegolotti's Tariffa, p.70. It remains unexplained in Pegolotti's text whether the merchandise in discussion was sold or bought; in other words, imported or exported. He reports that *azzurro della Magna*, listed with dozens of other *spezie*, was traded in Alexandria, but without Pasi-like definition of origin. In this case, however, one can assume its place of origin. *Azurro della Magna*, an alternative name for *azuro tedesco*, literally 'German blue', has important deposits in Northern and Southern Europe. As it was reported to have been traded in Alexandria in Pegolotti's, it seems safe to conclude that this blue colour was brought to Alexandria with other European goods by European merchants including Venetians. If it is so, it seems that the most precious colour of all exported colours from Italy to the East was azurite, or 'German blue'. It was reported to be sold in gros. 8 to 16 per pound in Venice in 1393, higher than vermilion which was highly valued in Eastern markets among the European colours chemically manufactured. The price of azurite in Eastern markets has not yet been discovered, but was certainly higher than in the European markets.

⁵⁸ The high quality of azurite is found in paintings by German school; Campbell et al., *op. cit.*, 1997, pp. 36.

⁵⁹ Gettens and Fitzhugh, *op. cit.*, 1993, pp.23-35.

⁶⁰ Cennini advised that orpiment, vermilion, azurite, red lead white lead, verdigris, and lac cannot be used in fresco; Cennini, *op. cit.*, Chapter 72. In Cimabue's fresco in the Upper Church of St Francis in Assisi, azurite is reported to turn green; Gettens and Fitzhugh, *ibid.*, p.27.

⁶¹ The rate of 1 ducat per 24 grossi is given in the document; Melis, *op. cit.*, pp.298-9.

difference may explain the various degrees of its quality on the market.⁶² In Central Italy, it cost slightly more, one to two ducats per pound.

It is important to note that the price of azurite ranked the second highest among pigments in Venice and Italy. In the price list of Venice in 1393, it was marketed at only a fraction of the price of ultramarine, 10 to 15%, but together with lake colours from the Orient, was dearer than indigo and vermilion. Because of its costliness, azurite was stipulated in contracts with ultramarine or as a single blue colour on its own in Central Italy; seven Italian contracts specifically designated the use of azurite.⁶³ However, there is no such stipulation for the use of azurite in the Venetian contracts for altarpieces, narrative canvases, and banners. This reflects the relative lack of interest of Venetian artists and clients in azurite.

The price of azurite against ultramarine in central Italy in fifteenth century was around 1:8, whereas it was around 1:4 in Venice. This discrepancy is primarily owing to the sharp increase of the price of ultramarine outside Venice. By extension, it can be assumed that the use of azurite was economically a less attractive option to Venetian than to other Italian painters.

The low profile of azurite in Venetian contracts is well reflected in earlier fifteenth-century Venetian picture-making, which demonstrates the dominance of ultramarine for the blue colour and a relatively marginal role given to azurite. It was mainly adopted as an underpaint for the more expensive and superior blue of ultramarine. This method serves a double function. Painters could not only create the strong blue with the minimum use of ultramarine, but stabilize the tone, since pure ultramarine in oils without underpaint and lead white added can turn grey.⁶⁴ It seems that the building up of a blue using azurite underpaint and the final glaze of ultramarine on the top was first developed

⁶² Depending on the quality of ore and its preparation for pigments by correct grinding with water, it should be coarsely ground to obtain a desirable blue hue.

⁶³ O'Malley report 7 Italian contracts which stipulated the use of azurite; O'Malley, *op. cit.*, pp.59-65. None of them are Venetian. Yet, some of Venetian contracts which mentioned 'azuro' can be meant to be azurite; see above fn. 52 and 53.

by Netherlandish painters⁶⁵ and became the standard oil painting method in Italy in the second half of the fifteenth century.⁶⁶ This method was practised in Venice, but often replaced by ultramarine underpaint.⁶⁷ The final azurite glaze in Florentine Madonna paintings such as Domenico Ghirlandaio's example and the extensive use of azurite as a principle blue for prestigious commissions such as Ugolino di Nerio's *Santa Croce Altarpiece* (National Gallery, London) has not yet been reported in any comparable Venetian painting.⁶⁸

Azurite was rarely used as a colour in its own right in Venetian painting, except the blue areas of greenish hues and as an additive to the secondary colours such as green and violet. Azurite is found in the distant landscape in Giovanni Bellini's *Blood of the Redeemer*, and in the sea and landscape in Titian's *Baccus and Ariadne*.⁶⁹ It was further used as a component of green and violet. Mixed with lead-tin yellow, it made a good green colour for foliage and grass and a major green in Bellini's main panel in the *Pesaro Altarpiece* (c.1473-5, Museo Civici, Pesaro) is formed in this way. Ultramarine was a principal element used with red lake for violet in Venetian painting, but azurite took the place of ultramarine in the violet mantle of Christ in Bellini's *Pesaro Altarpiece*.⁷⁰ It is important to note that these greenish blue, bluish green and violet areas were all matched compositionally against the purplish hue of ultramarine in all the compositions of the abovementioned paintings. It seems that these bluish colours, engineered by azurite, aimed to enhance a chromatic contrast in the compositions.

The important value of azurite as an inexpensive alternative blue colour was gradually appreciated by Venetian painters in the second half of the fifteenth century when they developed a new format of painting; canvas cycles of religious and historical narratives.

⁶⁴ Gettens and Fitzhugh, *op. cit.*, 1993, pp.23-35.

⁶⁵ J. Plesters, 'Ultramarine Blue, Natural and Artificial,' *Artists' Pigments*, vol.2, Washington, 1993, pp. 37-65.

⁶⁶ For instance, this glazing method is found in the work executed by Tura, Mantegna, and Perugino; see cat. 69, 72, and 86 in Appendix 3.

⁶⁷ For examples, see cat. 3, 4, 9, 29, and 30 in Appendix 3.

⁶⁸ The main blue is azurite in Botticelli's *La Primavera* (Uffizi, Florence); cat. 89.

⁶⁹ See cat. 5 and 53 in Appendix 3.

⁷⁰ See cat. 9 in Appendix 3.

In these canvas paintings for mural decoration with a secular or semi-secular function, azurite came to be used as a main blue.⁷¹

Smalt and Indigo

Unlike mineral colours like ultramarine and azurite, smalt and indigo are unstable in the sense that they give an unpredictable hue and discolour easily within a short time. Smalt is made from cobalt enamel, a by-product of the glass industry, and indigo is a plant extract⁷²; both were consequently cheaper than azurite. The account book of the Chapel of San Jacopo in Pistoia Cathedral recorded in 1347 that indigo was marketed at 3s. 10d. per ounce, about 1/20 of the same amount of ultramarine and about a half of azurite. This ranking of blue colours was found in the 1393 Datini letter and the 1457 account of Cosimo Tura's costs for pigments for the design of tapestry.⁷³ It appears that the price of smalt was not properly documented, probably because it was rarely used at that time and, as a by-product of glass-making, considerably cheaper than blues from precious mineral ores.

Indigo and smalt have both been reported as being used as underpainting for ultramarine in Venetian painting. Bellini for example, used smalt in the blue areas of sky and costume in the *Pesaro Altarpiece* (c.1473-5, Museo Civico, Pesaro).⁷⁴ In Titian's *Ca'Pesaro Altarpiece* (1519-26, Frari, Venice), indigo was identified underneath ultramarine glaze in background sky and a small amount of smalt was found as a mixture to ultramarine. These works are gigantic in their dimensions, and the painters' effort to save precious colours in less prestigious areas was a reasonable consideration. Probably for similar

⁷¹ In Jacopo Bellini's four canvas paintings which once were parts of narrative cycles, azurite was more widely used; see cat.2 in Appendix 3. See pp. 180-183 in Chapter 5, for the discussion of this phenomenon.

⁷² The discolouration of smalt is often observed with oil medium, although smalt is known to be a stable pigment. For the discolouration of smalt, see J. Plesters, 'A Preliminary Note on the Incidence of Discolouration of Smalt in Oil Media', *Studies in Conservation*, (14), 1969, pp.62-74.

⁷³ Melis, *op. cit.*, Doc.86, pp.298-9. For Tura's cost of pigments, see A. Venturi, 'Cosimo Tura genannt Cosmè', *Jahrbuch der Königlich Preussischen Kunstsammlungen*, (9), 1888, pp.7-8.

⁷⁴ See cat. 9 in Appendix 3.

reasons, Titian and Giorgione used smalt for drapery in frescoes for the wall of the Fondaco dei Tedeschi in c.1508.⁷⁵

Scientific analysis has shown that indigo was used outside Venice.⁷⁶ Smalt seems to have been used in Central Italy as early as the fifteenth century, since it was commented on in the Bolognese Manuscript, dated to the mid-fifteenth century, as a blue colour better than the poor grades of ultramarine.⁷⁷ The rare examples which show the use of smalt from Central Italy in the Core Works are Piero della Francesca's Brera Altarpiece (Brera, Milan) and Raphael's *Coronation of the Virgin* (Pinacoteca, Vatican), dated to 1516-1520.⁷⁸

The use of smalt as a pigment in Venice was understandable considering its thriving glass industry from the Middle Ages. Smalt, which is a powdery form of blue glass, was obtained from this industry and seems to have been one of its important trade products. In the discussion of the trade of Damascus, Pasi added 'smalto' to the products exported from Venice.

Smalto azzuro fino, fa per Damasco, e comprasia Morano a tanto lire di marchetti la lira sottile, e vendesi a Damasco, a tanti de remi e rotoli, e se conducono senza alcuna spesa e tara.⁷⁹

In 1291, the Venetian government decided to move the furnaces and craftsmen from the main island to Murano because of the risk of fire and the effects of smoke.⁸⁰ Pasi confirmed that the glass industry based on Murano was a main supplier of smalt.

⁷⁵ Smalt was found in the blue drapery in fragmented fresco for the wall of the Fondaco dei Tedeschi executed by Titian and Giorgione in c.1508; B. Muhlethaler and J. Thissen, 'Smalt', *Artists' Pigments*, vol.2, Washington, 1993, pp.113-129.

⁷⁶ For the use of indigo in Northern and Central Italian works, see cat. 71, 72 and 96 in Appendix 3. Indigo was used as an underpaint in the canvas work ascribed to Spinello; M. Ciatti, 'The Examination and Conservation of a 14th Century Banner: first considerations', *European Paintings on Fabric Supports in the 14th and 15th Centuries; Techniques, Function, and Display*, a study day held at the Courtauld Institute of Art, on 16th May, 1998. Cennini recommended the preparation of underpainting by indigo before applying ultramarine; Cennini, *op. cit.*, Chapter-75. Indigo is reported to be used in Leonardo's *Last Supper*, H. Scheppe, 'Indigo and Woad', *Artists' Pigments*, vol 3, Washington, 1997.

⁷⁷ For the Bolognese Manuscript, see Merrifield, *op. cit.*, vol.1, p. 340-341. Smalt is not found in Cennino's manual.

⁷⁸ F. Mancinelli, 'La Transfiguratione e la Pala di Monteluce', *Princeton Raphael Symposium; Science in the Service of Art History*, 1990, pp.149-160. Smalt was identified as used in fifteenth-century Northern European painting such as D. Bouts' the Entombment; Campbell et al., *op. cit.*, 1997, p.36.

⁷⁹ Pasi's Tariffa, p.69.

⁸⁰ Lane, *op. cit.*, 1973, pp. 155-165.

The frequent use of indigo in Venetian paintings reflects the Venetian trade in Eastern colours. Indigo is an Oriental colour extracted from the plant '*Indigoferae*', and used principally as a dye. Its origin is India, but it was later cultivated in various places in the East and then imported to the West through the Levantine trade route.⁸¹ In Pegolotti's Tariffa, for instance, four types of indigo of different origins were listed: Baghdad Indigo, Indigo of the Gulf (Adriatic Sea), Indigo of Cyprus, and Indigo of Rif.⁸²

Sources show a prosperous trade in indigo in Alexandria.⁸³ It is difficult to say for sure that the indigo in these cargoes was from India, since a large amount of the indigo exported to the European market in this period was also from Baghdad and the Adriatic Sea. Further implications of the trade in indigo will be discussed in relation to red lake colours.

1.1.2 Red

Pigment analysis has identified vermilion, minium, and various reddish lakes for the red colour in Venetian Renaissance paintings. Vermilion was a popular pigment since the Middle Ages, but it was lake colours that dominated red pigment in Venice.⁸⁴ Red lead, red earth and haematite were also reported.

Red Lake

Red lake is a by-product of dye, consisting of dyestuffs extracted from a number of insect and vegetable sources.⁸⁵ It was precipitated on to a colourless substrate, commonly hydrated alumina or a naturally occurring calcium salt such as ground egg shells or marble. These substrates become transparent when combined with an oil and even semi-

⁸¹ H. Scheppe, *op. cit.*, pp.81-85; Thompson, *op. cit.*, p.135. The European woad industry began in the fifteenth century and could provide alternative sources to indigo from the East.

⁸² Pegolotti's Tariffa, p.295. It is not known which areas geographically 'Indigo of Rif' indicates.

⁸³ Pasi's Tariffa, pp.58-68; Da Canal Tariffa, pp.66-8; Marciana Tariffa, pp.60-62.

⁸⁴ Lazzarini, *op. cit.*, 1983.

⁸⁵ Recent study of pigment has detected what seems to be the red lake retrieved from clothes. This so-called recycled red lake is found in Titian's *Venus and Adonis* (c.1560, Getty Museum, Malibu). See J. Kirby and R. White, 'The Identification of Red Lake Pigment Dyestuff', NGTB, (17), 1996, p.67.

transparent with egg tempera, allowing lake pigments to be extensively used for glazing.⁸⁶ The identification of dyestuffs is still a difficult process. Of the successful analysis made so far at the National Gallery, London, a high proportion of the fourteenth- to sixteenth- century Italian samples have turned out to derive from the secretion of the scale insects, such as kermes, cochineal, and lac.⁸⁷ The application of the dyestuffs of vegetable origin, brazilwood and madder, for painting pigment were comparatively rare.⁸⁸

Apart from madder and cochineal which were found in Europe, most of the sources of red lakes were oriental. It is known that before the sixteenth century, when trade with the Americas began to supply abundant colour stuffs, a great centre of supply for brazilwood remained Ceylon, and kermes and lac were also from the East.⁸⁹ All these Eastern sources exported to the West through the Mediterranean trade route. The Tariffas and merchant's letters give an exceptionally full picture of the busy traffic of such colour materials from East to West. The documentary wealth is presumably due to a greater amount of these pigments being required for dyeing industries.

One of the major markets for brazilwood and lac was Alexandria, a busy Mediterranean port since its ancient foundation. When describing the measures and weights of Alexandria, Pasi lists brazilwood and lac together with indigo.⁹⁰ The two fourteenth-century Tariffas generally confirm that these items were traded in Alexandria in *cantera forfori*.⁹¹ In a business letter, written on 16th March 1424 by a Venetian Niccolò

⁸⁶ Bomford et al., *op. cit.*, 1989, p. 33.

⁸⁷ Kirby and White, *op. cit.*, 1996, pp.56-80.

⁸⁸ *Ibid.*

⁸⁹ D.Thompson, *The Material and Techniques of Medieval Painting*, New York, 1956, p.117.

⁹⁰ In the section *Dillordine dilla Tariffa di Alessandria* in Pasi's Tariffa; 'E nota: che avanti si garbella, al detto cantera. ... Si comprano zenzeri de tutte le forti, e zenzeri verdi, ogni sorte di sandali, e verzini, incenso, lacche, mirra, cedoaria, femenzina, cafora, e mi rabolani conditi, e fecchi, e di ogni sorte, gomma rabica, endego, zuccari de tutte le sorti. ... Se comprano de li a ducati 23 in 24. Il detto cantera forfori. Et in vinetia si vendono a peso sottile a grossi 5 in 6 la lira...'; Pasi's Tariffa, p.59.

⁹¹ However, brazilwood weighed in the heavier weight called 'carica' in the Da Canal Tariffa; 'Anchora sapié che 'I verçi se vende in Allexandria a charga e la carga del verçi, si é cantera 6 forfori'; Da Canal Tariffa, p.68. In the Marciana Tariffa, Venetian merchants bought brazilwood in the same weight that Pasi reported; '...verzij... a kanter forforini'; Marciana Tariffa, p.60. Da Canal Tariffa reports that indigo, indigo powder, and lac are sold in Alexandria by the cantar forfori; Da Canal Tariffa, p.66. Marciana Tariffa described the trading method of indigo in Alexandria; 'Endego se vende a

Bernardo in Alexandria to his home town, brazilwood was reported to have been brought into Alexandria by the caravans from Mecca and Bassora through the Red Sea, the shortest all-water route between the Indian Ocean and the Mediterranean. A reference to 200 *cantera* of brazilwood, worth 22 bizante, was found in this letter, along with other wares of Oriental origin such as pepper and cinnamon.⁹² At the end of his letter, Nicolò Bernardo added a list of the trading items travelling from Alexandria to Venice by merchant ships, reporting that 4 *cantera* of brazilwood was heading for Venice with 10 *zurli* of indigo.

Those colours of Indian origin traded in Alexandria were also found in Syrian markets. Damascus was an alternative destination to Alexandria for the caravans travelling from the Red Sea and, moreover, was a junction of the sea and land routes. Consequently, the spice market in Damascus was large enough to compete with that of Alexandria. A document, dated to 1395, shows that two bands of the caravans, one from Aleppo and the other from Mecca, met in Damascus.⁹³ The first arrived at Damascus on November 27 over land on the backs of camels, the so-called 'ships of the desert', whereas the second, which may have come to Mecca by the Red Sea from India and then changed to camels, reached their destination on December 6. The cargo they carried was all *spezie*. The cargo brought by the Aleppo group includes a high proportion of dyestuffs and pigments. According to the report, it carried 166 *somi* of indigo, 97 *somi* of lac, 9 *somi* of brazilwood, altogether almost half of the whole cargo of the caravans. The presence of colour materials is again strong in the Mecca group cargo, which carried 67 *somi* of lac, 10 *somi* of brazilwood, and 27 *somi* of indigo.⁹⁴

peza e la dita peza die pexar kanter 1, rotoli 10 forforin'; 'e se la pexa a pluy, la è del comprador, e se la pexa men, la è de quel che vende, che 'l vien a refar. E sepi che questi 10 rotoli, li qual tu as de avantazio, si è perche eli non vuol far garbelar lo dito endego, e questi 10 rotoli, li qual la peza e pluy, si è per la to tara'; Marciana Tariffa, pp. 29, 61. See also Pegolotti's Tariffa, p.56.

⁹² 'Condizion de spezie, chome per altre ve ho scritto, el se trova tra qui 'l Chaiero, in man de' mori, chapitade con la charavana da la Mecha e per la via del Coseier, da sporte 800 in 900. Piper val bixanti 130; zenzer beledi, kantari 1000 val bx. 22; mechini, kant. 500 val bx. 13; verzi, kant.200 val bx.22; chanelle fina, 100 val bx.70; e molte altre spezie, la quantità del le qual mal savemo, per eser tute al Chaiero'; Melis, *op. cit.*, Doc.32, p.190.

⁹³ Melis, *op. cit.*, Doc. 99 and 100 p.330.

⁹⁴ The importance of colour stuffs is further revealed by a Venetian document, which reported that the caravan leaving Basora to Damascus in 1425 carried 20 *cantera* of lac and 35 *cantera* of brazilwood along with 102 *cantera* of pepper, 68 *cantera* of ginger and 50 *cantera* of other spices; Melis, *op. cit.*, Doc. 32, pp. 190-1. As trade in colours flourished in

Tariffas show that the other source of red lake, *grana*, was traded in Constantinople. This colour, *kerme* in Arabic, was listed as an export item from Constantinople to Venice together with indigo and lac; 'Di Constantinopoli si tragono per Vinetia, e per altri luoghi ... grana, endego, lacca.'⁹⁵ This insect dye has an Eastern origin, but some of the species are known to be found in Spain and Eastern European countries such as Romania and Poland. The price survey of Venice in 1393, for instance, listed seven different sources of kermes; grane di credi, Choronto, Crimara setana, Provenza, Valenza, spangniuolle, and barbaresche. Five of them were repeated in the price survey of Genoa in 1396. Thus, it can be assumed that the grana which, Pasi wrote, was sold in Constantinople for Venice was the grana of Eastern European countries, which were then collected in Constantinople and exported to the West.

The preparation of these colour stuffs for textile dyes and furniture decoration as well as pigments was flourishing in Venice. The street names such as Scala della Lacca and Calle della Lacca near Rialto bridge refer to the once lively activity of dyers in San Polo in Venice. European painters were aware of Venice as one of the main suppliers of lake pigments and bought them there together with the other colours of Eastern origin. Jacopo Bassano's accounts book records the purchase of 'grana' in Venice.⁹⁶ 'Lake of Venice' is often mentioned in seventeenth-century English colour books together with Florentine

Damascus, the surviving Tariffas describe the taxes, weights and tare of lac, brazilwood, and indigo in Syria in detail. Pasi's Tariffa records that 'Endigo ha di tara rotoli 5 per 105. E conventessi il detto Endego rotoli 21 cioè il zurlo abbatte di tara: essendo piu, si riffa al Moro: e la tara rimane al compradore; essendo mancho si riffa al christiano; ma la tar è dil Moro'; Pasi's Tariffa, 'Damascus; Dillordine dilla Tariffa di Damasco', p.72. For the trade of lake colour in Damascus, see Pasi's Tariffa, p.75. In the description of commercial trade in Damascus, Da Canal Tariffa mentioned various colour materials such as lac, brazilwood, orpiment was sold in Ayas; Da Canal Tariffa, p. 162. Marciana Tariffa listed brazilwood, lac, and indigo as trade itemes in Damascus; 'zenzevero, verzij, chanela, lacha, endego, inzenso e tute altre spezie grosse, e zuchary se vende a kanter soprascrito, lo qual geta a veniexia livre 600 a sotile'; Marciana Tariffa, p.63.

⁹⁵ Pasi's Tariffa, p.139. Da Canal Tariffa reported that brazilwood was sold in Constantinople by 100 gross pounds; Da Canal Tariffa, p.69. Marciana Tariffa further reports the trade of lac in Constantinople; 'piper, zenzevero, verzij, canela, lacha, e tute spezie grosse se vende in Constantinopoli a cento sotile, lo qual cento è mazor de quello de Veniexia da 4 per cento'; Marciana Tariffa, p.42. The question arises as to what kind of lac was imported to Venice from Constantinople, as Pasi wrote that *lacca* was also imported from Alexandria to Constantinople; 'Tragonsino alcune specie di Alessandria per Constantinopoli, ... lacca...'; Pasi's Tariffa, p.139. It is unlikely that the lac imported from Alexandria to Constantinople was sold again to Venetians, but Pasi does not give any further information on this point. The *lacca* which was exported to Venice from Constantinople, may refer to some other lake-like-colour, it may be madder in this case, particularly 'Rubia di Romania'.

⁹⁶ M. Murano, *Il Libro secondo di Francesco e Jacopo dal Ponte*, Venice, 1992, p.60.

lake.⁹⁷ Florence, which had a strong textile industry with involvement in Mediterranean trade, was also a supplier of good-quality lake colours. Gentile da Fabriano purchased lake colours in Florence whereas he bought ultramarine in Venice.⁹⁸

It is important to note the costly prices of lake colours amongst the pigments traded in Venice. The 300g of the stripped brazilwood 'verzino mondo' was priced at 8 to 10 grossi, less than a half ducat; the same as the medium quality of azurite. The prices of lac and indigo are slightly lower.⁹⁹ The price of these oriental colours varied geographically and over time, depending on their availability on the market as much as on quality, but they were generally dearer than other colours such as verdigris and orpiment.

It has been said that brazilwood is cheaper and inferior and thus was not used and regulated by guild statutes.¹⁰⁰ This is, however, contradicted by the evidence from the price surveys, by the Florentine merchant Datini and the Venetian government. In these documents, brazilwood was reported to be dearer than lac and grana.¹⁰¹ On the basis of these sources, it can be suggested that the rare occurrence of brazilwood in European painting is because of its costliness and the satisfactory chromatic quality of alternative red lakes.

Venetian Renaissance painters used lake colours extensively, increasingly exploiting its intense hue and transparency. Deep, saturated red used for drapery found in Venetian painting generally consisted of red lake glaze.¹⁰² Venetian painters' way of juxtaposing the strong red of lake with other brilliant colours in the overall chromatic composition will be discussed in later parts of the study.

⁹⁷ E. Harley, *Artists' Pigments, c.1600-1835*, London, 1970, pp.134.

⁹⁸ Christiansen, *op. cit.*, Doc. 3, pp.150-159.

⁹⁹ The price of grana was unusually low in the document, but the grana was weighed in a different weight.

¹⁰⁰ Kirby and White, *op. cit.*, 1996.

¹⁰¹ The 1393 Datini letter shows that 'verzino mondo' was marketed at 8 to 10 grossi per one Venetian pound, same as azurite.

Vermilion and red lead

A bright scarlet pigment, mercuric sulphide, could be prepared by pulverising the mineral ore 'cinnabar' imported from Spain in Ancient times, but was synthetically manufactured in the Middle Ages.¹⁰³

Like azurite, it was a popular export item to the East. According to Pasi, vermillion was bought in Venice and then sold to the Eastern market.¹⁰⁴ It appears that the vermillion, recorded by Pasi, was a Venetian product. The recipe for manufacturing vermillion was available throughout medieval Europe, but the Da Canal Tariffa records that the vermillion manufactured in Venice was of a good quality.¹⁰⁵

It seems unlikely that Venetian painters had any distinctive advantage with vermillion in terms of cost. It was marketed at 18 soldi per pound (24.5-25 ducats per centinaio) in Venice in 1393, whereas it traded in 24 soldi per pound in central Italy in 1395 and s.10 in 1472.¹⁰⁶

Another artificial opaque red pigment is lead tetroxide, called red lead. It has an orange hue and was popular in fourteenth-century Florence, particularly for the execution of sgraffito textiles where its density and covering power must have made it well suited for application over gold leaf. In the fifteenth century it seems to have been used mainly as an underpaint for vermillion, for example on the *Crucifixion* by Antonello (National Gallery, London) and on the first, painted-over version of Tura's *Allegorical Figure* (National Gallery, London), but it does occasionally appear as a pigment in its own right, notably for the oranges in Uccello's *Battle of San Romano* (National Gallery, London).¹⁰⁷

¹⁰² Lazzarini, *op. cit.*, 1983.

¹⁰³ Raw material of red cinnabar (*cinaprio*) was exported from Spain, but after 1500 from Idria in Yugoslavia with bitumen; *ibid.*

¹⁰⁴ 'Cenabrio si compra in vinetia a peso sottile, a tanti ducati il centenaro, e vendessi in Alessandria a cento di mene e pesasi al cantera zerovi, e dassi rotoli. 100 zerovi per 120 di mene e pasasi in panni per invogliado e dassi di tara, secondo che tuti accordi, e 110 per 100 e per il diritto di soldano. 10 per 100 vorria rispondere mene 386 ma non risponde piu di mene 316 & hanno di spesa minuda per cantera de remi.'; *ibid.*

¹⁰⁵ Da Canal Tariffa, p.78.

¹⁰⁶ Bomford et al., *op. cit.*, 1989.

¹⁰⁷ Dunkerton et al., *op. cit.*, 1991.

Red lead was one of the cheapest colours. Cennino Cennini warned of the adulteration of vermilion with red lead.¹⁰⁸ In 1457, one pound of red lead was marketed at s.2 in Ferrara, dearer than lead white, but half the price given to vermilion.¹⁰⁹ Probably, because of its great price advantage, it was used by Jacopo Bellini for the canvas cycles of the Scuola di San Giovanni Evangelista and then sporadically used in the sixteenth century.¹¹⁰

1.1.3 Yellow

Pigment analysis has identified lead-tin yellow, orpiment, realgar, earth colours and various yellowish lakes for the yellow-orange colour in Venetian Renaissance paintings. Like the rest of Italy, lead-tin yellow is widely used, but Venetian painters had a typical interest in orpiment and realgar.

Orpiment and Realgar

Orpiment, yellow arsenic sulphide, is one of the main yellows used in Venetian Renaissance painting, and often used with realgar, orange arsenic sulphide. They can be used alone, but were often mixed together to create a strong, rich yellow or applied interchangeably for colour modelling; for instance, orange realgar shading with bright yellow orpiment highlights. They can be prepared as pigments by grinding natural minerals or artificially made by subliming arsenic and sulphur together. As materials based on arsenic minerals, orpiment and realgar are highly poisonous, generating both toxic fumes and an unpleasant odour. Painters were well aware of their nature and, commenting on orpiment, Cennini warned against its use. For this health reason, they were less commonly used in paintings in Europe than lead-tin yellow.¹¹¹ In fact, their use was forgotten up to the present century, but modern pigment analysis has identified a few

¹⁰⁸ Cennini, *op. cit.*, Chapter 40.

¹⁰⁹ Venturi, *op. cit.*, pp.7-8.

¹¹⁰ Jacopo Bellini and His sons' canvases [cat.2]; G. Bellini's *San Giovanni Crisostomo Altarpiece*, (1513, S. Giovanni Crisostomo) [cat.15]; Giorgione's *Castelfranco Altarpiece*, (c. 1504, Castelfranco) [cat.32]; Palma Vecchio's *Assumption*, (1510, Accademia) [cat.35]; Sebastiano del Piombo, *S. Louis of Toulouse*, (1507, Accademia) [cat. 38].

¹¹¹ Orpiment and realgar were often mentioned in Medieval recipe books; E. Fitzhugh, 'Orpiment and Realgar', *Artists' Pigments*, vol.3, Washinton, 1997, pp.47-8.

cases, all belonging to Venetian painters or painters associated with Venice.¹¹² Thus, orpiment and realgar can be attributed as colours reflecting a typical local practice and should be viewed in the colourist tradition of Venetian painting.

Venetian painters may have appreciated the vivid tone and warmth obtained by orpiment and realgar, despite their hazardous natures. The ongoing trade of orpiment and realgar in Venetian markets also encouraged their local painters to use them as painting pigments. Apart from picture-making, orpiment and realgar were the major ingredients of medieval alchemists and used as medicines in carefully prepared doses. For these various usages, they were important trade items for *speziali*. Their raw materials are recorded from Hungary, Asia Minor and central Asia.¹¹³ Pasi's *Tariffa* distinguished Salonica, the Northern part of Greece, as their main supplier. He wrote that it was brought from Salonica to Venice, and then sold to Alexandria.

Il detto oro pimento che si compra in Salonichio a tanti ducati il cantera. E cantera uno e rotuli 79 di Salonicho, e fanno in Alessandira cantera uno zerovi.¹¹⁴

Northern Greece and Asia Minor, situated geologically on volcanic chains, seem to have been main sources of supplies for orpiment, and Venetians acted as the middlemen drawing profit from supplying it to both sides of the Mediterranean.¹¹⁵

¹¹² For Venetian examples, see cats. 9, 10, 14, 15, 17, 20, 24, 26, 26, 27, 29, 35, 39, 40, 42, 46, 53, 56, 57, 58, 60, 61, 63, 64, and 66 in Appendix 3. Orpiment and realgar are found in Paduan works such as Squarcione's *Virgin and Child* (cat. 67) and Schiavone's *Virgin and Child* (cat. 68).

¹¹³ Lazzarini, *op. cit.*, 1983.

¹¹⁴ Pasi's *Tariffa*, p.64. Ma per le fare e conto dieci per cento; e per datio dil Soldano ti bisogna a fare uno cantera zerovi rotuli 204. E tanti faranno uno cantera zerovi con tutte le tare, e datio dil soldano; e per spese minude da remi

¹¹⁵ Pasi's *Tariffa* reports that 'Oropimento si compra in vinetia a peso sottile e fa per Alessandria. ... Oropimento si compra in Vinetia al peso sottile a tanto ducati il miaro. Vendessi in Alessandria al cantera zerovi; e dassi di tara per il caratello. Il quatro, e dieci per cento per datio dil soldano; e dieci per cento hanno di spesa minuda. Come il morda sangue de remi.' 'Risagallo si compra a vinetia a peso sottile a tanti ducati il centenaro. In Alessandria si vende a cento di mene e dassi rot. uno per mene 120, che sono cantera uno zerovi, e dassi di tara per caratello il quatro come ti ho detto e 110 per 100 e per il diritto di soldano 10 per cento. Ma vendendo in galea, non paga datio alcuno, si non la tara, tanto quanto sia honesto. E discargando in dogana, tu havresti tutte le spese sopradetto, e datio & hanno di spese minude per caratello de remi E lire 387 sottile con tutte le tare; e datio dil soldano, ti faranno il Alessandira mene 120'. *Ibid.*

The price of orpiment was moderate. One pound of orpiment cost 4.2 grossi in Venice in 1396, about the half price of lac or brazilwood. The price of realgar was much cheaper, 1 grosso per pound, less than a third of the price of orpiment. Similar evidence is found in Bruges in 1399 where one pound of orpiment and realgar was sold for 6 and 2 grossi per pound, whereas indigo from Bagdad and lac were priced 20 and 11 grossi per pound. It is of interest to note that the price of orpiment was not distinctive from its companion yellow, lead-tin yellow, which cost around 16 soldi (5 to 6 grossi) per pound in the fourteenth century. It seems reasonable to assume that orpiment and realgar were not as widely adopted by European painters as lead-tin yellow, not because of their cost, but because of their hazardous nature.

Venetian painters show an exceptional interest in these colours. It has been reported that the yellow and orange vestments of saints in Venetian Renaissance altarpieces are for the most part of orpiment and realgar. The drapery of St Peter both in Bellini's *San Zaccaria Altarpiece* and in Cima's *Incredulity of St Thomas*, and *Castelfranco Altarpiece* (Duomo, Castelfranco) were made of a mixture of orpiment and realgar.¹¹⁶

A unique application of orpiment is found in Bellini's *San Giobbe Altarpiece* (c.1478, Accademia, Venice). In the orange yellow garment of the angel on the left, orpiment is mixed with litharge. The presence of litharge itself deserves our attention. Litharge is the orange yellow pigment made by the oxidation of molten lead metal like red lead and has been thought to have been used very rarely as a pigment. Yet, it now appears to have been used in Venice more frequently, since reports of its use increase.¹¹⁷ What is more curious here is that orpiment has long been known not to have been used with the lead-based pigments, since lead chemically responds to the arsenic sulphide of orpiment and eventually turns the colour black.¹¹⁸ In the case of Giovanni Bellini's *San Giobbe Altarpiece*, researchers report that the orange colour achieved by the mixture of orpiment

¹¹⁶ See cat 14 and 32 in Appendix 3.

¹¹⁷ Litharge was identified only a few times in painting; Palma Vecchio, *The Assumption*, (1510, Accademia) and Pordenone, *Madonna and Child with Saints* (1511, Accademia).

¹¹⁸ Artists knew this from their experience; see E. Harley, *op. cit.*, 93-94.

and litharge has survived reasonably well. They suggested that the colour change could be deterred by the use of an oil medium, which seals the particles of two pigments separately in the paint film.¹¹⁹ Why did Bellini use such a treacherous method? The addition of litharge to orpiment can intensify its orange tone and, moreover, speed up the drying process of paint. But one of the technical drawbacks of orpiment and realgar is that they dry very slowly with oils. Lead-based pigments, on the other hand, dry well with oil and it seems that litharge also served as a drier in this case.

Orpiment was more widely used than realgar. Pigment analysis has shown that orpiment was further used as an element of the mixtures such as green and flesh in Venetian paintings.¹²⁰ Mixed with lead white, orpiment was widely used for flesh (The *Pesaro Altapiece*; cat. 9). The green mixture made from orpiment and black is found in two Paduan works, ascribed to the circle of Squarcione (cat. 67, 68). Orpiment is found in Antonello da Messina's unfinished work, the *Dead Christ with Two Angels* (Museo Correr, Venice). Since this work is thought to have been executed in 1475-6 when he was in Venice (Cat. 20), the presence of orpiment suggests that he may have adopted the colour typically used by local painters.

The wide use of orpiment together with realgar in Venice and Padua for their main yellow-orange colour and further as an additive of green and flesh colour was a rare feature in other parts of Italy.¹²¹ However, it is difficult to see the employment of these colours as purely a Venetian invention. They may have continued the tradition of medieval picture-making, which employed these colours for various purposes according to surviving documentary evidence. Recent analysis of Byzantine icons provides another possible explanation for Venetian painters' inclination to orpiment and realgar. In the scientific examination of Byzantine icons, orpiment emerges as one of the main colours

¹¹⁹ S. Volfin and L. Lazzarini, 'Il colore e la tecnica pittorica della Pala di San Giobbe di Giovanni Bellini', *Quaderni ... di Venezia*, (19), 1994, p.31.

¹²⁰ This is an interesting result emerging from the survey of the use of orpiment in Venetian and Paduan painting; see cat. 9, 67, and 68 in Appendix 3.

¹²¹ No comparable examples are found yet in the Core Works outside the Veneto.

adopted by Eastern painters.¹²² Since Venice had close links with Byzantium, this explanation appears to be a more plausible hypothesis.

Lead-tin Yellow and Other Yellows

Another common yellow pigment used throughout the period in Venice was lead-tin yellow or 'giallino' in Italian. It gives a lighter and colder tonality than orpiment, colouristically more suitable for the imitation of golden embroidered patterns.¹²³

Apart from orpiment and lead-tin yellow, organic yellows from various local and Asiatic plants were used for pigments in Venice. Some cases were found in Tintoretto's canvas cycles for the Scuola di San Rocco and Cima's *Incredulity of St Thomas*.¹²⁴ However, their presence and painting methods based on them remain obscure, as analytical tools to identify them have yet to be developed.¹²⁵

Some yellow-earth colours were also used and, according to Lazzarini, a yellow earth *terra gialla di Verona* was a local pigment of the Veneto.¹²⁶ High quality yellow ochre is found for the decoration of the Virgin's costume in Bellini's *Madonna and Child with a Donor* (Private Collection).

¹²² Fitzhugh, *op. cit.*, 1997, pp.66-73.

¹²³ Modern study of pigment shows that there were two different type of lead-tin yellow, H. Kühn, 'Lead tin Yellow', *Artist's Pigments*, vol.2, Washington, 1993, pp.83-111. In Italy, the first one is thought to be a by-product of glass making and came to be used as a pigment earlier than the second type which is associated with the glazing of ceramics. Confusingly the former is named 'type II', whereas the latter is 'type I'. The 'type I' is less brilliant in colour, but rapidly displaced 'type II' in the fifteenth century because of its easy manufacturing process. In Venice, however, type II was continuously used until the sixteenth century, probably because of its thriving glass-industry and Venetian painters' concern with the chromatic beauty of colours. J. Plesters and L. Lazzarini, 'I Materiali e la Tecnica dei Tintoretto della Scuola di San Rocco', *Jacopo Tintoretto nel quarto centenario della morte*, Padua, 1996, pp.275-280, 371-374. Its type is not always referred in the technical report, since the identification of the types of lead-tin yellow requires sophisticated scientific tools such as x-ray diffraction analyses.

¹²⁴ Lazzarini reports the application of yellow lake in Tintoretto's works, but points out its discoloration and contamination; Lazzarini, *op. cit.*, 1991, p. 120. A certain yellow lake was found in Cima's work mixed with other yellows such as lead-tin yellow and yellow ochre; J. Dunkerton and A. Roy, 'The Technique and Restoration of Cima's 'The Incredulity of Saint Thomas'', *NGTB*, (10), 1986, p.17.

¹²⁵ Lazzarini, *ibid.* This is partly due to a fact that the amount of yellow lake in samples is likely to be small. Since yellow lake like gamboge gives cold and acid hue, yellow lake often occurs in mixtures with other pigments; J. Winter, 'Gamboge', *Artists' Pigments*, vol. 3, Washington, 1997, pp.143-155.

¹²⁶ Lazzarini, *op. cit.*, 1978.

1.1.4 Green

Green is a secondary colour which can be made by mixing blue and yellow and occasionally yellow and black. These green mixtures were often used for trees, grass and landscape in Venetian paintings, but this study will focus on single pigments used for green colour such as malachite, verdigris, and copper-resinate.

Verdigris and Copper-resinate

Verdigris is an artificial green, prepared by exposing copper plates to the fumes of acetic acid such as vinegar. Its companion green, copper resinate, is made by dissolving verdigris in natural resins over a slow heat. Verdigris, a pale bluish green, was known from ancient times, whereas copper resinate, a deep intense green, was associated with oil paintings and first used as a glaze in the fourteenth century. Both pigments, based on copper acetate, tend to turn brown and black with exposure to light and chemicals, but verdigris and especially copper resinate make a transparent film when bound with oil, a phenomenon that is essential to create a beautiful dark green, and were widely used as pigments in Europe in the fifteenth and sixteenth century.

Verdigris was marketed in the price range slightly lower than vermilion, the other chemically manufactured colour. This is probably because of its simple preparation process and the easy accessibility of its raw material, copper. It was sold at 20 ducats per 100 Venetian pound in 1393 in Venice. Like vermilion, it was exported from Venice to the East. Pasi records that it was bought in Venice and sold in Alexandria; 'Verderame, fa per Alessandria, e comprassi in Vinetia a peso sottile, e vendesi in Alessandria al cantera forfori.'¹²⁷ Accordingly, its price went up in Alexandria. It was sold 35 bisantes per centinaio de mene in 1419, dearer than brazilwood and indigo which were both 26 bisantes for the same amount.¹²⁸

¹²⁷ Pasi's Tariffa, p.64.

¹²⁸ Melis, *op. cit.*, p.320.

Verdigris and copper resinate were standard green colours in Renaissance Italy and copper resinate especially became the favourite choice in the course of fifteenth century with the increasing application of paint in an oil medium. Medieval Italian painters may, however, have been acquainted with copper resinate. The National Gallery Scientific Department discovered that it was copper resinate that was used in the green in the Tuscan *Crucifixion* (National Gallery, London), dated to the late thirteenth century.¹²⁹ This finding provides important evidence for the primitive use of oil as a paint medium in Italy. In the fifteenth century, the intense green achieved by copper resinate continued to be one of the elements to encourage painters to experiment with oil painting. The paint media of Mantegna's *St Luke Altarpiece* dated to 1454 (Brera, Milan) was analysed as egg tempera apart from the green areas achieved by copper resinate in oil.¹³⁰ Passages of copper resinate over egg tempera painting are found even in the early sixteenth century. In the *Virgin and Child with Saints and Donors* attributed to the workshop of Giovanni Bellini (c. 1505, Walters Art Gallery, Baltimore), the main paint medium was identified as egg, but oil was found in the green areas identified with copper resinate [staining methods].¹³¹

The adoption of copper resinate glaze over verdigris or other green underpaints, no doubt encouraged by Netherlandish painters or their works of art, became widely adopted in Italy in the course of the fifteenth century with increasing applications of paint in an oil medium. By 1500 this method was firmly established and was further refined in Venice. Whereas simple copper resinate glazing over lead white underpaint was used in the 1470s and 80s, an elaborate stratum of green paint layers is found in Venetian paintings produced at the turn of the century. In Bellini's *San Zaccaria Altarpiece* (1506, San Zaccaria, Venice) and Cima's *Incredulity of St Thomas* (1504, National Gallery, London), for instance, multiple glazing layers of copper resinate were applied over two or three opaque green layers of malachite and verdigris. The intense green colour created by

¹²⁹ Bomford et al, *op.cit.*, 1989, p.62.

¹³⁰ In the red robe of St Prosdocimo, copper-resinate was thinly glazed over red lake layer, S. Bandera Bistolletti, *Il Polittico di San Luca*, Florence, 1989, p.68.

¹³¹ The complicated development of oil painting in Italy will be the subject of the following chapter.

these meticulous methods epitomizes Venetian painter's concern with chromatic beauty in the early sixteenth century.¹³²

Malachite and Verditer

Malachite is a green pigment which is extracted from copper ore with azurite. It has a light bluish green tint with a good opacity and, as a mineral pigment, is less susceptible to the degradations caused by light and atmospheric pollutants than verdigris and copper resinate.¹³³

Cennini calls it 'verde azzuro' and similar terms such as 'azure green' are found in an English eighteenth-century manuscript.¹³⁴ Medieval recipe books rarely mentioned it and little evidence has survived about its trade. It seems that the trade in malachite was closely related to that of azurite, but its cost was much lower. In 1457, one pound of 'verde azuro' was 6 soldi, whereas the same amount of the lower grade of azurite 'azuro tedescho grosso' was 48 soldi.

Malachite can be used both in egg tempera and oil, but it is known to have been less used as a major green in oil painting.¹³⁵ This is probably because of its opacity, the granular form of its particles which could disturb the paint film, and its tone, far lighter than manufactured green colours. Cennini compared the coarse particles of malachite to 'fine sand'.¹³⁶ It appears that the role of malachite was relatively limited in Florentine paintings toward the end of the fifteenth century. Central Italian works surveyed in the Core Works show that malachite was used as a green mixture for the underpainting of copper resinate glaze and the lining of costume in the painting. In contrast, it was frequently applied in Venetian painting, particularly in Bellini's works, as a main green and found in more prestigious areas than other cheaper green colours such as verdigris

¹³² See pp.198-205 in Chapter 6.

¹³³ R. Gettens and E. W. Fitzhugh, 'Malachite and Green Verditer', *Artists' Pigments*, vol.2, Washington, 1993, pp.183-202.

¹³⁴ Harley, *op. cit.*, p.79.

¹³⁵ Gettens and Fitzhugh, *op. cit.*; Lazzarini, *op. cit.*, 1983.

¹³⁶ Cennini, *op. cit.*, Chapter 52.

and copper resinate. The single green used in the *Madonna and Child* (c.1480, Private collection) ascribed to Bellini is malachite. In Bellini's work, the different role of green colours such as the use of malachite in costume and verdigris and copper resinate in landscape are found in the *Pesaro Altarpiece* (Museo Civico, Pesaro), the *Madonna and Child with a Donor* (Private Collection) and the *Assassination of St Peter Martyr* (Courtauld Gallery, London).¹³⁷

Malachite can be chemically produced. Its synthetic version, verditer, was more widely used in fifteenth-century Italy than was previously thought. Jill Dunkerton has said that it is found in Central Italian works, always in an egg tempera medium, by Sassetta, Uccello, and in works executed by painters who were associated with Central Italy such as Bellini, Tura, Cossa and Squarcione.

* * *

Apart from the colours discussed so far, Venetian painters employed various pigments, such as lead white, plant and carbon blacks, and earth colours. They are spared in this study because of their low commercial value, but they provided invaluable colours for Venetian painters. On the other hand, one should be aware that there are some other colours which are yet to be examined by scientific tools such as yellow lakes and brown lakes. Recent discovery of softwood tars in Cima's work, for instance, show a wide range of pigments used in Venetian Renaissance painting.¹³⁸

The colours discussed in this section have been chosen principally to show the commercial significance of pigment and the dominance of Venice in this trade. It will provide a background for the ensuing discussion of the issues concerning Venetian colours.

¹³⁷ See cat. 9, 12, and 18 in Appendix 3.

¹³⁸ Softwood tars give a transparent orange-brown hue and were used as a glazing layer over lead-tin yellow in the costume; Dunkerton and Roy, *op. cit.*, p.17.

1.2 Training of Venetian Merchants in Colour Materials

On April 4, 1561, a young Venetian nobleman, Alessandro Magno, sailed for Alexandria in the *Crose*, a round ship of about 540 tons.¹³⁹ As soon as he reached Alexandria on May 2, he bartered some of his silk cloth for pepper and used some of his money to buy more spices. The *Crose* weighed anchor on October 19, and carried more than a half million pounds of spices including a little more than 400,000 English pounds of pepper. Alessandro was back in Venice on November 18 and soon sold the pepper at 97 ducats a *cargo*, having paid the equivalent of just over 56 ducats a *cargo* for it in Alexandria. He calculated his profit for this trip as 266 ducats, 18 denarii, and 22 piccoli.

This business journey of Alessandro Magno was well documented in his diary, which not only furnishes a picture of trade in Egypt in the middle of the sixteenth century, but illustrates further Venetian merchants' involvement in the colour trade. Along with copper and woollen cloths, 100 *barilli* of lead white was exported to Alexandria, whereas the *Crose* returned to Venice with a full cargo of Oriental spices which included 72 *cantera* of kermes and 43 *zurli* of indigo. The trade in these colour materials was traditionally a favorable source of profit to Venetian merchants. For a patrician merchant, Andrea Barbarigo, living in the first half of the fifteenth century, the trade in colour materials was an important business. His surviving account book shows that he gained a profit from consistent investments in the trade in kermes, brazilwood, and realgar.¹⁴⁰

Alessandro Magno and Andrea Barbarigo were typical Venetian merchants, and the wealth these merchants gained overseas was the basis of the political power of Venice.

¹³⁹ Alessandro Magno's travel diary is in the Folger Shakespeare Library, Washington, D.C; MS. 1317.1. The present discussion of his travel is based on the abstract of his voyage in F. Lane's article, 'The Mediterranean Spice Trade; Its Revival in the Sixteenth Century'; *American Historical Review*, (45), 1940, pp.581-90.

¹⁴⁰ Andrea Barbarigo's account book shows his profit from the trade of colour materials as follows; F. Lane, *Andrea Barbarigo; Merchant of Venice*, Baltimore, 1944. These colour materials were also for dystuffs. I used this evidence to indicate Venetian patrians' involvement with colour materials in general.

(1) 1433 March 1; Kermes (grane e poli) from Crete	5L	13s
(2) 1438 January 23; Realgar (rixegal) and arsenic	3L	11s
(3) 1438 February 28; Brazilwood	7L	1s

¹⁴⁰ These kinds of instructions may have been invaluable to any merchants, and as such were found in surviving Tariffas from other cities.

Venice had thriving industries. For instance, the *Arsenale* was the largest industrial complex of pre-modern Europe, and tanners, silk weavers, glass-blowers and many other craftsmen worked on a large scale in Venice. Yet, there was no sharp division between merchants and producers, since the ship building industry and the products from other manufacturers depended on international commerce. The regime of the Venetian patricians itself rested upon their grasp of the main opportunities for capital investment in long-distance trade, its supervision and production. No other state in the fourteenth and fifteenth centuries reserved for its hereditary ruling class such commercial privileges or maintained such extensive power of economic administration.¹⁴¹ It has been said that all the merchant nobles of Venice operated as one large regulated company of which the board of directors was the Senate, the Great Council.¹⁴² In a sense, most Venetians - whether they were patricians or craftsman- were involved with commerce in one way or another and, thus, it is not a total exaggeration to say that the Venetian Republic was essentially a commercial enterprise.

These Venetian merchants, small-scale shopkeepers as well as ruling patricians prominent in international trade, certainly had substantial knowledge of colour materials from their engagement in the trade of *spezie*. It is a duty for merchants to have a trained eye for the materials they deal with, and the surviving commercial records accordingly show their concern with the identification of good quality materials for colours. The Tariffa or merchant record of exchange, which aimed to help merchants engaged in long-distance trade, often contain information on the characteristics of spices and instructions to recognize each of them. The Da Canal Tariffa, for instance, advised that orpiment was a colour of gold and should be gold in colour and breaks into leaves when it is broken.

Orplimento vuol esser grosso e de chollor d'oro; quando ello se rompe, ello se sfoia e dentro si à chollor d'oro.¹⁴³

¹⁴¹ D. Chambers, *The Imperial Age of Venice; 1380-1580*, London, 1970, p.36.

¹⁴² Lane, *op. cit.*, 1973. For similar opinion, see R. Mackenney, *Tradesmen and Traders; The World of the Guilds in Venice and Europe*, c. 1250-1650, London, 1987, pp.3-10.

¹⁴³ Da Canal Tariffa, p.77.

A similar instruction was made in the identification of good-quality orpiment in the Marciana Tariffa, which underlined its natural golden colour; 'Oro plumento vuol esser grosso, e de color d'oro, quando lo se speza e lo se foja, e dentro die esser de color d'oro'.¹⁴⁴ Cennini also described that orpiment is a handsome yellow in colour more closely resembling gold than others.¹⁴⁵ In merchant's manuals, such discreet descriptions of colour materials were further given to the colours from the Levant: brazilwood, indigo, lac, as well artificial colours, lead white and vermilion. Fine lac or mature lac ought to be reddish and to contain little dust, whereas good brazilwood is a brilliant red.¹⁴⁶ Indigo from Baghdad should have a good, bright colour and its pulp is violet outside, but dark within.¹⁴⁷ The best lead white is marked with a plait and vermilion and other manufactured colours were well prepared in Venice.¹⁴⁸ These kinds of instructions may have been invaluable to any merchants, and as such were found in surviving Tariffas from other cities, for instance Pegolotti's Tariffa.

There was a similarity between merchant's manuals and Cennino Cennini's *il Libro dell'Arte* and the Bolognese Manuscript concerning the descriptions of good colour materials. No pigment can demonstrate that they shared the same interest in these matters better than ultramarine. Cennini underlined that the lapis lazuli with a rich blue colour gave a good ultramarine; 'if you want to recognize the good stone, choose that which you

¹⁴⁴ Marciana Tariffa, p.77-8.

¹⁴⁵ Cennini, *op. cit.*, chapter 47

¹⁴⁶ Da Canal Tariffa underlines that good quality brazilwood has brilliant red whereas the colour of lac is reddish; 'Verçi, sallvaçio vuol esser grosso e vermeio de bon chollor vivo e la soa medolla sia piçiolla e non sia buxo e vuolsse aver vardà quanto ce ligname ello tien e tanto lo compre lo men e la soa radixe vuol esser solla e bona e cossi è bon ...'; 'Lacha finca si vuol trar a chollor roxado e vuol esser grossa e tegnir pocha polere e sia be neta de legne'; Da Canal Tariffa, pp. 77-78. Similar descriptions are found in the identification of good lac and brazil wood in the Marciana Tariffa; 'Verzi vuol esser grosso, e dentro vermejo, de bon color vivo, e la soa medola sia pizola, e non sia buxiada e volve tegnir a mente quanto legno che 'l tien, e tanto compralo men'; 'Lacha fina, zoè la madura, si vuol trar in color rosso, e vuolo esser grossa e tegna puocha polvere, e sia ben neta de legno, ma non aver constreto per entro.'; Marciana Tariffa, p.70.

¹⁴⁷ Da Canal Tariffa advises that Baghdad indigo has bright colour and its pulp is violet; 'endego de Balldacho vuol esser de bon chollor vivo de for a e dentro e liçer a la man e la pasta si è sotile e quanto ello se ro(n)pe se vuol trovar mufollente, lo so dreto chollor si vuol esser violado e schiro dentro.'; Da Canal Tariffa, p.77. Marciana Tariffa's description on Bagdad indigo is similar to that of Da Canal Tariffa; 'Endego, si bagado chomo é sachafe, vuol esser de bon color vivo de fuora e dentro, e lezier a la men e la soa pasta sotil: quando elo se rompe vuolsse trovar mufolente lo so dentro color, vuol esser dentro molado ...'; Marciana Tariffa, 71.

¹⁴⁸ La blacha de la dreça si è la mior blacha che sia. çenabrio e çiaschun alltro sullimado se la nora ben in Veniça; Da Canal Tariffa, pp.70-71.

see is richest in blue colour, because it is all mixed like ashes'.¹⁴⁹ The Bolognese Manuscript added a method to test its quality. It advised that the perfect lapis lazuli is the one which retains and improve its colour, after being burned in the fire. If the colour changes, it is either poor quality ultramarine, or not ultramarine, depending on the degree of change.

Prima tolli uno pezo de le dicte petre e metila in nel fuoco e farla ben infocare de vantagio poi il tra fuori e lassala fredare da se stessa... se migliorasse colore che lo manteng e perfecta e bona. ... Ma se devinisse che la petra perdesse tutto el colore suo questa ... non sonno de ultramarine e non sono fini...¹⁵⁰

A similar testing method is found in Pegolotti's Tariffa. In this case, a small quantity of ultramarine in powdery form was put into the fire. Fine ultramarine should not change its colour afterward.

E conviensene fare pruova, e fassene in questo modo; abbi uno ferro netto e rovente, e ponvi suso un poco della polvere dell'azzurro ultramarino, e lo azzurro non ne arderà se fia fine, e quello che non fia fine ardera di presente.¹⁵¹

It also warned that, burned within charcoal with a strong heat, ultramarine does not lose its colour whereas azurite changes its colour and turns into ash.¹⁵²

As a rule, these methods of testing ultramarine described in merchant's manuals together with practical advice on various *spezie* show that the substantial knowledge of the nature of *spezie* was essential to the training of young merchants who entered the business world. According to Venetian tradition, men were able to join international trades as early as eighteen years old. Andrea Barbarigo, for instance, began his career at nineteen. How was the experience of colour materials which these Venetian merchants obtained from their trade in *spezie* reflected into the pictures they commissioned? This

¹⁴⁹ Cennini, *op. cit.*, Chapter 42.

¹⁵⁰ The Bolognese Manuscript is transcribed by Merrifield, *op. cit.*, pp.340-343.

¹⁵¹ Pegolotti's Tariffa, p.372

¹⁵² *Ibid.*

fundamental question can be addressed by examination of surviving artists' contracts in Venice.

1.3 Venetian Contracts

Venetian contracts in general contain many of the clauses commonly found in the artists' contracts of the period in central Italy, but there are some distinctions in their stipulation on colours. The quality of precious materials such as gold and ultramarine were generally designated, but azurite is not found in contracts. It is of interest that at least one of them mentions 'red lake'. On 10 Jan 1467, Andrea da Murano and Bartolommeo Vivarini were commissioned to paint a canvas painting with two pictorial fields for the Sala Capitolare, Scuola di San Marco. They are instructed to use fine colours such as gold, ultramarine, marble effect(?), red lake, and green and other necessary colours.

... e depente de bonj cholorj finj oro azuro oltramarin Marizi lacha e verdi e altrj cholorj achadera ale sopra schrite istorie che tutj sia in perfezion...¹⁵³

The stipulation of red lake was not exceptional in Italy at that time.¹⁵⁴ Red lake is found in the contract between Leondaro da Vinci and the Confraternity of the Immaculate Conception in San Francesco in Milan in 1483.¹⁵⁵ It is interesting to note that the use of 'lacha fina' was stated with vermilion in Leonardo's contract, whereas red lake was a single red mentioned in Andrea da Murano and Bartolommeo Vivarini's example. The Venetian case is unique in the sense that the term 'lacha' seems to have been referred to as a representative of red colours as did ultramarine for the blue pigments, suggesting that the foremost red to the mind of Venetian public and painters was red lake.

¹⁵³ Paoletti, *op. cit.*, 1894, p.10. The term 'Marizi' can be interpreted as marble effect by colours; *Grande Dizionario della Lingua Italia*, vol.9, Torino, 1975, pp.796, 819.

¹⁵⁴ In a personal communication, Dr. O'Malley pointed out that 'lacca' and 'lacche' were found in Italian Renaissance payment records, but was not sure of its stipulation in contract. Further findings on the stipulation of lake colour in Central Italian contracts are pending on O'Malley's research.

¹⁵⁵ Glasser, *op. cit.*, pp.331-332.

Contracts for foreign painters working in Venice were more specific with regard to colour. On 9 August, 1494, Perugino was commissioned by the Venetian Government to paint a canvas in the Great Council Hall. He was offered a fixed price of 400 ducats, so he agreed to use such materials at his expense.¹⁵⁶ With reference to colours, he was instructed to make the commissioned work more lavish '*richa*' than the other companion works in the Hall executed by local painters, using gold, silver, ultramarine, and necessary pigments,.

Devendo far ditta opera più richa dela prima a tutte soe spexe de oro arzento azuro et colori et de tute quelle cosse apertien a larte del depentor. Et li Magnifici Signori Provedadori li farano far il teller de legnami et de telle da depenzer suxo, et i soleri et altri inzegni, azo depender si possi.¹⁵⁷

Perugino's fame seems to have been well established in Northern Italy through his fresco works in the Sistine Chapel, Rome, but the Venetian Government may have underlined the importance of colours in this project, fearing that Perugino did not understand the characteristics of Venetian canvas painting.

Venetian patrons' involvement with the choice of colours, and possibly their handling can be demonstrated in a commission given to Alvise Vivarini by the Scuola di San Marco. On 6 August 1501, Vivarini signed a contract to paint a banner for this confraternity for 100 ducats which included his expenses for materials apart from the silk support. He was instructed to use all colours fitting and necessary and principally ultramarine and gold leaf.¹⁵⁸ What is significant in this contract is that it was his use of colour that was to be further directed by the Guardian and the companions of the confraternity.

In en qual penello veramente die intervegnir tuti quei colori pertinenti el nezessarj et prezipue azuro oltramarin et oro mazenado secondo lobieto et

¹⁵⁶ The Venetian Government provided the canvas and the wooden support for him, together with the scaffolding and other devices.

¹⁵⁷ Lorenzi, *op. cit.*, 1868, no.237, p.111.

¹⁵⁸ Vivarini has provided the design, '*segondo l'ordine e forma de el desegno che per luj è stato fato*', but it remains unclear whether the contract was ever executed.

apetito nostro, et secondo che per messer lo guardian overamente compagni li sera imposto.¹⁵⁹

The interim assessments of major pictorial projects were common in Italy and the quality of colours and the handling of them were certainly reviewed along with subject-matters and compositions by commissioning parties. Alvise Vivarini's contract, in which the use of colours was strictly termed as the single object of future assessment, is an unique Venetian example which reveals a patrons' straightforward intervention in the choice and handling of colours during the project.

Venetian patrons influenced their painters through the system of commission of Italian art. Since a majority of them were directly or indirectly involved with the trade in colour materials, it can be logically assumed that their criticism on colours and application of them could be more sophisticated. To look into the response of Venetian painters to their patrons' concern with colour, several of the scientifically examined Venetian paintings will be discussed in terms of colours and techniques in the following section.

1.4 Images

The involvement of Venetian merchants in the colour trade and the pragmatic experience they obtained from such a trade are significant in the discussion of the development of Venetian painting, since these merchants were not only responsible for a majority of pictorial commissions, but also constituted primary audiences, to whom Venetian painters had to appeal. I would argue that the experience of Venetian merchants instinctively required the high-standard presentation of colours in the painting. To examine Venetian painters' response to this, our attention needs to turn to the pictorial projects of the merchants who dealt with colour materials.

¹⁵⁹ Paoletti and Ludwig, *op. cit.*, 1899, pp.274-5; See also J. Steer, *op.cit.*, pp.172-173.

Venetian Trade Guilds

The main suppliers of pigments to Venetian painters were apothecaries, the middlemen who marketed the *spezie* arriving in Venice by means of the patrician merchants' international trade. The apothecaries formed a trade guild, the *Scuola degli Spezieri da Grosso*, as early as the fourteenth century, but it is interesting to see that it had never been evolved into an organized independent guild. Spices from the Levant were most profitable wares, and their international trade was dominated by the Venetian ruling class, *nobilis*, whose power was restricted in the administration of the *scuola*.¹⁶⁰ Venetian patricians may have restricted the *Scuola degli Spezieri* from being developed into a strong organization to serve its own interests.¹⁶¹ The weaker activities of the guild of the *speziali* seem to be reflected in their lack of ambition for pictorial decoration. Only a single pictorial commission was known to be made by the *Scuola degli Spezieri*, a *pala* in San Aponal in 1464, but even this work has been lost, leaving those shopkeepers' artistic interest obscure.¹⁶² The nearest artwork which can be linked with them is Bartolomeo Vivarini's polyptych for the *Scuola dei Taliapietra*, the *St Ambrose Altarpiece* (Accademia, Venice) [Plate 4]. Venetian stone-masons shared the same office building in San Aponal with the *speziali* and their altarpiece commissioned from Vivarini was erected in the same church in 1477. Therefore, it can be assumed that Vivarini's work, one way or another, had to compete with or reflect the *speziali's* altarpiece, dated ten years earlier.

It is not difficult to single out the specific effort Vivarini made in his work for the stone-masons' guild. The composition itself was almost identical with his earlier works such as the *St Augustine polyptych* (1473, San Giovanni e Paolo, Venice), but the colours appear more articulated in this work than his other works of the decade. Vivarini not only employed a wider range of colours, but also matched them distinctively in the inner and

¹⁶⁰ B. Pullan, *Rich and Poor in Renaissance Venice: The Social Institutions of a Catholic State*, Oxford, 1971; R. Mackenney, *op. cit.*, pp.3-10.

¹⁶¹ They formed a trade guild to be mainly supervised by the government. A survey carried out in 1569 by Venetian Government, *Milizia da Mar*, show that it has 122 practitioners; R. Mackenney, *ibid.*, pp.3-10.

¹⁶² The guild office was first situated at San Matteo in Rialto in 1383, but because of the increasing crowds near to the church, they moved their office to San'Aponal in 1394.

outer garments of the five saints; blue and red for St Sebastian, orange and green for St Louis, white and blue for St Ambrose, red and deep green for St Paul, yellowish brown and grey blue for St Peter [Plate 4].¹⁶³ This colouristic approach and the sumptuous representation of the brocade mantle of St Louis and St Ambrose remind us of his earlier work, the *Bari Altarpiece* (1464), not his other contemporary altarpieces of the 1470s where he increasingly emphasized simple forms and palettes dominated by red and brown colours. The presentation of diverse colours and the emphasis on the contrast between them in Vivarini's *St Ambrose Altarpiece* may be viewed as the colouristic taste of the *Scuola* or as a reflection of the *speziali*'s pala near to their altar. Although the Gothic polyptych design of altarpiece and the schematic formation of three-dimensionality make this work somewhat outdated, such material richness seems to reveal the aesthetic preference of this Venetian trade guild, and to verify the consistent popularity of Vivarini's altarpieces in Venice.

The patronal activities of Venetian trade guilds in general are so sporadic as to make it difficult to suggest 'collective taste' from the works they commissioned. They consisted of a large number of small groups, often with a membership of just twenty or thirty, and had much less economic and political power than their more famous Florentine counterparts. The aesthetic tendency of lay Venetians can be more clearly revealed by the artistic activities of the *Scuole Grandi* and *Piccole*, typical Venetian devotional confraternities in which they played an active role. These Venetian guilds, unrelated to trade, were important patrons of their local painters. In quantity and quality, the altarpieces commissioned by them surpass those commissioned by wealthy patricians and citizens.¹⁶⁴ However, it is their projects to decorate guild offices by canvas cycles that highlight the grandeur and artistic initiative of the *Scuole Grandi* and *Piccole*.¹⁶⁵ These

¹⁶³ The *St Ambrose Altarpiece* has received modern conservation treatments in 1993; M. Maida, 'Il restauro del polittico della Madonna di Bartolomeo Vivarini alle Gallerie dell'Accademia', *Quaderini...di Venezia*, (19), 1994, pp.9-19.

¹⁶⁴ P. Humfrey, *The Altarpiece in Renaissance Venice*, New Haven and London, 1992, p.114; P. Humfrey, 'The Venetian Trade Guilds as Patrons of Art in the Renaissance', *Burlington Magazine*, (128), 1986, pp.317-30.

¹⁶⁵ These secular narrative paintings on canvas representing relevant religious and historical stories, began to appear in Venice in the 1450s, and increased their popularity sharply towards the end of the fifteenth century, possibly after the successful replacement of deteriorating frescoes in the Great Council Hall, Palazzo Ducale, by this newly developing

canvas works, more ambitious in their approach to painting media and support than in terms of colour, will be the subject of discussion in the next chapter.

Venetians Commissioning Private Works

Before turning our attention to the aesthetic taste of the Venetian ruling class, it is necessary to examine the approach of less powerful Venetian individuals, particularly those of relatively moderate means, to colours. Literary evidence tells us little about the patronal activities of individual shopkeepers and artisans belonging to guilds like the *Scuola degli Spezieri da Grosso* or *Scuola dei Taliapietra*, but they probably constituted an important group of clients for Venetian painters. Hundreds of religious paintings of modest dimensions showing for example the Madonna and Child, the Crucifixion and the Pietà have survived. Most of these types of works seem to have been destined for a domestic setting as a practical aid for private devotion.¹⁶⁶ Wealthy patrician merchants may be still major customers, but their sheer quantity suggests the much wider popularity of these images amongst the Venetian public. The examination of the colours employed in such images, therefore, can shed some light on the colouristic taste of lay Venetian citizens in general.

The *Virgin and Child with a Donor* (1490, panel, private collection) from the workshop of Giovanni Bellini provides a clue for the standard approach of prosperous lay Venetians to colours [Plate 33]. The main function of the picture is as an aid to private devotion and as a declaration of piety. A middle-aged man in prayer is portrayed beneath the Virgin Mary and Child. As the three figures were to be depicted all in a modest size panel, 86x65cm, the format of the full-length enthroned Madonna was unsuitable, and only the profile and praying hands of the donor were represented. The marble ledge at the bottom of the picture, which was often employed in Bellini's Madonna and Child composition, serves here to divide the world of the devotee from that of the holy group; the donor is

vehicle. The canvas cycle for the Great Council Hall was destroyed in a fire in 1577, but a great deal of narrative canvases have survived.

¹⁶⁶ R. Goldthwaite, *Wealth and the Demand for Art in Italy, 1300-1600*, Baltimore, 1993.

situated outside the ledge near to us.¹⁶⁷ The donor who presumably commissioned this work, remains unidentified.¹⁶⁸ He may be a Venetian citizen, or even a non-Venetian interested in Bellini's work. Hundreds of Madonna and Child pictures were produced in Bellini's workshop to meet the popular demand for this image and, towards the end of his career, Bellini increasingly included donor portraits.¹⁶⁹

The overall colour composition of Bellini's *Madonna and Child with a Donor*, based on red, blue, and green, is that of a typical Madonna and Child product which Bellini developed from the 1470s. The costume of the Virgin was divided into a red inner garment and blue robe against a background where the green hanging serving as a cloth of honour or curtain is drawn, but left slightly open at the right hand side to accommodate a landscape.¹⁷⁰ The 1996 scientific examination, carried out by the UCL Painting Analysis Unit, shows that the blue parts of the painting such as the Virgin's dark blue cloak and the sky in the background were all painted in ultramarine and lead white¹⁷¹. The technical report also indicates that the chief red pigment is red lake from brazilwood or lac insect, and verdigris and malachite were used for green colours. One should recall that these major colours were among the favourite items that Venetian merchants traded at that time. In terms of commerce, it can be said that the imported colours from the East such as red lake and ultramarine colours dominate the foreground of the painting, whereas verdigris and malachite, the local European colours which cost relatively less were employed in the background.¹⁷² It might be argued that these are the colours used for the representation of the Virgin Mary, favoured by all Italian painters. However, the lavish use of expensive pigments such as ultramarine should be singled out along with the absence of azurite blue. Little effort to save on the cost is apparent in the application of ultramarine in this example of Bellini's work. Azurite may have been available in

¹⁶⁷ For detail discussion of this work, see pp. 225-230 in Chapter 7.

¹⁶⁸ His black dress alone does not differentiate him clearly.

¹⁶⁹ The *Priuli Triptych* (1507, Kunstmuseum, Düsseldorf) and *Camberwell Altarpiece* (c.1505, Birmingham Museum and Art Gallery) are the larger versions of Madonna and Child including a Donor.

¹⁷⁰ These colours and the format are nothing unusual for Bellini's Madonna and Child compositions, but emphasis on its intensity refers that the present work is dated to his late years.

¹⁷¹ UCL Painting Analysis Report C. 1094.

Bellini's workshop, since malachite -the pigment from the same mineral which gives azurite- was applied to enhance the green background hanging, but the blue is not found in the scientific analysis. In contrast, a thick pure ultramarine glaze was widely applied over the light blue underlayer of the mixture of lead white and ultramarine. Such extensive use of ultramarine and the complete absence of azurite are frequently found both in Bellini's and other Venetian painters' Madonna and Child compositions. No other pigment than ultramarine was reported in the blue areas in Alvise Vivarini's *Virgin and Child* (Ca'd'Oro, Venice).¹⁷³ In Bellini's *Virgin and Child* on canvas support (Private Collection, London), ultramarine was even mixed with the greens of the background landscape, in which the greenish blue of azurite might be appropriate. It is interesting to see that Bellini and his contemporary Venetian painters extensively used such a costly pigment for the production of the popular *Virgin and Child* image, probably marketed at moderate prices. Such lavish use of ultramarine for the most popular image confirms the image of Venice as the centre of the international trade of Oriental colours.

In this painting Bellini did not simply display the sumptuous materials, but attempted to create the brilliant chromatic effect of these colours by the masterful application of the newly-developed painting technique based on oil medium. A thick pure ultramarine, rather than the mixture of lead white and ultramarine which was a more popular method in the fifteenth century, was employed as a glaze over the light blue underlayer. These pure, saturated glazes are also found in the application of red lake. It seems that he aimed to achieve a means by which ultramarine blue and red lake can give the purest colouristic impression.¹⁷⁴ The popular domestic devotional images were often ready-made products in the Italian Renaissance workshop, but this is not the case for this picture which includes the portrait of the donor and a number of the details indicating the donor's preference.¹⁷⁵ The high-standard presentation of colours distinctively represented in this

¹⁷² All these colours are the pigments traded dearer in the top of the price range, whereas the colours such as earth colours were very limitedly used.

¹⁷³ Lazzarini, *op. cit.*, 1983, p.137.

¹⁷⁴ See pp.199-205 in Chapter 6, for detailed discussion of Bellini's glazing method at the turn of the century.

¹⁷⁵ There are a number of pentimenti, which may indicate possible the response to donor's request. See pp. 225-230 in Chapter 7, for its discussion.

picture may also have been required by the donor. Even if unspecified, Bellini seems to have attempted to please his customer and the viewers of the picture in general by the display of exotic and precious colours and further by the masterful method which could bring the best colouristic results from the materials.

Venetian Patrons of the Ruling Elite

The rich chromatic effulgence of colours and the skillful presentation of such materials are still more evident in the works of a larger format for public locations, commissioned by the Venetian ruling class and the Venetian government itself. As emphasised earlier in the present chapter, the grand families of Medieval and Renaissance Venice, unlike their counterparts in Genoa or in inland city republics, gained their wealth from commerce, showing less interest in maintaining independent or semi-feudal power bases in the country side. Long-distance Mediterranean trade was in their hands, whereas the activities of lay Venetian citizens, that is shop keepers and artisans belonging to trading guilds, were largely confined within Venice. Merchants with a trained eye constituted the Venetian ruling class and, accordingly, the experience of colour materials they obtained from their business may have instinctively required the high standard presentation of colour in the painting. As we might expect, Venetian painters seem to have duly responded to demand by the employment of sumptuous materials and the masterful application of such colours, more intensely and ambitiously than they did for the aforementioned works for trade guilds and domestic devotional purposes.

Titian's *Ca' Pesaro Altarpiece* (1519-1526, Frari, Venice), commemorating the members of the powerful Venetian family, the Pesaro, highlights the Venetian masters' formal and colouristic development in the early sixteenth century [Plate 5]. The subject is a traditional Venetian *Sacra Conversazione*, representing the Virgin and Child enthroned with saints, but Titian brought a drama into the serene, symmetrical composition of fifteenth-century examples by employing more expressive gestures and by rearranging the spaces far more dynamically. Titian shifted the Madonna to the far right and accordingly revised the positions of accompanying saints underneath the Virgin. St Peter

is now placed as a focus of the composition and St Francis is at the right hand side, below the Virgin.¹⁷⁶ In the front row of the composition, the members of the Pesaro family are portrayed. The kneeling votive figure on the right is Jacopo Pesaro and his counterpart on the left hand side is his elder brother, Francesco, leading four other male members of the family. As the captain of the Papal fleet in 1502, Jacopo won a victory in the decisive naval battle of Santa Maura against the Turks.¹⁷⁷ The emphasis on Jacopo, the inclusion of a Christian soldier holding a papal flag mounted by a laurel crown and presenting a Turkish captive with a Moor on the far left hand side, and the Cross erected by two putti on the top of the composition, all imply that Titian's monumental work on the canvas of 478cm high and 268cm wide was designed to visualize the victory of Christianity, not simply the devotion of the Pesaro brothers.

Colouristically, the importance of individual colours and their impressive display found in the works of Bellini's generation remained as strong characteristics in this work, but Titian, as the younger contender, seems to have aimed to further demonstrate here his virtuoso handling of colour. The 1979 technical report on the picture shows that Titian adopted a wide palette of pigments, virtually all the pigments which Pasi's Tariffa and other sources report, were marketed in Venice.¹⁷⁸ Ultramarine, again, is the predominant blue in this picture, but azurite, smalt, and indigo were also used.¹⁷⁹ The various lake colours as diverse as red, violet, and brown, were extensively applied as a glaze and mixed with other colours. The technical report also shows the use of verdigris, copper resinate, realgar, orpiment, and gold leaf.¹⁸⁰ The unique combination of pigments such as

¹⁷⁶ The two gigantic columns in the background were used to solve the imbalance caused by this new diagonal composition from the bottom left to the top right.

¹⁷⁷ Jacopo had commissioned a votive painting from Titian as early as in 1505 and seems to have been responsible for this decoration of his family chapel. He was a Dominican and was already the Bishop of Paphos by age thirty-five, having a close link with the papal court.

¹⁷⁸ For the report, see L. Lazzarini, 'La Pala Pesaro: Note Tecniche', *Quaderni... di Venezia*, (8), 1979, pp.68-71.

¹⁷⁹ Ultramarine was found in the sky and the blue garment of St Peter in which pure glaze was used for the shade. In its mid-tone, little smalt was added to ultramarine together with lead white. Lazzarini suggested that smalt was adopted as a drier, *ibid.*, pp.70-71. Azurite was found in the drapery of Jacopo Pesaro, mixed with other colours such as red earth and brown lake. Indigo was used as a underlayer of sky.

¹⁸⁰ *Ibid.* Pure red lake glazes were applied in the garment of Francesco Pesaro. Except for red inner garment of the Virgin, vermilion was not used as single colour. The report also suggests the presence of bitumen and litarge, but the method of their identification is not mentioned. Orpiment and realgar were found in the yellowish garment of St Peter. Verdigris and copper resinate were found in the background curtain and sky.

the mixture of azurite and brown lake for the dark green drapery of Jacopo and the use of the under-explored colours smalt and indigo should be viewed as evidence of Titian's marked colouristic interest.

The number of pigments Titian adopted in the *Ca'Pesaro Altarpiece* is as wide as that of Cima in the *Incredulity of St Thomas*, which has been said to employ an exceptionally wide range of colours by fifteenth and sixteenth century standards. Titian may have needed such a large number of pigments to create the complex composition formed by a dozen of the figures of almost human-size and to enhance it colouristically. The strong light from the left falling at 45 degrees reveals the individual forms, casting a deep shadow. It is heavenly figures like St Peter and the Virgin that receive the most vivid colours such as yellow, red, and blue, in contrast to the luxurious but monochromatic garments given to the earthly beings. The blue robe and yellow outer garment of St Peter reinforce the left turn of St Peter towards Jacopo Pesaro. The Virgin wears a bright red dress and blue outer garment and her long white veil marks her and the Child as a focal point of the image. Jacopo Pesaro in the left hand corner wears a dark green garment and, thus, the diagonal axis from him to the Virgin is intensified by the colour composition from dark to high-key colours. The counter axis from Francesco in the right hand corner to the Papal flag at the top left is balanced by two reds; the red velvet garment of Francesco responds to the red flag embroidered with gold leaf. This measured distribution of colours marks a continuation of Venetian tradition, developed by his earlier predecessors such as Giovanni Bellini. But it seems that Titian attempted to give colours a more active role in story-telling by making them part of a dynamic composition and taking a bolder approach to light and shade.

The masterful combination of colours and the movement generated by dynamic formal and chromatic composition distinguish Titian's work from fifteenth-century altarpieces such as Bartolomeo Vivarini's *Bernardo Altarpiece* and Giovanni Bellini's *Frari Triptych*, hanging in the same church. This kind of comparison seems to have been

deliberately invited by Titian.¹⁸¹ The surviving documents concerning the *Ca'Pesaro Altarpiece* show that Titian executed this monumental work for 102 ducats. This is a relatively low fee, considering that the artist demanded the same amount in 1523 from Isabella d'Este for a picture with a single figure. It is highly probably that Titian's main motivation was the attraction of its prestigious site, the nave of the Frari, not the payment.¹⁸² The impressive chromatic effects of Titian's altarpiece based on the unique combination of pigments, in particular, would appeal to a Venetian public, a large part of which had business experience of dealing with colours. The Pesaro family itself was a typical Venetian patrician family which gained wealth from the sea. Jacopo, before joining the Dominican Order, had an active secular career as a businessman in his earlier years, evidently in connection with Pesaro family business in the east. In the opening paragraphs of his will, the bishop was careful to specify that his bequests concerned properties and wealth acquired in Constantinople and elsewhere before he became a cleric.

havemo deliberato ... che havemo il tempo dispenser ... li quali non sono acquistadi ne' pervenuti in noi per conto de'benefitii ecclesiastici, ma como beni paterni et fraterni, et con grande nostre fatiche et sudori quando che eramo layco si a Constantinopoli como altrove havemo acquistadi.¹⁸³

When Jacopo Pesaro, born in 1465, worked in Constantinople in the late fifteenth century, the commercial relationship between Venice and Constantinople was temporarily in decline after the fall of the Byzantine Empire in 1453. However, he may have had an opportunity to deal with some colour materials in Constantinople since Pasi reports in his *Tariffa* published in 1502 that some colours like kerme, indigo, and lac were still sold in Constantinople for Venice. The technical analysis shows that Titian coincidentally used these colours. It seems unlikely that the use of rare colours like indigo in the *Ca'Pesaro Altarpiece* was a result of the direct intervention from Jacopo or

¹⁸¹ In terms of colours, it seems that Titian tried to surpass the efforts these two earlier masters made in the 1480s such as the emphasis on the physical beauty of colour in Vivarini's work and the accurate description of texture surface throughout the subtle transitions of light in Bellini's work.

¹⁸² C. Hope, *Titian*, London, p.46.

his other brothers, who had been involved with the business in Constantinople. Nevertheless, it is a reasonable conclusion that Titian had to take a more careful approach to colours, since he had to appeal to patrons and a public with knowledge of painters' pigments.

State Commissions

Titian completed the *Ca'Pesaro Altarpiece* in 1526, seven years after the first contract began. The gigantic dimensions and the complexity of composition would require a considerable amount of time, but its delayed completion seems more likely to be due to his commitment to the state project of redecorating the Great Council Hall. Titian joined this project in 1513 as an assistant of Giovanni Bellini, but took over his position after his death in 1516. The fire of 1577 destroyed all the works in the Hall, including works attributed to Titian; the *Battle of Spoleto, in which the city faithful to Pope Alexander III is destroyed by the Emperor* dated to 1513-32 and the *Emperor Humbles himself before the Pope at the entrance to the Basilica of San Marco*, dated to 1518-23. If they had survived, they would be the most important works demonstrating Titian's artistic development and, possibly, the colouristic taste of the Venetian ruling class.

The grandeur of the Venetian Republic presumably represented in the pictorial decoration of the Great Council Hall can be hinted at with reference to Bellini's *Barbarigo Canvas*, which has a similar function and was situated in the the same building.¹⁸⁴ Since its materials and methods are the subject of Chapter 6, the present discussion focuses on its commission and the later modification of its function which is more appropriate in the present context.

Bellini's *Barbarigo Canvas*, depicting Doge Agostino Barbarigo presented by St Mark and St Augustine to the Virgin and Child, was completed in 1488. This votive work is

¹⁸³ ASV, Zambelli, B. 1101, fol.121; R. Goffen, *Piety and Patronage in Renaissance Venice: Bellini, Titian, and the Franciscans*, New Haven and London, 1986, fn.41, pp. 230-31.

¹⁸⁴ Secular in subject and monumental in dimension, Titian may have viewed this as an opportunity to demonstrate his mastery with colours.

likely to have been commissioned to mark the coronation of the newly elected Doge Agostino, who was elected in 1486 after the sudden death of his brother, Doge Marco Barbarigo. The afore-mentioned Venetian merchant Andrea Barbarigo was not from the powerful branch of the Barbarigo which produced these two doges in the fifteenth century. Yet, the wealth of Doge Agostino's Barbarigo branch was also based on international commerce like that of Andrea and other Venetian patricians.¹⁸⁵ The brilliant surface textures and colours of the *Barbarigo Canvas* appear appropriately to reflect this fact. Colours from the East such as ultramarine blue and red lakes are dominant in the painting together with the accurate description of luxurious textiles.¹⁸⁶

In his will of 1501, Doge Agostino Barbarigo dedicated the *Barbarigo Canvas*, then in the Ducal Palace, to the monastic church of Santa Maria degli Angeli on Murano, where two of his daughters were nuns. He ordered the change of its function from mural painting to altarpiece, saying that the Madonna and Child with two angels on either side in the *Barbarigo canvas* made it suitable for the high altarpiece of a church dedicated to the Virgin Mary and angels.¹⁸⁷ The Doge's ultimate request was that his daughters and the other nuns pray before it for his soul.¹⁸⁸ The *Barbarigo Canvas*, which depicts Agostino himself being presented to the Virgin and Child by St Mark and St Augustine would have made an ideal stimulus for this activity. Agostino would have chosen this image as a means of advocating his soul, hoping also, no doubt, that the brilliant surface textures and colours of the *Barbarigo Canvas* would make a strong impression on an audience, who was merchant in blood and may have derived its aesthetic taste from the business experience of dealing with various colours. This suggests what well-handled expensive colours may have meant for the patrons in Venice.

¹⁸⁵ Agostino was posthumously accused of smuggling wine with his son-in-law during his regime; D. Chambers, *op.cit.*

¹⁸⁶ See Chapter 5, for more discussions of his painting technique employed in the *Barbarigo Canvas*.

¹⁸⁷ On 17 July 1501 Agostino Barbarigo wrote the transfer of this painting to the monastic church in his will; 'Item nui hordinemo che la pala nostra granda ch'è in la cròzolla del palazzo la sia mandada al monastero de santa Maria di Anzolli predetto, et per esser ben conforme quela figura di nostra Dona coi anzolli ad esser messa sopra al suo altar grande de la sua gesia ...'; ASV, Notarile-Testamenti, B.416, fasc. VI, c.2r. Although Barbarigo used the term *pala* to describe the *Barbarigo Canvas*, it is unlikely that the picture served such a function before its transfer; R. Goffen, *op. cit.*, 1989, p. 305.

Agostino Barbarigo's ambition of self-promotion in the *Barbarigo Canvas* which then functioned as an altarpiece seems to have been, to a large extent, fulfilled. Soon after his donation of this work, there was a huge demand for altarpieces of a similar votive format from the Venetian ruling class. In the fifteenth century, donor portraits were rarely intended for altarpieces in metropolitan Venice, presumably because of the traditional Venetian suspicion of individual self-promotion, especially on the part of the patricians who may have aspired to excessive power. Yet, it seems that Bellini's powerful image, through Agostino's ambition, marked the U-turn in this practice. The *Ca'Pesaro Altarpiece* which has basically a similar format and subject-matter was in a sense Titian's response to Bellini's *Barbarigo Canvas*, further enhancing the magnificent colouristic effects of his predecessor's work.

* * *

The ensuing chapter is concerned with Venetian painters' experiments with various painting media and supports. They will show the crucial stages of the development of Venetian painting techniques.

¹⁸⁸ 'Et quanto plus presto sarà messa tal palla in opera, tanto plus speremo in la beata Verzene Maria, habia esser nostra avvochata apresso el nostro summo chreator Idio...'; ASV, *ibid.*

Chapter 2

Experiment: Painting Technique at the time of Giovanni Bellini

The aim of the present chapter is to define the rapid development in painting method, which occurred in Italy in the second half of the fifteenth century. Around this time, some painters began to move away from meticulous medieval craftsmanship to a freer approach to technique in picture-making with the availability of a growing diversity of painting materials.¹ This transition was prolonged, but began to find its focus in the form of oil-on-canvas painting at the turn of the century. This study will explore questions emerging from this vibrant artistic environment such as the type of technical changes witnessed during this period, and the problems faced by painters whose careers encompassed this period such as Giovanni Bellini and his contemporaries. It will also argue the case that the transition from tempera to oil and of panel to canvas is likely to have been further provoked by a changing concept of art and, at the same time, the change of cultural climate, which came to demand unconventional methods of painting and create new functions for painting. The analysis of these questions will help us toward a deeper understanding of Giovanni Bellini's position within the broader perspective of the development of painting materials and method in fifteenth-century Italy as a whole.

2.1 The Transition from Tempera to Oil

One of the significant technical developments in fifteenth-century Italian painting occurred in the field of paint medium. During the Middle Ages, egg yolk now known as 'egg-

¹ The word 'transition' is used to describe the period between the second half of the fifteenth century and the first two decades of the sixteenth century when, this study argues, a new form of painting was established as oil-on-canvas. The hyphenation is used to make clear the various combinations of painting media to support such as tempera-on-panel and glue-on-canvas.

tempera' or 'tempera', was the most widely used medium for easel painting in Italy.² This method constituted an ancient painting practice that was popular in the Eastern Roman Empire.³ It was a standard painting medium in Italy after the rebirth of pictorial tradition in the twelfth and early thirteenth century, and remained a main vehicle until its supremacy was seriously challenged in the later fifteenth century. In the course of the century, oil increasingly achieved a position of strength as an alternative to tempera. Once developed, it came to be a predominant paint form in the early sixteenth century. By the time Vasari asserted in the mid-sixteenth century that the method of colouring 'a tempera' had fallen out of use, tempera does indeed seem to have become far less frequently employed.⁴

The ease of handling achievable in oil is compatible with the aesthetic values of the 'terza maniera', thus the origin of oil painting has long captured scholarly attention.⁵ Yet, the traditional view of its development has still to be fully revised with reference to the modern knowledge of the transition of paint media based on scientific examination. Media analysis which gathered momentum with the application of gas-liquid chromatography to art objects in the National Gallery, London, in the 1970s is among the more recent developments in the scientific examination of painting.⁶ As the amount of scientific data

² At the time of Giovanni Bellini, the word 'tempera' was used equivalently to our use of the term 'medium'. In Cennino Cennini's book *Il Libro dell'Arte*, published in the early fifteenth century, he directs the painter to 'take scraping of sheep parchment; boil them with clean water until it becomes a regular tempera, that is a size [author's italics]', explaining how to varnish terre-verde; '*abbi raditura di carta pecorina: bollila bene con acqua chiara, tanto che vegna una comunel tempera, conla cioè...*'; C. Cennini, *Il Libro dell'Arte*, Vicenza, 1971, Chapter 178, p.196; D. Thompson, *The Craftsman's Handbook 'Il Libro dell'Arte' Cennino d'Andrea Cennini*, New York, 1960, p.122. Even in the sixteenth century when Vasari says that; '*e così macinati con questi olii, che è la tempera loro, non bisogna altro, quanto a essi, che distendergli con pennello*'; Vasari, *Le Vite...*, ed. by R. Bettarini and P. Barocchi, vol. 1, Florence, 1987, p.134. Here, the tempera is described for its quality as a fluid substance, equivalent to our use of the word medium. With the gradual prevalence of oil, painters were becoming more critically concerned with the differences between paint media. In modern denomination, the term 'tempera' is mainly applicable to the medium of egg, so-called egg tempera or tempera.

³ Paintings in tempera appeared in an Egyptian mummy wrapping from Fayum (2nd century, Louvre, Paris); G. Argan, 'Painting', *McMillan Dictionary of World Art*, vol.10, New York, 1967, p.926.

⁴ '*...E perché adoravo sempre la memoria e le opere degli antichi, vedendo tralasciare questo modo di colorire a tempera...*'; Vasari, *op. cit.*, vol. 6, p.155.

⁵ The importance of a certain freedom of handling achievable in oil is clear in Vasari's writing. He wrote in 1568 that by using oil the artists impart wonderful grace, vivacity and vigour to their figures; Vasari, 1568, *op. cit.*, vol.1, p.133. Other properties can be listed retrospectively; the possibility of retouching, subtle shading, the superimposition of transparent glazes or liquid colours, impasto, and scumbles.

⁶ This method was pioneered by John Mill and Raymond White in the Scientific Department in the National Gallery, London; J. Mills, 'The Gas-Chromatographic Examination of Paint Media Part I. Fatty Acid Composition and Identification of Dried Oil Films', *Studies in Conservation*, (11), 1966, pp. 92-106; J. Mills and R. White, 'the Gas-Chromatographic Examination of Paint Media. Some examples of Medium Identification in painting by Fatty Acid Analysis', *Conservation and Restoration of Pictorial Art*, London, 1976, pp. 72-77.

has consistently grown in the last three decades, a more accurate picture of the pattern of change in paint media in Italy has come to light.⁷ The present study is largely based on the recent findings of media analysis and will further discuss questions which have not been fully touched upon, reassessing the documentary sources relevant to this subject. For instance, the problem of local variations in practice in the application of paint media, particularly the case of Venetian painting and the historical factors which influenced the transition in paint media will be addressed.

Technical difficulties of oil paint medium

It is now clear from the modern analysis that there was no sudden breakthrough in the change in paint media from egg tempera to oil, and that it was a mixed technique - either the mixture of two media known in Italy as 'tempera grassa' or the separate application of the media in the same painting field - that was the most popular method in Italy in the fifteenth century.⁸

The direct transition from tempera to oil may have been deterred by various factors, but painters' earlier training in tempera seems to be a principal one. Although later fifteenth-century Italian painters were introduced to the specific properties of oil, their experience of picture-making based on tempera could obstruct the wider application of this new material. Indeed, from the standard of fifteenth-century painting technique, oil painting poses a number of problems.

One of the drawbacks of the oil medium is its drying process, which requires a longer time than any other medium.⁹ The drying process of oil is affected by various factors, but it

⁷ The results of media analysis have been published in its journal, the National Gallery Technical Bulletin (hereafter, NGTB). Until 1996, about 70 Italian paintings, largely dating from the fifteenth century, have been analyzed in the Scientific Department of the National Gallery, providing so far the most comprehensive data for a single group of paintings. On the basis of this research, Jill Dunkerton assessed the general patterns of the change of paint media in fifteenth-century Italian painting and discussed its meaning; J. Dunkerton, 'Modifications of traditional egg tempera techniques in Italy', *Early Italian Paintings Techniques and Analysis*, 1997, pp.29-34. Raymond White's recent technical reports on the media analysis provides a crucial data; NGTB (17) and (19) published in 1996 and 1998; R. White and J. Pilc, 'Analyses of Paint Media', NGTB, (17), 1996, pp.91-103; R. White, J. Pilc, and J. Kirby, 'Analyses of Paint Media', NGTB, (19), 1998, pp.74-91.

⁸ White and Pilc, *ibid.*, pp.91-93; Dunkerton, *ibid.*, pp.29-30.

⁹ For scientific explanation of the drying process of oils, see J. Mills and R. White, *Organic Chemistry of Museum objects*, London, 1987, pp.30-35.

generally takes days and, sometimes, weeks to become solid enough to receive a further paint layer.¹⁰ Although this was the very quality that allowed painters to blend colours on the painting ground to obtain gradual tonal transition, it undermined their technique which depended on the rapid drying-speed of the binding medium.¹¹ Andrea Mantegna was aware of oil paint medium from his early years, but there is no evidence to show that he ever extended its application during his time.¹² Mantegna may have chosen not to use it for various reasons, but one of them was certainly its slow drying rate. He once claimed that he preferred to work in glue because it dried fast.¹³ The drying problem of oil paint medium still remained critical in the early sixteenth century, and painters like Giovanni Bellini had to excuse themselves to their private clients, who were less familiar with the nature of the medium. Isabella d'Este received a letter dated in January 1504 from her Venetian correspondence, Lorenzo da Pavia, reading that 'Bellini needed another one and a half months because it was winter and his colours would not dry properly.'¹⁴ Bellini may have made up these practical excuses to disguise his unwillingness to advance Isabella d'Este's commission but, nevertheless, it appears that his explanation was, to a large extent, based upon the technical problems of oil painting at that time.

The prepolymerization of oil or heat-boiled oil can speed up the drying process, though its role is limited because it should not be used extensively due to its strong viscosity.¹⁵ Oil diluent was available in forms of turpentine as early as the fifteenth century, but no documentary evidence has been found to date to indicate its use as a painting diluent

¹⁰ R. Gettens and G. Stout, *Painting Materials: A Short Encyclopaedia*, New York, 1966, p.72; Mills and White, *ibid.*, p.30.

¹¹ The method of working on several canvases at once rather than sequentially was developed as a later response to this problem, for example, by Titian; M. Boschini, *La carta del navegar*, ed. by A. Palluchini, Venice and Rome, 1966, pp. 711-12.

¹² See pp. 118– 120 in this Chapter, for Mantegna's approach to oil paint medium.

¹³ R. Lightbown, *Andrea Mantegna*, Oxford, 1986, p.228.

¹⁴ 'Cercha al quadro de Giovane Belino io de contunevo lo sollicito, ancora che me valia pocho, ma m'à promiso che in termine de uno mese e mezo che el sarà finito e dice che a l'invernada pole male colorire che non suga i colori'; C. M. Brown, *Isabella d'Este and Lorenzo da Pavia: Documents for the History of Art and Culture in Renaissance Mantua*, Geneva, 1982, doc.82, p.78. The medium used was not specifically mentioned, but from the context it is clear that Bellini was working with oil.

¹⁵ Jill Dunkerton and Jo Kirby empirically found it impossible to work with prepolymerized oil alone. They showed the handling qualities and optics of pre-polymerized oil in her talk on paint media at the internal seminar of the National Gallery held on 15th June, 1998. Her paper will be available in published form.

before the seventeenth century.¹⁶ Lead, copper, manganese and chalk-based pigments promote drying, but their presence should be measured carefully; otherwise their discrepancy in drying time with other pigments can result in a defective paint film, such as localized crackles and severe wrinklings, so-called the 'crocodile appearance'.¹⁷

The yellowing of oil undeniably discouraged fifteenth-century painters who valued the purity of colour. Despite oil paint's good chromatic effect, its transparency is a matter of degree depending partly on the pigments; the worst case being that oils can turn yellow within a short period of time and consequently darken the paint film.¹⁸

These problems seem to have been recognised by medieval painters on both sides of the Alps. The Strasbourg Manuscript, a fifteenth-century recipe book of Northern European oil painting, contains various methods which could promote its drying rate and at the same time help to bleach oil colours. Its treatments are generally matched with the aforementioned modern treatments. It advises painters to employ a variety of drying oils such as linseed, walnut, and hempseed, to refine them by absorbent and acidic additives, to add varnishing materials, and to heat with metallic drying catalysts.¹⁹ Some of these treatments were known to Italian painters. Media analysis has shown that fifteenth-century Italian painters preferred walnut oil, presumably knowing by experience that it yellows less than

¹⁶ Personal communication with Dr. Jo Kirby in June, 1998. Oil diluent is believed to give an unpredictable transparency to hand ground pigments. It should be also noted that it is impossible to prove its application as the additive of paint medium, since it evaporates instantly without leaving any chemical traces. Oil diluent as a form of turpentine is found in fifteenth and sixteenth-century manuscripts, but seems to have been used earlier for various purposes such as the cleaning of brush. For the development of oil diluent, see L. Campbell, S. Foister and A. Roy (eds.), 'The methods and materials of Northern European Painting 1400-1550', NGTB (18), 1997, pp.40-43; C. Eastlake, *Methods and Materials of Painting of the Great Schools and Masters*, New York, 1960, vol.1, p. 290ff.

¹⁷ The localized form of crackles is found in the red garment of vermilion in Bellini's oil painting, the *Pesaro Altarpiece* (Museo Civico, Pesaro); see pp. 148-9 in Chapter 4. The 'crocodile appearance' can be caused by the addition of pyrolysis materials to walnut oil. Girolamo da Carpi's *Adoration of the Kings* (National Gallery, London) gives the best example of this defect; White and Pilc, *op. cit.*, 1996, p.92. For the crackles caused by the varying combination of paint media, see following pp. 106-107. For discussion of crackle found in fifteenth century Italian paintings, see L. Keith and A. Roy, 'Giampietrino, Boltraffio and the influence of Leonardo', NGTB, (17), 1996, p.15.

¹⁸ It has been believed that walnut oil was employed for pale colours because it was initially less yellowing; Mills and White, *op. cit.*, 1987, p.34. For yellowing of oil, see R. Mayer, *The Artist's Handbook of Materials and Techniques*, London, 1951, pp.130-133.

¹⁹ *The Strasbourg Manuscript, A Medieval Painter's Handbook*, London, 1966, pp.54-55. The validity and meaning of the instruction given by the Strasbourg Manuscript for the preparation of drying oils is examined by NGTB(18) and C. Villers, G. van Heemstra, and C. Reynolds, 'A fourteenth-century German triptych in the Courtauld Gallery', *Burlington Magazine*, (139), 1997, pp.668-675.

linseed oil, particularly with white and blue colours.²⁰ By adding varnish materials such as pine resin, the paint medium can be made more glossy and transparent.²¹ The identification of resin by chemical analysis of media should be treated cautiously though, as it can be the result of the contamination of the paint sample by varnish, but a few Italian cases have been reported to suggest the addition of resin to oil.²² The pre-polymerisation of oil -either by boiling or steady exposure to daylight- can not only effectively speed up the drying rate, but reduce the yellowing.²³ Cennini was well aware of this and recommended both preparatory methods.

Perch'è dell'utili cose che a te bisogna sapere sì per mordenti sì per molte cose che s'adovra, ti convien sapere far questo olio. ... Quando hai fatto il tuo fornello, empiglia un fuoco temperato: ché quanto il farai bollire più adagio, tanto sarà migliore e più perfetto. E fallo bollire per mezzo, e sta bene.²⁴

Quando tu hai fatto questo olio, abbi il tuo olio di semenza di lino: e di state mettilo in un catino di bronzo o di rame, o'n bacino; e quando è il sole lieto, tiello al sole, el quale, se vel tieni tanto che torni per mezzo è perfettissimo da colorire.²⁵

As Cennini made it clear that in the case of its preparation for mordants oil should be cooked over fire, and the resulting stand oil was meant to be used as paint medium. It is, however, important to note that the viscosity of prepolymerised oils almost becomes prohibitive such that painters can hardly grind pigments with it and further handle the

²⁰ Filippino Lippi used walnut oil for blue and linseed oil for green and red in the *Moses Brings Forth Water Out of the Rock* and the *Worship of the Egyptian Bull-God, Apis*, both dated to c. 1500 and in the National Gallery, London; Mills and White, *op. cit.*, 1978, pp.71-6. However, there is little consistency in his use of walnut oil. In the case of the *Virgin and Child with St John*, c.1480, Lippi used linseed oil for blue and walnut oil for red lake glaze; White and Pilc, *op. cit.*, 1996, p.92. Vasari wrote that walnut oil is thinner and does not yellow. The recommendation of walnut oil for blue and white colours is found in sixteenth-century treatises such as Borghini's *Il Riposo* (Florence, 1584) and Armenini's *De' veri Precetti della Pittura* (Ravenna, 1586); J. Plesters, 'Technical Aspects of Some Paintings by Raphael in the National Gallery, London', *Princeton Raphael Symposium; Science in the Service of Art History*, (ed.) J. Shearman and M. Hall, 1990.

²¹ Campbell et al., *op. cit.*, 1997, p.94; Villers et al., *op. cit.*, 1997, pp.668-675.

²² Some resin was identified by GLC as added to oil in Cosimo Tura's *An Allegorical Figure* (National Gallery, London); J. Mills and R. White, 'Analyses of Paint Media', NGTB, (11), 1987, pp.92-93. The oil medium mixed with pine resin is reported to be in all the three paintings of Piero di Cosimo which have been recently examined by the Scientific Department of the National Gallery, London [GLC-MS and FTIR]; *A Satyr mourning over a Nymph* (c.1495, National Gallery, London), *The Fight between the Lapiths and the Centaurs* (1500-1515, National Gallery, London) and the *Forest Fire* (c.1505, Ashmolean, Oxford); R. White, J. Pilc, and J. Kirby, 'Analyses of Paint Media', NGTB, (19), 1998, pp.74-90.

²³ Mills and White, *op. cit.*, 1987, p. 34.

²⁴ Cennini, *op. cit.*, Chapter 91.

paint. Because of this, it seems that painters tended to add a little pre-polymerized oil to uncooked drying oil to obtain similar effects.²⁶

The complicated process of preparing oil medium and its subsequent instability may have frustrated painters who had much experience with painting in tempera, which has a comparatively straightforward preparation and a stable interface with pigments. In contrast to viscous oils, paint bound in egg yolk and diluted by water, forms a liquid of a consistency between water and jelly, and thus allows the painters who were concerned with fine craftsmanship to achieve precise forms with certainty.²⁷ In addition, the paint film in tempera is arguably the toughest and most long-lasting achievable with any media, if the pigment-to-medium and water-to-medium ratio are correctly gauged.²⁸ Therefore, unlike oil painting, considering their age, the astonishingly fresh tints of many medieval works is notable. Thus, to many of fifteenth-century Italian painters, tempera remained a favourable option, even when oil was available as a serious alternative.²⁹

Mixed technique

For such varied practical reasons, most fifteenth-century Italian painters took a cautious approach to oil paint. Media analysis has shown that painters did not always use pure oil medium, but employed it in varying combinations with tempera. Two types of mixed technique can be categorised from the results; [1] the separate application of the media within the same painting -in separate areas or separate layers; [2] creating the third medium 'tempera grassa' by adding a little oil to egg tempera.

²⁵ *Ibid.*, Chapter 92.

²⁶ The presence of prepolymerized oil can be identified only by the Mass Spectrometry. It is reported to have been used together with untreated oil in Paolo Uccello's *St George and the Dragon* (c.1460) and Piero di Cosimo's *A Satyr mourning over a Nymph* (c.1495) in the National Gallery, London; R. White et al., *op. cit.*, 1998, pp.74-90. For its use in Northern European paintings, see Campbell et al., *op. cit.*, 1997, pp.41-42. For empirical test for prepolymerised oil as a paint, see above fn 15.

²⁷ These qualities of tempera painting have been praised even by artists of the present day L. Maclehorse, *Vasari on Technique*, New York, 1960, p. 294. For a twentieth century painter who worked with tempera, see D. Thompson, *The Material of Medieval Painting*, New York, 1956, pp.62-3.

²⁸ D. Bomford et al., *Art in the Making, Italian Painting before 1400*, London, 1989, p. 28.

²⁹ Francesco del Cossa's *San Vicent Ferrer* (c.1473, National Gallery, London) was reported to be painted in egg tempera, despite its grossy appearance; J. Mills and R. White, 'Analyses of Paint Media', *NGTB*, (5), 1981, pp.66-67. The paint medium of Carlo Crivelli's *Immaculate Conception* (1492, National Gallery, London) is egg; J. Mills and R. White, 'Analyses of Paint Media', *NGTB*, (11), 1987, pp.92-95.

Media analysis of painting from this period has detected either isolated passages of oil paint appearing in tempera painting or *vice versa*. The green of copper resinate and other dark colours such as red lake give a deeper but translucent tone with oils and painters valued this quality formerly unattainable in tempera painting. It is interesting to find that Cennini advised the preparation of dark colours such as ultramarine blue, black, verdigris, and lac in oils.

Quando hai così fatto, tolli di più colori macinati ad olio, sì come azzurro oltre marino, negro, verderame e lacca: e se vuoi alcun vestire o riverscio che risponda in verde, metti verde...³⁰

He mentioned this method for draperies of golden brocades in the section dedicated to the decoration of glass, but media analysis confirms that these are the colours which are often bound in oil in tempera painting.³¹ Conversely, egg binding medium which naturally gives the colour a sharper and brighter tone remained a favoured choice for critical parts of the painting for painters who began to use oil paint medium extensively.³²

The application of oil over a tempera layer -tempera for underpainting and oil for glazing- can be also placed in the first category of mixed technique. This method aims to combine the speedy drying quality of tempera with the subtle chromatic quality of oil, and seems to have been popular in Northern Europe as a practical solution to the slow drying process of oil.³³ The best surviving Italian example to indicate this working process based on these two media is Cima's unfinished *Virgin and Child with Saints* (c.1495, National Gallery, Edinburgh).³⁴ The tightly hatched paintwork underneath more fluid modelling layers is also found in the infra-red scanning of Giovanni Bellini's *Pesaro Altarpiece* (1473-5,

³⁰ Cennini, *op. cit.*, Chapter 172.

³¹ Andera Mantegna used oil especially for ultramarine in his tempera paintings for the Studiolo [GLC]; S. Delbourgo et al., 'Etude analytique de la matière picturale; L'Analyse des Peintures du Studiolo d'Isabelle d'Este', *Laboratoire de Recherches des Musées de France; Annales*, 1975, pp.23-25. David Ghirlandaio employed oil for red lake and green glazes in the *Virgin and Child with St John* (1480s, National Gallery, London) [GLC]; Dunkerton, *op. cit.*, 1997.

³² Egg tempera and tempera-based emulsion are often found in the paint for larger areas such as priming and the background of composition as well as the underpaint. These paint media were presumably essential for these areas because of their speedy drying rate. In Filippino Lippi's *Virgin and Child with Saint John* (1480, National Gallery, London), for instance, egg tempera is reported to be present in the pale blue sky and the underpaint of green lining of Virgin's sleeve; R.White and J. Pilc, 'Analyses of Paint Media', *NGTB* (17), 1996, pp.96-7. See following p.85, for Cima's use of emulsion.

³³ Campbell et al., *op. cit.*, 1997, pp. 40-3.

Musei Civici, Pesaro) and *Portrait of Doge Loredan* (c.1501-5, National Gallery, London) seems to indicate this type of mixed technique.³⁵

Tempera grassa

The second mixed method, so-called 'tempera grassa', is the most distinctive practice that marks the transitional period of paint medium in fifteenth-century Italy. Its origin and later development is yet to be clarified, but media analysis has identified its presence in Northern European paintings as early as the fourteenth century.³⁶ Media analysis shows that Masaccio and Masolino's dismembered altarpiece for the Colonna Chapel, Santa Maria Maggiore, Rome, dated to the 1420s is the earliest Italian case, at least reported so far. The paint media of its section with *St Liberius(?) and Matthias* stylistically attributed to Masolino is egg emulsion and oils, and different from that of the other part ascribed to the hand of Masaccio, the *St Jerome and John the Baptist*, that was predominantly painted in egg tempera.³⁷ The most likely hypothesis is that tempera grassa was introduced into Italy by an artist like Masolino who travelled widely in Hungary and north of the Alps.³⁸

No contemporary source refers directly to this method, but the use of a certain emulsion of egg-and-oil can be inferred from the Bolognese Manuscript dated to the mid-fifteenth century. It recommends the addition of linseed oil to egg tempera in the preparation of certain pigments like red lake. 'To make a rose colour very good and beautiful', it advises the grinding of 1½ oz of lac and the same quantity of ceruse 'with linseed oil and prepared

³⁴ See P. Humfrey, *Cima da Conegliano*, Cambridge, 1983.

³⁵ See Chapter 4, for discussion of the possible use of the tempera-based techniques in Bellini's *Pesaro Altarpiece*. For the comment of tight brushstrokes in the underlayer of the *Portrait of Doge Loredan*, see J. Dunkerton et al., *Giotto to Dürer*, London, 1991, p.200.

³⁶ The emulsion was frequently adopted as a paint medium in the Low Lands [staining method]; L. Kockaert, 'Note sur les emulsions des primitifs flamands', *Institut Royal du Patrimoine Artistique* (14), 1973/4, pp.133-9; L. Kockaert, 'Note on the painting technique of Melchior Broederlam', *ICOM Committee for Conservation*, Copenhagen, 1984, Preprint 184. 19., pp.7-10. The wide-spread use of emulsion in medieval German paintings is identified by staining method and reported in H. Kühn, 'Pigementanalysen', *Katalog der Altkolner Malerei*, Wallraf-Richartz Museum, Cologne, 1990, pp.567-666. See also Villers et al., *op. cit.*, 1997, p.674.

³⁷ Both works are in the National Gallery in London, and the result of their media analysis by GLC/FTIR-microscopy is reported in White and Pilc, *op. cit.*, 1996, pp.91-103.

³⁸ *Ibid.*, pp.91-2.

white of egg'.³⁹ Evidently, egg-and-oil emulsion was often adopted as a binding medium for red lake, for instance, in Dominico Ghirlandaio's *Virgin and Child* (1480s, National Gallery, London) and Botticelli's *Primavera* (1480s, Uffizi, Florence)⁴⁰

It has been said that tempera grassa, in nature, 'would have differed from ordinary egg tempera to the extent that it would be rather richer and could be manipulated more freely and with greater flexibility', allowing 'a softer blending of individual brush strokes'.⁴¹ However, it is important to note that this mixed medium combines the advantages of the two media only in a limited way. Its characteristics and handling quality are fundamentally closer to those of tempera. Because of this, tempera grassa was generally adopted by painters who preferred to work in egg tempera in the fifteenth century and eventually ceased to be used in the next century when oil became a dominant paint medium throughout Italy.

Media analysis has shown that tempera grassa was more widely used in central Italy than Northern Italy.⁴² It has been said that the slow migration of oil painting and the strong tradition of paintwork based on aqueous media like tempera and fresco in Central Italy sustained a tempera-based technique like tempera grassa for longer.

The mixed medium was certainly practised in Northern Italy and Venice, but it seems that it was less frequently adopted there and chronologically came several decades later than the central Italian examples. Cosimo Tura employed it partially for green grass and blue sky areas in his predominantly oil painting, *St Jerome* (National Gallery, London).⁴³ This work, dating to the 1470s, is one of the earliest examples of tempera grassa in Northern Italian painting. Media analysis shows that amongst Venetian painters Carlo Crivelli had

³⁹ 'Recipe lac untiam unam cum dimidia et tantundem ceruse et macina cum oleo seminis lini et cum clara ovj preparata et pone in carta et si vis magis coloratum et optimum acipe tantundem grane et macina insimul et habebis'; the Bolognese Manuscript, section (201); Merrifield, *op. cit.*, pp. 486-7.

⁴⁰ Tempera grassa is found in red lakes, greens and blues. It makes these colours more transparent giving warmer tone; Dunkerton, *op. cit.*, 1997, p.32.

⁴¹ White and Pilc, *op. cit.*, 1996, p.91.

⁴² Dunkerton, *op. cit.*, 1997, pp.31-32.

⁴³ R. White and J. Pilc, 'Analyses of Paint Media', NGTB (14), 1993, pp.86-94.

an exceptionally keen interest in this medium [Table 2].⁴⁴ In the *Vision of the Blessed Gabriele* (National Gallery, London), dated to 1489-90, he used egg emulsion extensively. Cima partially employed an emulsion of oil and protein for lead-white priming and the light blue areas of sky in his paintings reported to be generally painted in oils such as the *Virgin and Child with Saints* (c.1490s, Brera, Milan), the *Lamentation* (c.1490, Modena), and the *St Peter Enthroned* (c.1516, Brera, Milan).⁴⁵ It is probable that the fast drying rate of tempera grassa was adequate for the paints employed for larger areas such as priming and background sky.

It is unlikely that Giovanni Bellini was unaware of this mixed technique, but media analysis has not yet shown clear indication of the presence of egg emulsion in his works.⁴⁶ The scientific identification of the media used in the *San Giobbe Altarpiece* (Accademia, Venice) suggests some possibility of protein-based emulsion in the preparatory layer [staining method], but not in the painted film.⁴⁷ Its painted area is divided into either tempera or oil [GLC/staining method]. The pattern of Bellini's disposition of paint media in a single piece of work is yet to be fully examined, but he clearly showed his intimate knowledge of the changing characteristics of pigment dependent on paint medium; oil for rich and warmer tones and egg tempera to add lighter and cooler shades. Three white areas of lead white examined in the *San Giobbe Altarpiece*, for instance, the loin cloth of St Sebastian and the white marble from the throne are identified as painted in tempera and appear sharp and edgy, whereas the white head-dress of the Virgin is in walnut oil and consequently gives a warmer tone appropriate to its quality as drapery [GLC/staining method].

An example showing the sophisticated disposition of paint media in this period is found in Piero della Francesca's *Brera Altarpiece* (c.1470-2, Brera, Milan). He employed all the

⁴⁴ J. Mills and R. White, 'Analyses of Paint Media', NGTB, (2), 1978, pp.71-76.

⁴⁵ R. Rossi-Manaresi and A. Tucci, 'Painting Technique of Cima da Conegliano and Analytical-Documentary Comments about Pigments', *ICOM Committee for Conservation*, 1990, pp. 72-78.

⁴⁶ Staining method suggests some possibility of egg emulsion in the media analysis of the preparatory layer of *San Giobbe Altarpiece* (Accademian, Venice); S. Volfin and R. Stevanato, 'Studio dei leganti pittorici della Pala di San Giobbe di Giovanni Bellini', *Quaderni della Soprintendenza per i Beni Artistici e Storici di Venezia*, (19), 1994, p.41.

⁴⁷ Like Cima, Bellini may have valued the speedy drying rate of oil for the paint of preparatory layers.

possible combinations of egg tempera and oil [Mass Spectrometry-UV/Visible spectrum].⁴⁸ Distinctively he adopted tempera for the background architectural setting and for grey colour areas and egg-and-oil emulsion for flesh and glassy marbles. The rest of the composition is painted either in oil-resin, oil over tempera, or even tempera over oil. The complicated application of various media can be exemplified in the media analysis of blue areas. In the mantle of the Virgin, ultramarine bound in tempera is applied over the azurite underlayer of oil.⁴⁹ The blue mantle of St John the Baptist is singularly painted in azurite mixed with oleo-resinous medium, whereas the paint media used for the blue marble near the saint employs the mixture of azurite and lead white in oil only. Piero della Francesca may have valued the different characteristics of diverse paint media, and carefully measured their chromatic variations and different drying rates. These would be sensible precautions to produce a large, unified devotional composition, which includes the portrait of Federigo da Montefeltro, Piero's patron who apparently had much interest in the new painting material.

The scientific tool employed for the *Brera Altarpiece*, Mass Spectrometry, is an effective analysis which allows the identification of the media employed in individual paint layers.⁵⁰ The application of this method to other contemporary works which have a large composition and permit a subsequently larger number of samples, can produce similar complex results. It is, therefore, not certain yet whether Piero's mixed method is exceptional in this period, but his method can be used for the present as a distinctive example which shows the painter's unprecedented awareness of the nature of different paint media and their diverse effects on pigments in the second half of the fifteenth century.

⁴⁸ F. Trevisani and E. Daffra (ed.), *Quaderni di Brera* (9), 1997, pp. 257-261.

⁴⁹ This unusual method leaves consequently severe defects in paint surface; *ibid.*, pp.258-260. See following pp.111-112 for the craquelures caused by the application of tempera over oil.

⁵⁰ For a brief discussion of Mass Spectrometry, see Appendix 1.

2.2 Motives for 15th century Italian painters' use of oil paint

One can see therefore how the transition in paint media in fifteenth-century Italy was a complicated affair. The choice of oil medium was not imperative and most of its practical advantages were yet to be appreciated. Painters initially wanted to find a way to combine the merits of each paint medium, rather than switch wholesale from one to the other. Nevertheless, they increasingly adopted oil as a main paint medium in the course of the fifteenth century. What then motivated the use of this medium? This question should be examined in a broader perspective and not only in terms of the practical facilities, posthumously attached to oil painting.

Patronal initiative in the development of oil painting

The role of patrons in the development of oil painting in Italy has been curiously underestimated, although the choice of painting material that so clearly affected the final appearance of works would be of concern to patrons and should be addressed as such. Patronal influence toward raising the status of oil paintings at the transitional period of paint media is evident from the fact that oil painting technique in fifteenth-century Italy was closely linked to artists who worked for princely courts, in which patrons' interest can be claimed as a governing force in artist's activity, as well as certain other Italian centres that I shall refer to shortly. Colantonio, believed to have given the initial training in oil painting to Antonello da Messina between 1440 and 1445 was a Neapolitan court painter under the regimes of both René of Anjou and Alfonso of Aragon.⁵¹ Zanetto Bugatto, the portrait painter to the powerful duchy of Milan, seems on the basis of documentary evidence to have been closely involved with Netherlandish oil painting.⁵² Artists who were associated with courts of modest size such as Ferrara and Urbino shared an intimate interest in oil painting. Cosimo Tura who worked for the Este in Ferrara is now considered to be one of the early Italian practitioners of a sophisticated oil painting

⁵¹ J. Wright, 'Antonello da Messina; Origins of his style and technique', *Art History*, (3), 1980, pp.41-52.

⁵² L. Syson, 'Zanetto Bugatto, court portraitist in Sforza Milan', *Burlington Magazine*, (138), 1996, pp.300-308.

technique.⁵³ Piero della Francesca refined his oil painting in the 1460s when he was closely associated with the court of Urbino.⁵⁴

The explanation for the close link between oil painting and court painters has to be related to the popularity of Netherlandish paintings at these courts. The influence of Northern European practice on Italian painters was fundamental in terms of the development of oil painting technique. Although scientific analysis shows that Italian painters used oil as early as the Middle Ages and adopted it more widely than previously thought, there is little evidence that they independently developed oil painting technique up to the level of fourteenth- and fifteenth-century Northern European paintings.⁵⁵ The extensive use of oil and complicated glazing technique found in Italy after the middle of the fifteenth century such as Cosimo Tura's *Allegorical Figure* (National Gallery, London) seems strongly to imply either direct or indirect influence from Northern Europe.⁵⁶

In the discussion of Northern European influence on Italian oil painting, it is important to note that paintings from North of the Alps were not universally accepted in Italy. Its popularity gained real strength in major courts, reflecting the more exotic taste of the ruling elite. Netherlandish paintings appealed to them in terms of very specific types of verism such as the appearance of texture in materials and effects of light such as lustre or mirror-like reflections. René of Anjou, the French King who ruled Naples between 1438 and 1442 showed deep interest in the Netherlandish paintings. According to Summonte, René himself was a painter and even made a study of Netherlandish painting.⁵⁷ This preference for Netherlandish art continued in the Neapolitan court under the rule of Alfonso of Aragon from 1442. The humanist Fazio who was active in Naples from 1444

⁵³ J. Dunkerton, A. Roy and A. Smith, 'The Unmasking of Tura's Allegorical Figure', NGTB, (11), 1987, pp.5-35.

⁵⁴ M. Hall, *Color and Meaning: Practice and Theory in Renaissance Painting*, Cambridge, 1992.

⁵⁵ Northern medieval paintings show the sophisticated and assured use of oil, although there was no uniform approach to its use; C. Villier et al., *op. cit.*, 1997; J. Lynn, 'Two Thirteenth century Panels from the Painted Chamber, Westminster Palace', *Zeitschrift für Kunsttechnologie und Konservierung*, (1), pp.15-28; for Norwegian examples see L. Einar Plahter and U. Plahter, 'The Technique of a Group of Norwegian Gothic Oil Paintings', *Conservation and Restoration of Pictorial Art*, London, 1976, pp.36-42. There is no such extensive use of oil in Italian Medieval paintings.

⁵⁶ Dunkerton et al., *op. cit.*, 1987, pp.5-35.

⁵⁷ A. Cole, *Art of the Italian Renaissance Courts*, London, 1995, pp.45-66.

recorded that the Spanish king had a collection of Netherlandish paintings by Jan van Eyck and Rogier van der Weyden.⁵⁸

The Neapolitan court painter Colantonio reflected his employers' interest in his own work. His major surviving works such as the *St Jerome* and the *St Vincent Ferrer Altarpiece* (S. Pietro Martire, Naples) show a wider range of influence from France and Spain as well as Flanders, partly confirming contemporary critics' praise of his masterful oil painting method, similar to that of Jan van Eyck.⁵⁹ Antonello da Messina was in his workshop in the 1440s and it was here that he came to have an initial interest in the technical and formal quality of Eyckian works.⁶⁰

There is documentary evidence which indicates that princes and their spouses encouraged their painters to practise oil painting. In the early 1460s, for instance, the awareness of Netherlandish oil painting at the Milanese court had risen to a level where at least one of their painters was sent to the Netherlands to study paintings produced in an oil medium, particularly in relation to portrait paintings. In a letter to Rogier van der Weyden on 7th May 1463, Bianca Maria Visconti, the Duchess of Milan, thanked him for the care he had taken in teaching her court painter Zanetto Bugatto 'tucto quello intendevati nel mestriero vostro'.⁶¹ Due to the lack of the surviving works of Zanetto, it is difficult to substantiate the Netherlandish painter's influence on Zanetto in terms of painting technique. It is, however, highly probable that Zanetto learned oil painting technique from the circle of van der Weyden. Confirming Zanetto's study trip to Bruges, Filarete says in his treatise of c.1464, that Zanetto had lessons from van Eyck and van der Weyden concerning oil painting.⁶²

Bianca Maria Visconti's decision to send her painter to the Netherlands to master oil painting technique is not an isolated case indicating patrons' praise for Netherlandish

⁵⁸ *Ibid.*

⁵⁹ Wright, *op. cit.*, pp. 42-45.

⁶⁰ *Ibid.*

⁶¹ See Syson, *op. cit.*, pp.300-308.

⁶² Filarete, *Trattato di architettura*, vol. 2, ed. A. Finoli and L. Grassi, 1972, p. 667.

paintings and their desire to collect them. Federigo da Montefeltro, Duke of Urbino, apparently frustrated with Italian painters' application of oil paint, gave orders that Netherlandish painters be invited to Urbino to paint for him.⁶³ In 1465, Justus van Ghent was in Urbino and commissioned to paint an altarpiece.⁶⁴

On the grounds of recent scientific analysis one can speculate that the artistic contact between Italy and the Netherlands encompassed an Italian desire to know how Netherlandish paintings were made and, consequently, raised the possibility of such an exchange of painters across the Alps known from documents. It has been demonstrated that the systematic Netherlandish use of oil paint by an Italian painter was adopted in the late 1450s in Ferrara, where Rogier Van der Weyden's work had been known since c. 1450 together with Jan van Eyck's *A Woman at her Toilet*.

The transition from tempera to oil in Italian court painting is well-exemplified in Cosimo Tura's *Allegorical Figure* (late 1450s, National Gallery, London) for the decoration of studiolo at the Castello of Belfiore in Ferrara. Chemical analysis [GLC] suggests that Tura changed his painting technique in the course of the work's execution, and implies that after starting with tempera, he came to learn the complexity of oil technique, switched media, and completed the work using his new method.⁶⁵ Tura's command of oil painting has been attributed to direct instruction from Netherlandish painters visiting Ferrara or, else, from other Italian painters who had already mastered the Northern methods.⁶⁶

Venice and Northern European Painting

On the basis of the above documentary and scientific evidence, it can be safely assumed that nobles' increasing interest in Netherlandish paintings consequently influenced their

⁶³ According to the biographer Vespasiano da Bisticci, Federigo Montefeltro 'per non trovare maestri a suo modo in Italia, che sapessino colorire in tavole ad olio, mandò infino in Fiandra'; Vespasiano da Bisticci, *Vite di uomini illustri*, ed. by P. D'Ancona and R. Aeschlimann, Milan, 1951, p. 209.

⁶⁴ C. Eastlake, *Methods and Materials of Painting of the Great Schools and Masters*, New York, 1960, vol. 1, pp. 214-218; R. Weiss, 'Jan van Eyck and the Italians', *Italian Studies*, (11), 1956, pp. 1-15; (12), 1957, pp.7-21.

⁶⁵ Dunkerton et al., *op. cit.*, 1987; Dunkerton et al., *op. cit.*, 1991, pp.198-99.

⁶⁶ Dunkerton et al., *ibid.*, 1991, pp.198-199. It is also possible that Tura painted over the work which other painters working for Lionello d'Este left unfinished. In any case, this work show that the change of paint media in the Este court of Ferrea in the mid-fifteenth century; see Dunkerton, *op. cit.*, 1997, pp.30-31, for its discussion.

employees closely to copy Northern European painters' technique and further provided the opportunity to develop a sustained practice with this relatively less explored medium. In the case of Venice, the similar patronal role in the promotion of oil painting could be played by its strong mercantile community. It is difficult not to assume that they were at that time, if not earlier, showing a preference for paintings in oil. Bruges, the vibrant artistic centre in the North, for instance, was a close commercial partner of Venice and a patriarchal merchants like Andrea Barbarigo set up businesses there.⁶⁷ The shippings between these two centres was regularly scheduled and supervised by Venetian government and probably offered the most reliable method for the import of Netherlandish products, including its artwork, to Italy.

The ruling families of Venice had clearly an interest in collecting Netherlandish works. Although little documentary trace of this survives, there is some circumstantial evidence of artistic contact between Venice and the Netherlands. The small Eyckian portrait of the future Doge, Marco Barbarigo, probably painted about 1450 when he was a consul in London, may well have been in Venice soon after this date.⁶⁸ It is also probable that some of the Netherlandish paintings in Venetian private collections, mentioned by Marcantonio Michiel in the 1530s, may have been there much earlier.⁶⁹ Giovanni Bellini's early involvement with oil painting was certainly encouraged by the social milieu of Venice and, on the other hand, should be viewed as the reflection of the growing interest in oil as a paint medium in the Venetian establishment in general.⁷⁰ It should be emphasized that the cosmopolitan and sophisticated tastes of travelling merchant elite with access to Netherlandish paintings in Northern European cities could also explain the interest in Netherlandish painting in other mercantile centres in Italy such as the Medici circle in Florence.⁷¹

⁶⁷ For the life of Andrea Barbarigo, see F. Lane, *Andrea Barbarigo-Merchant of Venice*, Baltimore, 1944.

⁶⁸ M. Davies, *National Gallery Catalogues: The Early Netherlandish School*, London, 1945, p.36.

⁶⁹ G. Robertson, *Giovanni Bellini*, London, 1967, p. 9.

⁷⁰ See pp.136-9 in Chapter 3, for discussion of Bellini's early works in oils. Lorne Campbell proposed Dieric Bout's influence on the young Bellini; L. Campbell, 'A Polyptych Painted on Linen by Dirk Bouts', in a study day held at the Courtauld Institute of Art, on 16th May 1998, on *European Paintings on Fabric Supports in the 14th and 15th Centuries; Techniques, Function, and Display*.

⁷¹ There was a tendency to emulate courtly style to some extent in the Medici circle. See P. Nuttall's 'The Medici and Netherlandish Painting' in the *Early Medici and their Artists*, F. Ames-Lewis (ed.), London, 1995, pp.139-144.

Contracts

The role of patrons in the development of oil painting is further implied in artists' contracts. The earliest contract known so far which stipulated the use of oil together with precious materials is for the execution of a banner commissioned to Piero della Francesca by the Confraternity of the Annunciation in Arezzo in December 1466.

E che el sopra detto ghonfalone sia ... chon tutti e cholori e oro fino, tuti fini e l'azuro ultramarino, e lavorato a oglio, e che sia in tuto e per tuto bene laborato a uso di buoni maestri, chome è 'ldovere.⁷²

It is interesting to find that the timing of this contract generally concided not only with the change of paint media used by Piero della Francesca, but by Italian painters in general. The St Michael panel, completed in 1469 (National Galley, London), was reported to be painted in oil, marking the change of his earlier painting practice which was previously based on egg tempera in the 1460s [Table 5]. In a similar way, other Italian artists like Cosimo Tura began to use oil in the 1460s [Table 4]

According to the contract, Leonardo da Vinci's *Madonna of the Rocks* (Louvre, Paris) commissioned in Milan in 1483 was to be skilfully executed in oil; '... facta aolio in tucta perfetione'. The specific stipulation of the use of an oil medium is probably explained by the fact that its use was not yet widespread in Milan at that date.⁷³ The stipulation of oil is not evident in a sample of 30 Venetian contracts, consulted for the present study. Geographically, the nearest example is the contract for the altarpiece for Santa Giustina in Padua of 1513, which required the painter, Girolamo Romanino, to use oils; '...se obliga de farla in tuta perfeczion laurata a olio'.⁷⁴

Oil as a vehicle for 'Naturalistic Painting'

Patrons' concern with painting executed in the new medium appears to have been decisive in the initial development of oil painting, but could not explain the ultimate transition in

⁷² E. Battisti, *Piero della Francesca*, vol.2, Milan, 1971, p. 615.

⁷³ H. Glasser, *Artists' Contracts of the Early Renaissance*, 1965, pp.35-36.

paint media, which is likely to have resulted from broader cultural changes. It seems that Italian painters' increasing application of oil paint was closely related to the change of aesthetic in favour of the representation of naturalistic form and space during the course of the fifteenth century. For the creation of this optical quality, oil has its own inherent characteristics, which render it incomparable to tempera.

The choice of paint media can significantly affect the appearance of a painting. Surrounding the particles of pigment, it constitutes the actual paint film and, to a large extent, defines its visual property. In an effort to imitate tonal transition in nature, each colour needs to be at its maximum intensity when in full light, and then this intensity is gradually modified with reduction of illumination appearing to fall on the depicted object.⁷⁵ With oil this effect can be produced with far greater ease. The slow drying process of oil allows the painter to attain a continuous value progression by blending colour on a support of panel or canvas. In addition, deep-toned shadows can be achieved without loss of intensity by applying multiple transparent glazes over opaque underlayers.

The effort to approximate continuously graduated colour change would be immense for a tempera painter. Tempera dries so quickly that colour cannot be blended very easily while wet, and artists using tempera must handle the brush systematically, using premixed colour for modelling. In addition, glazing, the most successful painting method to imitate the colour values and density of dark shadow, was not possible for the tempera painter. Glazing method depends on the transparency of colour, but pigments appear opaque or semi-opaque when mixed with tempera. The loss of moisture by evaporation in tempera painting causes the paint to shrink and make pigments stick on the surface, leaving the proportion of pigment to medium relatively high. As a result, light cannot penetrate the paint film made of tempera, which rather scatters it arbitrarily. In contrast, oil does not dry, in the sense of losing moisture, but rather sets by a slow and gradual process of

⁷⁴ N. Baldoria, 'Pitture di Girolamo Romanino', *Archivio storico dell'arte* (4), 1891, pp.59-60. The altarpiece is now in Museo Civico, Padua.

⁷⁵ D. Thompson, *The Practice of Tempera Painting*, New York, 1962, pp.1-8. It was Jan van Eyck who first substantially realised this quality with great emphasis on reflection and material texture.

oxidation. Then, the pigment particles remain suspended in the paint film of oil which light can penetrate, reaching the underlayer.

Without a satisfactory glazing method, tempera painters often used pure colour for shadow and added white to lighten the tone.⁷⁶ On the basis of this method, however, a reduction in complexity of natural effect is inevitable. Alberti advised artists to add black to the coloured pigment for the representation of naturalistic shade.⁷⁷ The origin of 'Albertian-style modelling' technique is yet to be defined, but was commonly practised in Italy in the fourteenth and fifteenth century.⁷⁸ The works of Fra Filippo Lippi and Domenico Veneziano have been cited as examples; for instance, Lippi's *Madonna and Child with Angels*, (c. 1460, Uffizi, Florence) and Domenico Veneziano's *Saint Lucy Altarpiece* (c. 1445, Uffizi, Florence).⁷⁹ The result of adding darkening agents to the colour with egg tempera, however, can make the painting look murky, and, for this aesthetic reason, this traditional modelling was soon to be replaced by the oil-based technique.⁸⁰

The transition from tempera to oil seems logical at a time when 'naturalistic painting' was much admired.⁸¹ In 1475 Galeazzo Maria Sforza praised Bugatto as a painter who could copy from nature with singular perfection, in a letter to his Venetian ambassador, Leonardo Botta, asking for a replacement for Bugatto after his death.⁸² His Venetian correspondent recommended a Sicilian-born painter currently working in Venice, almost certainly Antonello da Messina.⁸³ One of the qualities of Netherlandish oil painting is its

⁷⁶ This modelling method is called Cennini-style modelling, and was generally found in the works discussed in D. Bomford et al., *Art in the Making: Italian painting before 1400*, London, 1990 such as Ugolino di Nerio's *Santa Croce Altarpiece* (c.1324-25, National Gallery, London) and Nardo di Cione's *St John the Baptist with St John the Evangelist and St James* (c.1365, National Gallery, London).

⁷⁷ '...tum levissimo albo quam parcissime suo loco intra fimbrias colorem alteres, suoque contrario loco pariter nigrum illico adiunges. Nam hac nigri et albi conlibratione, ut ita dicam, surgens prominentia fit perspicacior. Dehinc pari parsimonia additamentis prosequere quoad quid satis sit assequutum te sentias'; C. Grayson (ed. and tr.), *Leon Battista Alberti - On Painting and Sculpture*, London, 1972, pp. 88-89.

⁷⁸ For discussion of the Albertian practice in the fifteenth century Italy, see pp.144-5 in Chapter 3.

⁷⁹ For detailed discussion, see Hall, *op.cit.*, pp. 48-52, and J. Ruda, 'Color and Spatial Structure in Painting by Filippo Lippi', *Colour and Technique in Renaissance Painting-Italy and North*, ed. by M. Hall, New York, 1991, pp.41-54.

⁸⁰ Hall, *ibid.*, 1991, pp. 48-52.

⁸¹ The term 'naturalistic painting' in this study refers to the painting in which painters aim to represent objects as they have empirically observed them in nature.

⁸² Syson, *op. cit.*, p. 300.

⁸³ *Ibid.*

power of capturing naturalistic light effects such as lustre and sheen and texture of material, and these may have strongly affected Italian viewers' taste for this type of painting. Accordingly, Sforza's Venetian correspondent may have thought that Antonello, who was acclaimed for his mastery of Netherlandish oil painting technique and his naturalistic representation of light and form, was an ideal replacement for Zanetto Bugatto. It is, however, unlikely that Netherlandish oil painting initiated this trend in Italy. Naturalistic representation was valued in Italy before oil painting began to be regarded as an effective vehicle to obtain this effect. Masaccio's painting method is generally based on traditional egg tempera and fresco, but he attempted to create realistic volumetric forms in his pictorial works.⁸⁴ Masaccio's apparent desire for naturalism was focussed on by the humanist Landino who described him as '*optimo imitatore di natura*'.⁸⁵

The naturalistic potential of oil painting seems to have provided one of the vital motivations for Giovanni Bellini's consistent concern with this new material. This study will show that the young Bellini had a keen interest in the realistic representation of light and colour in the period when he worked closely with the conventional painting materials, and this prodigious effort bore more refined results with the increasing application of oil paint medium in the 1470s.⁸⁶ At this stage he began to build upon his confidence in oil painting and, particularly, its quality of allowing the painter to achieve naturalistic form and space.

* * *

During the fifteenth century, the choice of new media was, to a great extent, a matter of artists' commitment to patronal requests and artistic inclination to certain kinds of naturalistic effect. The cautious transition from tempera to oil paint encountered a turning point towards the end of the century when it converged with corresponding changes in

⁸⁴ For Masaccio's approach to light and colour, see P. Hills, *Light of Early Italian Painting*, New Haven and London, 1987, pp.129-145. Masaccio's *Virgin and Child*, c.1426 (National Gallery, London), was identified as painted in egg tempera [GLC]; R. White, 'Analyses of Paint Media', NGTB, (16), 1995. See above pp. 88-9 and fn.37, for discussion of the paint media of Masaccio and Masolino's altarpiece for the Colonna Chapel, Santa Maria Maggiore, Rome, c.1420s.

⁸⁵ For the discussion of the meaning of '*imitatore di natura*' in Renaissance Italy, see M. Baxandall, *Painting and Experience in the Fifteenth Century Italy*, Oxford, 1990 (2nd ed.), pp.119-121.

⁸⁶ See Chapter 4, for discussion of the development of Bellini's oil painting.

other painting materials; the development of canvas support, for instance. Canvas painting which was steadily developing in the fifteenth century influenced the painter's approach to oil medium. This question will be dealt with separately in the following section.

2.3 The Innovative Use of Textile Support

The innovative use of canvas is as remarkable as the development of oil in the period of transitional painting technique from the mid-fifteenth century. In the Middle Ages, canvas was mainly employed for decorative and temporary works.⁸⁷ Yet, from the mid-fifteenth century until the early sixteenth century, its use underwent fundamental changes such that the basic rules of early methods laid out by Cennini were completely superseded. Canvas, then, became a dominant material in Italy in the sixteenth century, and was to take over most of the functions of panel as well as of fresco in the following two centuries. The long period of coexistence between the supports culminated with the predominance of canvas. What was the fundamental element that promoted the use of canvas during the transitional period?

Tempera-on-canvas painting

The diversification of the technique associated with textile support in mid-fifteenth century Italy provides an important cue to its development. Until then, the standard method of canvas painting was not far different from that of panel painting. Cennino Cennini advised that the method based on egg tempera in panel painting was applicable in the canvas painting, except for a few unavoidable modifications arising from the change of the wooden support to flexible textile.⁸⁸ The recent technical examination of fourteenth-century Italian canvas paintings generally confirms this well-established tradition of tempera-on-canvas painting in Italy.⁸⁹

⁸⁷ In its early days, canvas was appreciated as an economical alternative to panel and tapestry. See Chapter 5, for the function of medieval Italian paintings on textile support.

⁸⁸ Cennini, *op. cit.*, Chapter 162 and 163.

⁸⁹ C. Villers, 'Paintings on Canvas in Fourteenth century Italy', *Zeitschrift für Kunstgeschichte*, (58), 1995, pp. 338-358.

This tradition continued towards the end of the fifteenth century. A number of fifteenth-century canvas paintings such as Botticelli's *Birth of Venus* (canvas, Uffizi, Florence), Lorenzo Costa's *Assumption* (1488-90, Monteveglio Chapel, Bologna), and Gentile Bellini's *Dead Christ with Saints* (c.1472, Ducal Palace, Venice) have been reported to be in egg tempera. Yet, this traditional format of painting was subject to the general modifications of tempera-based technique. The partial employment of oil paint is reported in the media analysis of fifteenth and early sixteenth-century textile paintings. The paint medium of Mantegna's *Pallas Expelling the Vices* (c.1505, Louvre, Paris) is identified as egg tempera, but the blue area of ultramarine is reported to be in oils.⁹⁰ An isolated oil passage is also found in the copper-resinate green area of the tempera canvas painting, the *Virgin and Child with Saints and Donors* (c.1505, Walters Art Gallery, Baltimore), attributed to the Bellini workshop.⁹¹

Netherlandish glue-on-canvas painting

One of the methods which characterise the transitional period of canvas painting is the application of glue medium on textile support. This was the method popular in Northern Europe, but is unlikely to have been commonly practised in Italy before the mid-fifteenth century.⁹² Mixed with gesso for the ground layer, glue was an indispensable material in Italian painter's workshop and was, to a limited extent, used as a binding medium. Nevertheless, there is no clear evidence that indicates its application as a medium on canvas painting.

It is probable that this type of glue-on-canvas painting was introduced into Italy, alongside more sophisticated oil painting. The Italian centres associated with collecting Northern canvas paintings in glue medium and practising this unconventional format are identical to those associated with Netherlandish panel painting. The demand for this type of painting was strong in courts and with discerning patrons and collectors. Although

⁹⁰ Delbourgo et al, *op. cit.*, pp.22-25.

⁹¹ E. Packard, 'A Bellini Painting From the Procuratia di Ultra, Venice', *the Journal of the Walters Art Gallery*, (33-34), 1970/71, pp.64-84.

⁹² Jehan le Begue who recorded Northern canvas painting technique in Paris in 1431 instructs the use of glue as a main paint medium of textile painting. See D. Wolfthal, *The Beginnings of Netherlandish Canvas Painting:1400-1530*, Cambridge, 1989, pp.23-29.

there is no direct evidence supporting the popularity of northern textile painting in Urbino, the thinly-painted subtle images on textile that survive in the Ducal Palace, such as the Verrocchiesque *Virgin and Child* and the *Salvatore Mundi* attributed to Melozzo da Forlì or Bramantino appear to reflect the influence of Netherlandish canvas painting. The large number of Netherlandish canvas paintings in the 1492 Medici inventory suggests its popularity in the Medici circle.⁹³ None of their canvases have survived, but the pictures listed as ‘panni dipinti alla franzese’ and ‘panni dipinti di fiandra’ in the inventory are unlikely to have been much different from the fifteenth-century Netherlandish canvas paintings known to us.⁹⁴

Netherlandish glue-on-canvas painting found its real home in Northern Italian courts, particularly in Mantua during the middle of the fifteenth century.⁹⁵ Andrea Mantegna who worked for the Mantuan court from 1460 was an exceptional Italian artist who became familiar with the properties of glue-based canvas painting. He used fabric supports extensively throughout his career, and matched them with glue more frequently than any other media. Amongst the forty of the surviving Mantegnesque canvases, the application of glue-on-canvas method is notable; glue has been identified in more than 24 out of the 28 works examined.⁹⁶ Some of them dated to his early career in Padua, but a majority of them were executed in his later period dedicated to the Mantuan court.

Mantegna’s choice of this material must have been with his employers’ approval. He once pointed out the convenience of canvas for works to be transported in a letter to his employer dated 1477, though he did not specifically comment on the associated paint medium.⁹⁷ It seems that his patron was well aware of Mantegna’s preference for working in glue medium with canvas support. The choice of paint media is one of the subjects of

⁹³ For *panni dipinti*, see E. Muntz, *Les Collections des Medicis*, Paris, 1888, p.58 and Wackernagel, *The World of the Florentine Renaissance Artists*, trans. by A. Lucks, Princeton, 1981, p.154. See more recently P. Nuttall, *op. cit.*, pp.139-144.

⁹⁴ For a survey of fifteenth century Netherlandish canvas paintings, see D. Wolfthal, *op. cit.*

⁹⁵ The question of its introduction into Italy remains unclear.

⁹⁶ The forty known Mantegnesque canvases are equal to almost one third of all surviving Netherlandish canvases. His increasing use of textile support illustrates the change of painting support at the transitional time of painting technique; Rothe, *op. cit.*, pp. 82-86.

⁹⁷ See also pp. 209-210 in Conclusion, for detailed discussion of the transportability of canvas work. For Bellini’s commission for Isabella d’Este, see pp.195-6 in Chapter 6.

heated discussion in the correspondence between Isabella d'Este and the painters providing canvas paintings for the decoration of her Studiolo. She mistakenly claimed to Lorenzo Costa that Mantegna's tempera work was glue.⁹⁸ Her mistake is, however, understandable, considering that glue was Mantegna's major medium for canvas.

The admiration of Northern canvas painting in Mantua can be clearly seen in a letter from Nicolo Nobili in Lyon to Federico II Gonzaga, Duke of Mantua. Dated to August 18, 1518, it was a response to the Duke's earlier request for the acquisition of several canvas paintings depicting Mary Magdalene 'in forma grande e chollochata in la chrotta'.⁹⁹ The Duke originally intended to buy them from Flanders, but Nobili explained that such works were not made there and were only available in his current residence, Lyon or near Dijon.¹⁰⁰ He wrote that he had bought three and sent them to Signor Giam de Mantova, the Duke's barber. This purchase not only shows the interest of the Duke and his mother, Isabella d'Este, in the cult of Mary Magdalene, but also their concern with and knowledge of Northern canvas painting.

The optical property of glue-on-canvas painting

Glue-based canvas painting has its own specific appearance, which may have drawn the attention of painters and their patrons during the transitional period of painting method. With glue medium, pigments were generally applied to the sized canvas so thinly, often without gesso ground, that the paint embedded itself in the textile layer. Surviving glue canvas paintings extensively reveal the texture of the fabric through the paint film, giving an impression of opacity, which is often now described as thin, powdery, and matt. These properties, combined with the fabric weaves of canvas, are in marked contrast to the smooth surface of panel painting and create a humble and fragile appearance, appropriate

⁹⁸ The modern examination shows that Mantegna's work is actually painted in tempera with the partial use of oil.

⁹⁹ C.M. Brown, 'Documents Regarding Duke Federico II Gonzaga's Interest in Flemish Art', *Source*, (11), 1992, pp.17-20.

¹⁰⁰ *Ibid.*

for religious images. Most surviving glue-on-canvas paintings depict pious devotional subjects.¹⁰¹

Unlike oil painting, however, glue-on-canvas painting technique exerted a limited impact on Italian painters. As it was, its life spanned only a few decades from the second half of the fifteenth century to the early sixteenth century. Its restricted aesthetic properties and some practical difficulties may have undermined its wide application. Its rapid drying rate, for instance, may have caused some technical dilemmas. Glue colours almost instantly dry on sized textile support, and painters who aimed to create any subtle paintwork had to slow down its drying process by retaining water from the back of the canvas.¹⁰² The speedy drying rate of glue medium, together with its high opacity, means that this method does not successfully allow the subtle tonal transition and glazing technique which are essential to capture the naturalistic representation of colour and form.

The fragility of this technique is another drawback. There is no proper paint film in glue-on-canvas painting. The opaque paint is thinly applied on the fabric support, the texture of which shows through the sizing and paint film. A varnish layer does not provide a practical solution in this case, since the glue paint which is non-fatty and dry, absorbs the varnish and darkens.¹⁰³ As a result, textile support with glue colours has no genuine protection from paint layer and varnish, and remains as a vulnerable material.¹⁰⁴ The rare survival of glue-on-canvas works reflect its inherent fragility, and most that do survive are in poor condition. Finally, it is not an ideal material to create a sumptuous image on a monumental scale. Therefore, the glue paint medium along with egg tempera gave way to oils in the sixteenth century.

¹⁰¹ The 1492 Medici inventory shows that some secular subjects such as folk dancing and landscapes were depicted on fabric support. Yet, it was the religious subjects which dominated the subjects of early canvas paintings in Northern Europe on the basis of surviving examples and sources.

¹⁰² Wolfthal, *op. cit.*; Dunkerton et al., *op. cit.*, 1991, p.188. See following footnote 147.

¹⁰³ See Dunkerton et al., *ibid.* In the case of banners and hangings probably in tempera, Cennino advises painters to get a good clear varnish for water-proof protection; Cennini, *op. cit.*, Chapter 162. This practice does not apply to glue painting.

¹⁰⁴ In practice, pigments could not be applied thickly, if mixed with traditional media, as the evaporation of moisture caused the paint to shrink rapidly and even leave bubbles on the surface after drying. Therefore, painters had to apply colour thinly on the ground.

Nevertheless, the unique appearance of glue-on-canvas painting would seem to have excited painters and their discerning peers who had mostly been used to the smoothly-plastered ground of panel and fresco.¹⁰⁵ Presumably, the subtle aesthetic properties of textile support based on glue medium played a critical role in transforming the general appraisal of canvas as an inexpensive and inferior material to a viable, indeed desirable, alternative to panel and fresco.

Oil-on-canvas painting and Narrative canvas-cycles

A more influential change emerged in the field of painting technique in the last quarter of the fifteenth century when certain painters began consistently to adopt oil on a textile support. Unlike oil-on-panel and glue-on-canvas paintings, this combination of painting material is an Italian contribution to the development of European painting technique. In the Netherlands, in spite of the widespread use of oil painting, the institutional system of painting production prevented canvas painters from using oil as a binding medium. According to the rules of the Painter's Guild in Bruges, only *schilders*, the artists who worked on panel, could use oil. *Cleederscrivers*, the artists who worked on canvas, could not adopt it. A legal verdict of 1463, makes clear that '...painters on cloth shall not be permitted to work on their cloths with any oil colour...'.¹⁰⁶ In consequence, the standard method of canvas painting in fifteenth-century Europe was generally based on aqueous glue, rather than oil. The early Netherlandish oil-on-canvas works generally date to the 1530s.¹⁰⁷

Oil and canvas each have their own merits and, moreover, paired together their technical potentials increase.¹⁰⁸ The chromatic intensity of oil colour can transform a canvas painting of any dimension to produce a powerful image. Through this combination, painters could solve technical difficulties connected with medieval painting practice. The

¹⁰⁵ For the discussion of Mantegna's canvas painting, *Ecco Homo*, the best surviving example in Mantegna's canvas works, see pp.119-120. The handling of fabric weaves was at issue from the Middle Ages onward, and, as a result, a variety of ways of preparing textile ground are identifiable in surviving examples.

¹⁰⁶ Wolfthal, *op. cit.*, p. 7.

¹⁰⁷ Maerten van Heemskerck's canvases in the 1530s are painted in oil. see H. Miedema and B. Meijer, 'Introduction of coloured ground in painting and its influence on stylistic development with particular respect to sixteenth century Netherlandish art, *Storia dell'Arte*, (35), 1979, p.87.

handling of fabric weaves was at issue from the Middle Ages onward, since the flexibility of textile support did not properly permit solid gesso ground, an indispensable preparatory layer for tempera painting.¹⁰⁹ Oil was found to be especially helpful in this matter. The viscosity of oil works well over sizing, thin gesso ground, or directly on lead white priming, and thus makes gesso ground no longer a necessity. In addition, as tough oil paint film can protect textile fabric, it can be said that oil made canvas a technically more durable and satisfying material.

This unprecedented format of painting was exploited particularly in Venice where canvas was adopted as a practical option for large mural decorations of secular or semi-secular buildings from the mid-fifteenth century. The geographical environment of Venice provided ideal conditions for the pursuit of commerce centred on a natural port, but it brought problems for the cultivation of the pictorial arts. Venice was not an ideal place for the preservation of fresco; the salt moisture of the lagoon, in which Venice was set, condemned such works to rapid destruction, even when the technique was attempted.¹¹⁰ Thus, the large-scale mural paintings of religious and historical scenes familiar elsewhere in Italy had remained virtually out of reach for centuries. Here, canvas painting with oil paint could provide an expedient alternative to fresco. Linen cloth was an essential material for the shipbuilding industry and was traded in the Venetian market in various forms.¹¹¹ This almost weightless textile was comparatively easy to sew together to form a large paint support for use either on walls or ceilings and, with the application of oil, rich

¹⁰⁸ The flexibility and adaptability of textile supports do not undermine the potentials of oil, discussed above in pp.91-100.

¹⁰⁹ As a result, a variety of ways of preparing textile ground are identifiable in surviving examples.

¹¹⁰ For damage on fresco caused by salty moisture, see P. Mora, L. Mora, and P. Philippot, *Conservation of Wall Painting*, London, 1984, pp.178-87. Explaining the rapid deterioration of fresco in Venice, Vasari wrote that '...per me non trovo cosa che nuoca più lavoro in fresco che gli scirocchi, e massimante vicino a la marina, dove portano sempre salsedine con esso loro...'; Vasari, *op. cit.*, vol. 4, p.44. While fresco was often used for decorative designs on Venetian church walls, Venetian fresco does not seem to have existed to the standard or numbers of Tuscan narrative fresco. The catalogue of Venetian fresco reports that 120 fresco works, executed from the twelfth to the eighteenth centuries, have survived in Venice; G. Fiocco et al., *Pitture murali nel Veneto e tecnica dell'affresco*, Venice, 1960. Yet, most of them were designed as architectural decoration by seventeenth and eighteenth century painters; see M. Murano, 'Affreschi Veneti- Restauri e Ritrovamenti', *Emporium*, (138), 1963, pp.99-118.

¹¹¹ The linen industry in Northern Italy will be discussed with reference to the development of Venetian canvas painting in pp.176-178 in Chapter 5.

durable images with intense colours became feasible.¹¹² Initially, tempera was a major medium in mural decorations on canvas. Some surviving works from Jacopo Bellini's canvas cycle for the meeting room of the Scuola di San Giovanni Evangelista appear to be in egg tempera with the modification of oil glazes.¹¹³ The *Dead Christ with Saints* in the Ducal Palace attributed to Gentile or Giovanni Bellini are reported to be painted in tempera.¹¹⁴ Gentile and Giovanni Bellini's official commission to replace with canvases the frescoes in the Hall of the Great Council in 1474 which had become so damaged only a few decades after their creation, can be viewed as one of the landmarks in the changing concept of canvas in Venice. Although this ambitious project implies some technical innovation, the loss of all these compositions means that their associated painting method is not known. It appears that oil came to be adopted more frequently towards the end of the century. Carpaccio's canvas cycle for the Scuola di Sant'Orsola, consisting of 9 works depicting the life of St Ursula (c.1490-1500, Accademia, Venice) is reported to be in oils.¹¹⁵ The paint medium of Gentile and Giovanni Bellini's canvas for the Scuola Grande di San Marco is also oil.¹¹⁶

Venice is not the only city which used canvas for mural decoration in Italy in the second half of the fifteenth century. In Florence, the Pollaiuolo brothers executed a three canvas cycle with each canvas as big as 3 metre by 3 metres in about 1460.¹¹⁷ Botticelli's canvas the *Birth of Venus* (Uffizi, Florence) originally decorated the wall of a Medici villa. However, Venetian painters show a more ambitious and consistent approach to canvas

¹¹² Canvas was often used for mural decoration in Italy. In Florence, in the 1460, the Pollaiuolo brother executed a three canvas cycle with each canvas as big as 3 metre by 3 metres; A. Wright, 'Piero de' Medici and the Pollaiuolo', *Piero de' Medici "il Gottoso" (1416-1469)*, ed. A. Beyer and B. Boucher, 1992, pp.130-149. Botticelli's canvas the *Birth of Venus* (Uffizi, Florence) was originally commissioned for the wall of a Medici Villa. See pp.179-187 in Chapter 5, for detailed discussion.

¹¹³ One of the landmarks in the changing concept of canvas in Venice is found in Gentile and Giovanni's official commission to replace with canvases the frescoes in the Hall of the Great Council, which had become so damaged only a few decades after their creation. For the first time, canvas was used as a major painting material in Venice, but due to the loss of the entire compositions, the associated painting method is not known. See Chapter 5.

¹¹⁴ A. Dorigato (ed.), *Carpaccio, Bellini, Tura, Antonello: e altri restauri quattrocenteschi della Pinacoteca del Museo Correr*, Milan, 1993, p.42.

¹¹⁵ These canvas works received conservation treatment in 1982-4; P. Brown, *Venetian Narrative Painting in the Age of Carpaccio*, New Haven and London, 1988, p.281.

¹¹⁶ The result of paint media is pending on the response of Dr. Vasco Fassina, Soprintendenza per i beni artistici e storici di Venezia.

¹¹⁷ A. Wright, 'Piero de' Medici and the Pollaiuolo', *Piero de' Medici "il Gottoso" (1416-1469)*, ed. A. Beyer and B. Boucher, 1992, pp.130-149.

painting. By means of large canvas compositions, they launched a massive project of mural painting in the government council chambers and guild meeting rooms towards the end of the fifteenth century. Their experimentation with oil-on-canvas painting went further in the sixteenth century, when it was fully established as a material of various religious paintings such as altarpieces. This development signalled the dominance of textile support in the coming centuries across European painting in general.

2.4 Reaction to the Increasing Diversity of Painting Materials

Canvas achieved its status as a major painting support in Italy towards the end of the fifteenth century, bringing about an immense impetus for change in artistic practice. An ambitious patron like Isabella d'Este, for instance, seems to have calculated that, thanks to the ease of transporting canvas, she could fulfil her aspiration to commission the *studiolo* and other important decorations from various eminent masters, for example Leonardo da Vinci, Giovanni Bellini, Lorenzo Costa, Perugino, and Mantegna, by means of 'mail-order'.¹¹⁸ As for her *studiolo*, she believed that she could control the general scheme of the decoration, if she simply sent the framed empty canvas to the master, or wrote a letter quoting the required dimensions of the work and an instruction as to the subject.¹¹⁹ However, this ambition was not that easy to realise. She frequently had to write letters to inform one artist of the paint methods employed by the others. It was the problem of paint media, used by individual painters, that was the centre of this correspondence. First, Lorenzo Costa wrote a letter asking for the clarification of his commission, particularly the medium of Mantegna's painting;

¹¹⁸ C. M. Brown, '“Lo insaziabile desiderio nostro de cose antique”-New Documents for Isabella d'Este's Collection of Antiquities', C. Clough (ed.), *Cultural Aspects of the Italian Renaissance- Essays in honour of Paul Oskar Kristeller*, Manchester, 1976; E. Verheyen, *The Paintings in the Studiolo of Isabella d'Este at Mantua*, New York, 1971. The 10-year-long exchange of letters between Isabella d'Este and her Venetian mediators and Bellini himself from 1496 to 1506 are preserved in the Archivio di Stato, Mantua, and have been published in C. Brown, *Isabella d'Este and Lorenzo da Pavia: Documents for the History of Art and Culture in Renaissance Mantua*, Genève, 1982, pp.149-167.; J. Fletcher, "Isabella d'Este and Giovanni Bellini's 'Presepio'", *Burlington Magazine*, (113), 1971, pp.703-712. In these letters, the choice of painting materials, the dimension of the painting and the number of depicted figures were frequently mention together with the subject matter and payment.

¹¹⁹ J. Fletcher, 1971, *op. cit.*; C. M. Brown, 'New Documents Concerning Andrea Mantegna and a note regarding "Jeronimus de Conradis pictor"', the *Burlington Magazine*, (111), 1969, pp.538-44.

...et che lo quadro de Messer Andrea mi pareva havere il lustro, overo essere invernigato d'il che si maraviglio in tela. Gli e necessrio che Vostra Excellentia me dia aviso se l'opera de Messer Andrea è lustro, et che lustro, overamente se l'e invernigato o non....¹²⁰

Isabella d'Este responded that Mantegna's picture was painted in animal glue 'a guaza', not in oils.

non sono gia colorite ad olio, ma cossi a guaza, et poi invernigato doppo che tutte sono finite. Il pictore vostro (Costa) haverà lui a colorire over ad olio o a vernice secundo il [la] consueta, arte et satisficatione sua.¹²¹

In spite of all her efforts, however, some misunderstanding was inevitable. When she saw Perugino's canvas, it was the methods and materials that made her dissatisfied.¹²² Isabella d'Este regretted that Perugino's canvas was not as precise and clear as Mantegna's. In fact, Perugino, who did not understand Mantegna's particular technical treatment, applied tempera on canvas, but without proper preparation, in order to conform to the tempera medium used by Mantegna for his commissions for the *studiolo*.¹²³ Perhaps, Isabella d'Este felt that oil was Perugino's more effective medium and thus Perugino should use it for her commission. As a rule, the increasing number of paint media and their combined application on such different supports led to misunderstandings between the artists who took part in Isabella d'Este's *studiolo* project.

Similar confusion is in evidence thirty years later at the Mantuan court. On 19th March, 1531, Federico II Gonzaga wrote in a letter to his agent in Antwerp, Sigismondo a Torre, that he wished to acquire several Flemish landscape paintings on canvas. He made it clear that they should be in oil, instructing him to buy the type not yet represented in his picture collections.

¹²⁰ A. Luzio, *La Galleria dei Gonzaga*, Milan, 1913, pp.206-207; C. Brown, *op. cit.*, 1969, p. 542; K. Christiansen, 'Some observations on Mantegna's Painting Technique', *Andrea Mantegna*, Exh. Cat., London, 1991, pp.68-78.

¹²¹ A. Luzio, 'Isabella d'Este and Giulio II', *Rivista d'Italia* (XII), 1909, pp. 864-865; C. Brown, *ibid.*, p.542. Isabella mistakenly responded that the pictures were painted in animal glue, 'a guaza'. An examination proves that Mantegna's *Studiolo* allegories are painted on a gesso preparation in tempera, possibly with a slight addition of oil; S. Delbourgo et al., *op. cit.*, pp. 21-28. J. Dunkerton, 'Mantegna's painting techniques', *Mantegna and 15th century Court Culture*, (ed.) F. Ames-Lewis, Birkbeck College, London, 1992, pp.26-38.

¹²² F. Canuti, *Il Perugino*, 2 vols, Siena, 1931, doc. 376; Lightbown, *op. cit.*, p. 227.

¹²³ It can only be hypothesised that Renaissance artists were concerned with continuity of painting material when working with other artists. It is also possible that Perugino simply matched 'canvas' painting with 'tempera', because it was a more traditional component of textile support than oils.

Volemo che vediate li in Fiandra di trovar qualche belle tele a paesi di quella sorte che voi sapete che non havemo, ma che siano belle et a belle et diverse foge, et sopra tutto fatte a olio...¹²⁴

Federico II Gonzaga may have favoured oil-on-canvas painting, but may not have known that this was then almost a purely Italian type of painting, developed from the late fifteenth century. In the Netherlands, oil-on-canvas painting was hardly practised at that time. In a letter dated to April 4 in the same year, Sigismondo a Torre had to apologize for not finding what the Duke wished. He said that there are some good landscape works in canvas, but none of them were painted in oils.

Per la letera del xviii dil passato, ho inteso il desiderio de Vostra Excellentia de haver de queste picture di Fiandera. A questi di, trovandomi in Anversa, il signor Ridolfo Campeggio et io andassemo a casa de tutti li maestri che ci sono et trovassimo pocho di buonom ma nessuna cosa fatta a oleo, salvo che alcuni retratti, et di queste anchonette de santi. Pur di qualche paese che trovasimo in tela, et non a oleo ne richercasimo cosi el pretio.¹²⁵

Federico II's ambition to purchase non-existent 'oil-on-canvas paintings' in Flanders and the confusion between the patron and the painters in Isabella d'Este's Studiolo project indicate that there was considerable uncertainty about the choice of painting material and method, as the diversity of painting materials grew. New traditions were yet to be established, while old rules were being abandoned. As it was, the seas upon which artists of this period ventured were wide, and the wind of change blew in many directions.

Uncertainty about new materials

The uncertainty about new materials from the painter's point of view is evident in an increasing number of unprecedented technical defects in the paintings executed during this period. Oil, in particular, seems to have brought more problems to tempera painters than any other material. It has been argued that painters were alternating tempera and oil media in the same painting in an effort to combine the merits of both. Yet, it is clear that some painters were not aware of the rule that oil paint, a fatty substance, can be applied over

¹²⁴ Archivio di Stato, Mantova, bus.2969, Copialettere, Libro 45, cc.70r-v; Brown, *op. cit.*, p.17.

lean substances like tempera, but the process should not be reversed, as tempera over an oil underlayer tends to crack. The severe loss of paint in the green lining of the Madonna's mantle in the *Madonna and Child with St John the Baptist* (c. 1490, Walters Art Gallery, Baltimore) from the Botticelli workshop, for instance, was actually caused by the employment of tempera between oil layers.¹²⁶

The accomplishment of a successful oil painting technique demands knowledge of its behaviour with certain pigments. For example, the most precious of all the pigments, ultramarine, can darken with a high proportion of oil.¹²⁷ For this reason, painters often prepared ultramarine and lead white underlayers before applying thin pure ultramarine glaze, or added lead white to ultramarine rather to make a semi-transparent glaze. The cost of failing to adopt these measures is high, as can be seen in the severe discolouration of the blue in Perugino's *Certosa di Pavia Altarpiece* (National Gallery, London), dated to the early sixteenth century.¹²⁸

It can be argued that the technical defects described above did not develop within the life time of a painter. However, it is highly probable that painters became gradually aware of such technical problems throughout their training and later experience, and that certain artists among them were unsettled by those empirical aspects of oil painting technique and decided to continue to work using conventional methods. The scientific media analysis of Carlo Crivelli's works, for instance, shows that he employed oil together with tempera in the second part of the 1480s, but in the next decade he returned exclusively to tempera [Table 2]. His brother Vittore was also reluctant to use oil.

¹²⁵ Archivio di Stato, Mantova, bus.567, c. 18; Brown, *ibid.*, p.18.

¹²⁶ M. Johnson and E. Parkard, 'Methods used for the Identification of Binding Media in Italian Paintings of the Fifteenth and Sixteenth Centuries', *Studies in Conservation*, (16), 1971, pp. 156-7. Tempera paint was applied over oil in the Saint Helena (Walters Art Gallery, Baltimore); *ibid.*, pp.158-9. Some crackle in Bellini's Pesaro Altarpiece seems to have been caused by miscalculating the drying time of each paint layer; see Chater 4.

¹²⁷ Brown ochre becomes very transparent and loses its original colour when mixed with oil.

¹²⁸ D. Bomford et al., 'Three Panels from Perugino's Certosa di Pavia Altarpiece', *NGTB*, (4), 1980, pp. 26-7.

Table 2. List of the Analysis of Paint Media of the Crivelli Brother¹²⁹

Artist	Picture	Date	Sample Medium	Medium Reference (method)
Carlo Crivelli	Mary Magdalene (Rijks.)	1485/90	1.Marbled balustrade 2.Brown zone beneath the Magdalen's foot	Egg Holland (S) Egg (whole)
Carlo Crivielli	The Annunciation with S. Emidius (NG)	1486	1.White of window frame 2.Green of Virgin's robe 3.Brown of planks below shelf 4.Thick globular mordant of gilding	Egg+ some oil w.NGTB14(G) Oil + some resin Egg Egg+ a little oil
Carlo Crivelli	The Vision of the Blessed Gabriele (NG)	1489/90	1.White Sky 2.Black foliage 3.Green/blue 4.Pale brown	Egg+ oil (emul.) NGTB2 (G/S) Egg+oil (emul.) Egg+oil (emul.) Egg+oil (emul.)
Carlo Crivelli	Virgin and Child with SS.Jerome and Sebastian (NG)	1490-	1.Red robe 2.Brown glaze on flower pot 3.White marble 4.Green book 5.Brown marbling 6.Virgin's blue robe 7.Green marbling on predella frame	Egg with little oil NGTB11(G) Egg Egg Egg with little oil Egg Egg with little oil Egg+Wax
Carlo Crivelli	The Immaculate Conception (NG)	1492	1.White scroll 2.White architecture 3.Blue of Virgin's robe 4.Red of Virgin's dress 5.Brown glaze on marble 6.Green inside mantle	Egg NGTB11(G) Egg Egg Egg Egg Egg
V. Crivelli	S Anthony of Padua(Heerenberg)	1480s	?	Egg Holland (S)
V. Crivelli	S Bernardino of Siena (Heerenberg)	1480s	?	Egg Holland(S)
V. Crivelli	S Louis of Toulouse (Rijks.)	1490s	1.Black(azurite) sample	Egg Holland(S) (whole)

Botticelli's painting technique is predominantly based on egg tempera and its modified form, egg emulsion. He increased pure oil glazes in the Primavera, but never adopted oil as a main painting medium. His reluctant approach to oil is apparently a conscious one, since contemporary Florentine painters such as the Pollaiuolo brothers used it more frequently.

¹²⁹ Unless canvas is mentioned, the support of paintings in Table 2 to 6 are on panel.

Abbreviations for Table 2 to 6;

Cons. *Studies in Conservation*

Holland Van Os et al., *The Early Venetian paintings in Holland*, Maarssen, 1978

NGTB *National Gallery Technical Bulletin*

G=Gas Liquid Chromatography

S=staining method

MS=Mass Spectrometry

FTIR=Infrared Fourier Transform Spectroscopy

UVS=Ultraviolet Spectrometry

LHS=left hand side RHS=right hand side

Oil l.=linseed oil Oil w.=walnut oil

Table 3. List of the Analysis of Paint Media of Sandro Botticelli¹³⁰

Picture	Date	Sample Medium	Medium	Reference
Primavera (Uffizi)	c.1480	1.underlayer 2.glazing layer	Egg+Oil (emul.) Higher presence of oil or pure oil	Prima
Birth of Venus (Uffizi, Canvas)	c.1480	1.Green Foliage	Egg	Uffizi (G)
Virgin and Child with S. John the Baptist(Walters)	c.1490s	1.Green lining of the Virgin's mantle	Oil-egg-oil	Cons.16 (S)
Mystic Nativity (NG, Canvas)	1500	?	Oil	Giotto
Four Scenes from the Early Life of S. Zenobius	c.1505	1.Blue sky between buidlings 2.Green carpet, foreground 3.White paint of architrave	Egg Egg+some oil Egg	NGTB16 (G)
Three Miracles of S. Zenobius	c.1505	1.Blue sky between buildings 2.Pink glaze of man's clock 3.Orange-red glaze of man's garment 4.White paint of highlight on the robe of figure in centre 5.Bright blue of garment of figure in centre	Egg Egg+some oil Egg+some oil Egg Egg	NGTB16 (G)

The Northern Italian painter Cosimo Tura had a clearer preference for oil painting. However, the pattern of his choice of paint media is not straightforward. Media analysis shows that Tura extensively used oil in the 1460s, but also indicates that he never gave up egg tempera. In his later works, he specifically employed egg as a underlayer and for background architectural and landscape settings.

LHC=left hand corner RHC=right hand corner

¹³⁰ Abbreviations for Table 3;

Cons. *Studies in Conservation*

Giotto Dunkerton et al., *Giotto to Dürer*, New Haven and London, 1991.

Prima Baldini, U., *Primavera: Restoration of Botticelli's Masterpiece*, New York, 1986.

Uffizi Berti et al., 'La Nascita di Venere e L'Annunciazione del Botticelli restaurate', *Gli Uffizi*, (4), 1987.

For further abbreviations see Table 2.

[Table 3] List of the Analysis of Paint Media of Cosimo Tura¹³¹

Picture	Date	Sample	Medium	Reference (Method)
An Allegorical Figure (NG)	c.1460	1.Green of inside robe	Oil l+ some resin	NGTB11 (G)
		2.Red glaze on robe	Oil l+ some resin	
		3.White band at bottom	Oil w	
		4.Dark blue sky	Oil l+ trace resin	
		5.Red underlayer	Egg	
		6.Pale green underlayer	Egg	
		7.Green underpaint of dress	Egg	
		8.Green underpaint of green of masonry	Egg	
Vrigin and Child Enthroned (NG)	c.1470	1.Green pilaster	Oil w	NGTB11 (G)
		2.Red glaze of pilaster	Oil w+some resin	
		3.Pink underlayer of 2.	Egg	
		4.Brown capital	Egg	
S.Jerome(NG)	c.1475	1.Darkened green or black of tree trunk	Oil w.	NGTB 14 (G)
		2.Red of hat	Oil w.	
		3.Pale green grass	Egg+ some oil	
		4.Blue sky	Egg+ some oil	
The Virgin: Fragment of an Annunciation (NG)	1490-5	1.Green grass in background	Oil w.	NGTB14 (G)
		2.Blue of Virgin's robe	Oil w.	
		3.Green underpaint from canopy over throne	Egg	

Piero della Francesca's choice of paint media is not very different from the pattern found for Cosimo Tura. He began his career with tempera, and moved to oil. Yet, egg tempera and egg emulsion remained a major paint medium in his later years.

[Table 4] List of the Analysis of Paint Media of Piero della Francesca¹³²

Picture	Date	Sample	Medium	Reference (Method)
Baptism of Christ (NG)	1450s	?	Egg	Giotto
Madonna della Misericordia (Borgo Sansepolcro)	1454	?	Oil	Giotto (Visual Analysis)
San Michel (NG)	1469	?	Oil	Giotto
Brera Altarpiece (Brera)	1472	1.blue garment of St John	Oil	Brera 9 (MS/UVS)
		2.architectural setting	Egg	
		3.flesh and marble	Emulsion	
Nativity (NG)	1470s	1.Blue sky	Oil w.	NGTB
		2.Discoloured green of distant tree	Oil w.	

¹³¹ For abbreviation, see Table 2.

¹³² Unless canvas is mentioned, the support of paintings in Table 1 to 6 are on panel. Abbreviations for Table 1 to 5; Giotto Dunkerton et al., *Giotto to Dürer*, New Haven and London, 1991.

Brera *Quaderni di Brera*, (9), 1997.

For further abbreviations see Table 2.

The cautious approaches to the new painting material taken by the Crivelli brothers and Botticelli and, to some extent, Cosimo Tura and Piero della Francesca, seem to be standard practice in Italy in the second half of the fifteenth century. However, some Italian painters became more fascinated by its experimental aspects and, it seems, regarded the multiplication of painting techniques as an opportunity to fulfil their artistic goals. An artist like Leonardo da Vinci, for instance, took an extremely radical position with regard to paint media.

Leonardo da Vinci

According to Vasari, Leonardo da Vinci wished to paint the *Battle of Anghiari* (c.1504, destroyed) using oils directly on the surface of the wall in the Hall of the Great Council in Florence. Vasari wrote that;

Et imaginandosi di volere a olio colorire in muro, fece una composizione d'una mistura sì grossa per lo incloato del muro che, continuando a dipignere in detta sala, cominciò a colare, di maniera che in breve tempo abbandonò quella.¹³³

One can understand from this episode that Leonardo da Vinci tried to apply a new oil painting technique to the execution of wall painting instead of applying the traditional fresco. This experiment, like his efforts to cast a colossal bronze horse, was doomed to failure. Similar problems can be found in his earlier mural painting, the *Last Supper* (ca. 1495-98, Santa Maria della Grazie, Milan), where his obsessive experimentation, encouraged by the development of new painting materials produced what constituted a new paint medium for wall painting. A group of experts have ascertained that the original process employed by Leonardo for the *Last Supper* was not pure oil painting, but a mixed process in which oil played only a part.¹³⁴ Again, the result of his experiment was the speedy ruin of the work. Leonardo was a front runner in his profession; even when wounded artistically, he went ahead of his contemporaries, and explored unknown

¹³³ Vasari, *op. cit.*, vol. 4, , 1568 p.268.

¹³⁴ Maclehorse, *op. cit.*, 1960, p. 233.

territory. It is significant, however, that the materials and methods of painting came to be appreciated as an area in which an artist could show his artistic virtuosity.

The quality that fascinated Leonardo about oil painting above any other was the potential it gave him to create gradual tonal change to approximate naturalistic form.¹³⁵ His unfinished panel paintings, the *Adoration of the Magi* (ca. 1482, Uffizi, Florence) and *St Jerome* (Pinacoteca, Vatican) show that he made an initial brownish underpainting in thin, monochrome tones on gesso, intending to build up the picture as a whole using oil paint, and to achieve a unifying effect of light and shade. The term '*sfumato*' which has long been applied to his modelling method is largely concerned with gradual tonal change, based on the innate property of oil paint. When Leonardo da Vinci deserted the conventional mural painting method, fresco, for the *Battle of Anghiari* and the *Last Supper*, and tried to invent a new paint medium for wall painting based on oil, it seems that he was attempting to apply the tonal properties of oil painting together with the gradual working process of easel painting to mural painting. It is now generally accepted that Leonardo da Vinci applied oil-based paint in order to break away from the standard *giornata* day-work pattern required for fresco painting. He seems to have hoped to build up the picture on the wall gradually as a whole as in his panel paintings, such as the *Adoration of the Magi* and *St Jerome*, and, ultimately, to obtain a naturalistic tonal change by glazing technique.¹³⁶ He must also have wanted to achieve the richer optical qualities of oil painting on a wall.

Undoubtedly, Leonardo was one of the most experimental and imaginative oil painters of his time. However, it should be noted that Leonardo did not attempt to use the full potential of the oil painting technique.¹³⁷ For instance, unlike tempera, the oil medium allows for extensive retouching and can achieve many plastic qualities such as impasto

¹³⁵ Leonardo had learned a technique based on panel painting in oils as early as his time in Verrocchio's workshop; F. Ames-Lewis, 'Leonardo's technique', *Nine Lectures on Leonardo da Vinci*, London, 1990, pp.37-39.

¹³⁶ Francis Ames-Lewis has proposed these three principal reasons; *ibid.*, pp.37-39.

¹³⁷ It should be noted that other painters had used oil to a limited extent in murals; for instance, Piero della Francesca in the Legend of the True Cross cycle in Arezzo.

and scumbles. Yet, Leonardo does not seem to have been concerned with these potential effects of painting in oil.

To a great extent, it is likely that Leonardo da Vinci was aware of the additive quality of oil painting which allows constant correction.¹³⁸ In drawing, for instance, Leonardo rarely accepted any form as final, but went on creating, in strong contrast to methods of medieval draughtsmanship.¹³⁹ Furthermore, he wrote that this was one of the characteristics of painting which distinguish the painter's occupation from the sculptor's; 'the sculptor says', wrote Leonardo, 'that if he removes more marble than he should, he cannot rectify his error as can a painter'.¹⁴⁰ Yet, Leonardo did not explore his conception beyond the drawing stage to the finished product in painting; even with the oil medium which allows extensive retouchings. The x-ray study of his painting yields little of interest, since he remained faithful to his preparatory drawing, and rarely changed the composition during the colouring.¹⁴¹ In practice, he often employed conventional charcoal underdrawing sometimes using a cartoon to transfer his original design accurately.¹⁴² In cases where a cartoon was not used, the infra-red reflectograms show careful underdrawings were prepared as a normal process in his workshop.¹⁴³ As a rule, it seems that his freely inventive spirit of working out compositions was restricted to the drawing process and did not transfer to the painting itself. Leonardo was one of the pioneers who had developed the potentials of oil painting, but clearer failed to appreciate its re-corrective quality. Discipline was still imposed upon the painting process by a conventional step-by-step method of painting; first working out composition and then

¹³⁸ J. White, 'Paragone', *Studies in Renaissance Art*, London, 1982, pp.1-67.

¹³⁹ E. H. Gombrich, 'Leonardo's Method for Working out Compositions', *Norm and Form*, London, 1985, pp.58-65.

¹⁴⁰ M. Kemp, *Leonardo on Painting*, Oxford, 1989, pp.38-39; G. Manzi (ed.), *Trattato della pittura di Leonardo da Vinci*, Rome, 1817; J. P. Richter, *The Literary Works of Leonardo da Vinci*, 2 vols, London, 1939.

¹⁴¹ M. Kemp, 'Leonardo's Madonna of the Yarnwinder- the making of a devotional image', *Leonardo da Vinci: The Mystery of the Madonna of the Yarnwinder*, National Gallery, Scotland, 1992, pp.9-24. For a reproduction of the x-rays of Leonardo da Vinci's *Virgin of the Rocks* (National Gallery, London), see M. Davies, *Leonardo da Vinci: the Virgin of the Rocks in the National Gallery*, London, 1947.

¹⁴² The infra-red reflectogram of his portrait of *Ginevra de Benci* (National Gallery of Art, Washington), reveals the dots, formed by charcoal pounced through pricks in the cartoon, around the outline of the eye lid; M. Kemp, *ibid.*, pp. 9-24.

¹⁴³ See Leonardo da Vinci's careful underpaint found in his unfinished *Adoration of the Magi* (Uffizi, Florence). He used the brownish tempera underpaint in thin, monochrome tones on gesso. This stage of the painting was meant to be the skeleton beneath the surface of the finished product in oil paint. For discussion of underpainting in Leonardo, see L Keith and A. Roy, 'Giampietrino, Boltraffio, and the influence of Leonardo', *NGTB*, (17), pp. 13-16.

modelling, colouring, and finally applying details based on the original designs or highly finished drawing. In fact, Leonardo had a concept of painting and art as capable of achieving an ideal perfection beyond purely physical qualities and, therefore he would not have found the possibility of revealing the plastic possibilities of painting appealing. Continuous innovations in the application of paint media were certainly an important formative factor in the development of Renaissance painting, but this effort would be related to the artist's concept of art, and, without a corresponding change in the artist's aim, could not produce change in itself. Oil painting did not evolve autonomously.

Mantegna

In contrast with Leonardo, Andrea Mantegna's approach to painting materials does not fall into any category discussed so far and can be termed individual and unique. The application of the new paint medium, oil, was far from being Mantegna's main concern. It seems that the oil medium, which was still at an experimental stage, did not appeal to Mantegna's perfectionist ideal. Furthermore, the slow-drying time of oil may have been frustrating to an artist like Mantegna who had constant demands from patrons.¹⁴⁴ His reluctance to use oil is not unusual, but it is his exceptional preference for working on textile support and the application of glue on it that make his position unique in the development of painting technique in Italy.

The original appearance of Mantegna's glue-based canvas works remains unknown, since most of his early canvases suffered severe natural damage and retouchings; the general appearance of his glue-medium canvas painting can be reconstructed only from his later examples. The *Ecce Homo* (Institut de France, Musée Jacquemart-André, Paris), for instance, which is dated c. 1500, has fortunately escaped varnishing, and has been protected under glass, so is still in good condition.¹⁴⁵ In this canvas, Mantegna used a fine weave linen, and applied glue paint over the sized ground without gesso preparation.¹⁴⁶ In

¹⁴⁴ In fact, Mantegna once remarked that the execution of a painting was quicker by means of glue-sized medium. R. Lightbown, *op.cit.*, p.228.

¹⁴⁵ *Andrea Mantegna*, exh. cat., London, 1991, pp. 245-7.

¹⁴⁶ In this case, canvas was mounted on panel, possibly after it reached its destination. John Shearman has observed that it seems very probable that a high proportion of canvas paintings of the fifteenth and sixteenth centuries were to all intents and purposes panel paintings with a canvas surface; J. Shearman, 'The Historian and the Conservator',

practice, glue paint tends to dry immediately after being applied over sized canvas. It is likely that this quick-drying quality of glue paint was of particular interest to Mantegna.¹⁴⁷ The paint film was not elaborately superimposed, and generally appears thin, but Mantegna used shell gold to highlight the modelling and haloes, and to give brilliancy to the matt surface. As a rule, Mantegna's canvas paintings were executed with great care, and their splendid overall impression epitomises a change in the purpose of canvas painting in the transitional period of painting material. Indeed, in conjunction with this careful practice, canvas could be used for the most prestigious commissions given to an acclaimed master like Andrea Mantegna, regarded as a support with which the versatility and virtuosity of this painting method could be displayed.

Media analysis has shown that Mantegna was an artist who clearly registered the innovations brought about by the application of oil colours. By means of oil glazing, Mantegna seems virtually to have obscured the distinction between tempera and oil. In the two canvases for Isabella d'Este's *studiolo*, dated to c.1497, where oil glazes were applied over tempera, it is extremely difficult to distinguish pictures painted in this way from those worked entirely in oil.¹⁴⁸ The results were more of a compromise when Mantegna utilised the mixed techniques so characteristic in the *St Luke Altarpiece* (Brera, Milan) and the *Pallas Expelling the Vices* (Louvre, Paris) for the *studiolo*, where the blues has been mixed with a little walnut oil, probably to ensure their stability[GLC].¹⁴⁹

Mantegna attempted to exploit painting materials and methods in his own distinct way. In the canvas painting of the *Adoration of the Magi* (ca. 1497-1500, J. Paul Getty, Malibu) for instance, an astonishingly life-like effect of material was captured even when using

Princeton Raphael Symposium, ed. by J. Shearman and M. Hall, 1990, pp. 11-12. This practice may be indicative of the transitional stage from wooden support to textile.

¹⁴⁷ One little-known practice that emerges from documents is that canvases with aqueous media may be painted whilst wet. Cennini notes with pleasure that canvas, like fresco, remains moist during painting; Cennini, *op. cit.*, Chapter 162. The Bruges legal decision of 1458 requires that canvas 'shall be...worked while wet in the threads'; Wolfthal, *op. cit.*, pp. 25-26. In comparison to panel and fresco, then, canvas has an advantage; if delicate modelling is required, the rapid drying of paint can be prevented by wetting the back of the canvas; Dunkerton et al., *op. cit.*, 1991, pp.187-188.

¹⁴⁸ Brown, *op. cit.*, 1969, p. 543; Dunkerton, *op. cit.*, 1992, pp. 26-38.

¹⁴⁹ Over some of them, a layer of egg tempera has been laid to modify the effect; Lightbown, *op. cit.*, pp. 227-228; Delbourgo et al., *op. cit.*, pp.21-28.

glue in the garment of the Magus in the right foreground.¹⁵⁰ It is likely that Andrea Mantegna was aware of the properties of an oil medium, and deliberately challenged the naturalism of the oil medium by insisting on using animal glue-based painting technique in an innovative way, using the 'great care' referred to by Isabella d'Este. All in all, the splendid overall impression of his work epitomised for Isabella d'Este the versatility and virtuosity of his painting methods.¹⁵¹

Giovanni Bellini and Oil-on-canvas Painting in Venice

Andrea Mantegna was an influential artist in Northern Italy and his authority may have affected the art of Giovanni Bellini, his brother-in-law, in various ways.¹⁵² However, it remains difficult to define his influence at a practical level. In fact, Bellini's application of oil and methods associated with fabric support were fundamentally different from those of Mantegna. Media analysis [Table 5], for instance, shows the persistence of egg tempera in Bellini's late works, but also indicates that Bellini's approach to oil was more open and consistent than that of Mantegna and his near contemporaries such as Botticelli and Piero della Francesca.¹⁵³ Canvas was an important support for Bellini from his early years, but there is little evidence to indicate that the Bellini ever used glue medium on this support.¹⁵⁴ Exploiting the properties of oil gradually and systematically, he matched them with a fabric support. It will be argued in this study that it was his technique of using oil on canvas upon which the later development of Venetian painting practice was to be based.

¹⁵⁰ He may have achieved this effect by retaining the moisture in the canvas to obtain a certain amount of blending of brushwork. At that time, canvases were painted whilst wet with tempera- and glue-based paint. This method enabled the painter to achieve smooth transitions in the modelling. This is one little-known practice that emerges from documents; D. Wolfthal, *The Beginning of Netherlandish Canvas Paintings: 1400-1530*, Cambridge, 1989, pp.23-29; J. Dunkerton et al., *op. cit.*, 1991, pp. 161-162.

¹⁵¹ Aside from these practical reasons, the optical properties of fabric support seem to have excited painters and their public at a time when the smoothly-plastered ground of panel and fresco was predominantly used. See Chapter 5 for detailed discussion.

¹⁵² In 1453 Mantegna married the daughter of Jacopo Bellini. For Venice and Mantegna, J. Fletcher, 'Mantegna and Venice', *Mantegna and 15th Century Court Culture*, Birkbeck College, London, 1992, p.17.

¹⁵³ It is interesting to note from Table 6 that Bellini's choice of paint media fell into the categories of either egg tempera or oil, but less likely the third medium egg emulsion.

¹⁵⁴ It seems that Bellini employed glue medium on textile support in the *Incident from the Life of Scipio* (the National Gallery of Art, Washington) around 1506 when he was probably commissioned to continue Mantegna's canvas works for the Conaro family. See Conclusion, for discussion of Bellini's the *Incident from the Life of Scipio*.

[Table 6] List of the Analysis of Paint Media of Giovanni Bellini¹⁵⁵

Picture	Date	Sample Medium	Medium	Reference (Method)
St Jerome in the Wilderness (Barber Institute)	c. 1450s	1. Blue sky 2. White tile	Egg Egg	NGTB 2 (G)
Transfiguration (Correr)	c. 1450s	1. green grass 2. sky	Oil l. Oil l.	Correr (G)
Blood of the Redeemer (NG)	c. 1460s	1. Blue sky 2. White tile	Egg Egg	NGTB2 (G)
Agony in the Garden (NG)	c. 1465	1. Blue paint of tree	Egg	NGTB1 (G)
Pietà (Correr)	c. 1465	1. sky	Oil l.	Correr (G)
Pesaro Altarpiece (Pesaro)	c. 1470s	1. Red cloak of St Peter (main panel) 2. Pavement (main panel) 3. Light brown colour in San Terezio (predella)	Oil l.	La Pala (G)
San Giobbe Altarpiece (Accademia)	c. 1480	1. lead white (loincloth of St Sebastian) 2. lead white (white marble) 3. lead white (head dress of Virgin)	Egg Egg Oil w.	Quaderni 17 (G)
Barbarigo Canvas (Murano, Canvas)	1488	?	Oil (Olio Magro)	Quaderni 3 (S)
Virgin and Child with Saints and Doner (Walters, Canvas)	c. 1505	1. copper-green background 2. Samples from the rest of the picture	Oil Egg	Walters 33/4 (S)
Madonna of the Meadow (NG)	c. 1500	1. Unpigmented priming on ground 2. Blue underpaint	Egg+trace oil? Egg+ oil?	NGTB1 (G)
Pietà	c. 1505	1. White of Christ's garments	Oil l.	Giorgione
Assassination of S Peter Martyr (Courtauld)	c. 1505	?	Oil	Fletcher (G)
Feast of the Gods (NG W., Canvas)	c. 1515		Oil	NGW. (G)

Bellini's late workshop production, the *Virgin and Child with Saints and Donor*, is in egg tempera apart from the copper-resinate green areas [staining method]. Yet, it seems that his preferred medium with canvas was oil. At any rate we know that Bellini's *Barbarigo*

¹⁵⁵ For Abbreviation for Table 6.

Correr Dorigato (ed), Carpaccio, Bellini..., Milan, 1993.
 Fletcher Fletcher, J. and Skipsey, 'Death in Venice...', *Apollo*, (133), 1991, pp.4-9
 Giorgione *Giorgione a Venezia*, Exh. Cat., Milan, 1978.
 La Pala Valazzi, M. R. (ed), *La Pala ricostituita*, Venice, 1988.
 NGW Bull, D. and Plester, J., 'The Feast of Gods: Conservation, Examination, and Interpretation', *Studies in the History of Art*, (40), 1990.
 Quaderni Quaderni di ... Venezia.
 Walters Packard, E., 'A Bellini Painting From the Procuratia di Ultra, Venice', *the Journal of the Walters Art Gallery*, (33-34), 1970/71, pp.64-84.

For further abbreviations see Table 2.

Canvas dated to c.1488 is thought to be the first true oil on canvas painting¹⁵⁶ [staining method] and his secular canvas, the *Feast of Gods*, is identified to be in oil [GLC].

Bellini is not, however, the first artist to have applied oil paint onto a canvas surface. The medium of Paolo Uccello's small National Gallery canvas of *St George and the Dragon*, c.1460, has been analyzed as oil.¹⁵⁷ Yet, this is an isolated case. Bellini made a more systematic approach to this new combination of painting materials, and continuously exploited the qualities of 'oil on canvas' technique, including impasto, scumble and glazing method. The fascinating development of oil-on-canvas painting in Venice will be examined in Chapter 5.¹⁵⁸

The fact that Venetian painters of the later generation usually worked with oil and canvas, and increased their interest in the spontaneous and immediate application of oil paint on rough canvas demonstrates that the persistent struggle of Venetian artists to attain the complete mastery of new painting materials such as oil and canvas bore fruitful results. Finally, in the first half of the sixteenth century, the method of handling new painting materials such as oil and canvas became less mechanical, and their properties were better understood and exploited. From then on, painters confronting canvas no longer faced the difficulties met by the former generation.¹⁵⁹

A number of the properties which have been historically attached to oil paint are applicable to the paintings produced in this period. For instance, it is often said that pigments, if bound with oil, can be more easily applied to the surface than traditional paints, as Vasari wrote in 1568:

¹⁵⁶ C. Villers, 'Artists Canvases; a History', 6th ICOM Committee for Conservation, Ottawa, 1981. Simonetti said that Michele Giambono's *Death of the Virgin* (1440s, Museo di Castelvecchio, Verona) is painted in an oleo-resinous medium, but did not mention the method of identification; M. Simonetti, 'Tecniche della pittura Veneta', *La Pittura nel Veneto: Il quattrocento*, (ed.) M. Lucco, Milan, vol. 1, 1990, pp. 261-63.

¹⁵⁷ J. Dunkerton and A. Roy, 'Uccello's Saint George and the Dragon: Technical Evidence Re-evalued', *NGTB*, (19), 1998, pp.26-30.

¹⁵⁸ See pp.187-190 in Chapter 5 for Bellini's oil-on-canvas painting technique.

¹⁵⁹ According to Vasari, Giorgione said that the right way of design is to work directly on the canvas brushing in the forms without preliminary drawing.

Questa maniera di colorire accende più i colori né altro bisogna che diligenza et amore, perché l'olio in sé si reca il colorito più morbido, più dolce e delicato e di unione e sfumata maniera più facile che li altri....¹⁶⁰

His praise of oil painting was echoed by Palma Giovane who, according to Boschini's account in 1674, once described Titian's dynamic application of paint.

... 'Mi diceva Giacomo Palma il giovine ... con pennellate massiccie di colori, alle volte d'un striscio di terra rossa schietta, e gli serviva (comme a dire) per meza tinta; altre volte con una pennellata di biacca, con lo stesso pennello, tinto di rosso, di nero e di giallo, formava il rilievo d'un chiaro, e con queste massime di Dottrina faceva comparire in quattro pennellate la promessa d'una rara figura...'¹⁶¹

Titian's late works embody how oil painting came to be a perfect vehicle for painters aiming to work freely using their inspiration and conception at the painting stage. Thanks to x-ray, it can be proven that Titian's *Apollo and Marsyas* (National Museum, Komeriz) [Plate 35], possibly begun in the 1550s, was not only an example of Titian's development of his style over the quarter century since the *Bacchus and Ariadne* (National Gallery, London), but also a culmination of his method of using oil paint, a crowning accomplishment of the new concept of painting that was prefigured by Leonardo's draughtsmanship. The x-ray dramatically shows Titian working out the composition as Leonardo did in his drawing. Such expressive working-out on the canvas surface was not possible using tempera and glue, or following the conventional process for picture making. The use of oils played a fundamental role in Titian's expressive art.

As mentioned earlier, from the second half of the fifteenth century, Venetian painters were to exploit an old, but less prestigious painting material, textile support, in ingenious new ways, and began to use it in combination with an oil medium. This new format of painting, oil-on-canvas, brought, in turn, an important technical freedom to the later generation of Venetian painters such as Titian. Later in this study, 'the beginning and development of

¹⁶⁰ Vasari, *op. cit.*, vol.1, p.133. The cross-sections of Tintoretto's paintings make visible what his contemporary Vasari talked about in terms of the advantages of oil over tempera; J. Plesters, 'Tintoretto's Paintings in the National Gallery', *NGTB*, (3), 1979, pp.3-24.

¹⁶¹ M. Boschini, *La carta del navegar*, ed. by A. Palluchini, Venice and Rome, 1966, pp. 711-12. Boschini further wrote in 1674 referring to the authority of Palma Giovane, that Titian used his finger for final touches.

this Venetian oil-on-canvas painting will be more thoroughly examined with reference to Giovanni Bellini's painting technique.¹⁶² Following this study, I will propose a key solution to questions arising from comparison between the x-rays of earlier masters of oil painting and the work of Titian.

¹⁶² For the early development of Bellini's oil on canvas painting, see Chapter 5.

Part II

Bellini's Painting Methods; the Case Study

Chapter 3

The Early Work of Giovanni Bellini

Beginning the chronological discussion of Giovanni Bellini's major work, this chapter is concerned with the artist's technique before the 1470s, the time before he began to paint extensively in oils. It will focus on questions such as how he accomplished a sophisticated approach to the use of light in this period and whether such an interest was to serve as a motivation for him to adopt oil. These questions are fundamental to understanding the later development of his art.

The discussion will be largely based on his work in the 1460s, rather than the 1450s, a decade which has long been the subject of controversy in the literature. Probably born sometime between 1435 and 1440, Giovanni Bellini began his independent career in the 1450s.¹ A group of modest-size panels have been attributed by scholars in this century as a possible product of the hand of the young Bellini in this period. However, there are no paintings which could serve as a touchstone of his initial work, since none of them have been securely documented or share close formal resemblance to one another.² It is only a

¹ In his second edition of the *Vite*, Vasari wrote that Giovanni Bellini died, at the age of ninety; Vasari, *Le Vite...*, ed. by R. Bettarini and P. Barocchi, Florence, 1987, vol.3, pp.427-441. His record makes the year of his birth 1426. His dating was accepted by G. Fiocco; 1949, 'Giovanni e la famiglia dei Bellini alla luce di nuovi documenti', *Vernice*, (33-34), p.4. This would make Bellini forty years old in 1465. Vasari's testimony, however, contradicts a family document of the Bellini which recorded that Anna Rinversi, wife of Jacopo, wrote her will in 1429 in expectation of the birth of her first child, Niccolo or Gentile; see C. Ricci, *Jacopo Bellini e i suoi libri di disegni*, vol. 1, 1908, pp. 50, 59. Gentile is always recorded as an elder brother of Giovanni in later documents; see F. Gibson, 'New evidence for the birth date of Gentile and Giovanni Bellini', *Art Bulletin* (55), 1963, pp.54-58. G. Robertson, *Giovanni Bellini*, Oxford, 1968, pp. 9-12; M. Olivari, *Giovanni Bellini*, English translation by A. Brierley, Faenza, 1990, p. 3. Indeed, there is no sure evidence for assigning a year to his birth. His existence was first documented in 1459 when he acted as a legal witness, living at that time in San Lio apart from his father and brother; P. Paoletti, *Raccolta di documenti inediti per servire alla storia della pittura veneziana nei Secoli XV e XVI; Fascicolo I, I Bellini*, Padua, 1894, p.II.

Recent scholars such as P. Humfrey, M. Lucco, and M. Boskovits seem to have reached a consensus that he was born in around 1435; P. Humfrey, *Painting in Renaissance Venice*, New Haven and London, 1995, pp.279-280; M. Lucco, 'Venezia 1450-1500', *La Pittura nel Veneto: Il quattrocento*, Milan, 1990, p.411; M. Boskovits, 'Giovanni Bellini: Quelques suggestions sur ses débuts', *Revue du Louvre et des musées de France*, (36), 1986, pp. 386-93. The new National Gallery catalogue dates his birth at 1435; J. Dunkerton et al., *Giotto to Dürer*, New Haven and London, 1991, p. 235.

² On works like the *St Jerome in the Wilderness* (Barber Institute, Birmingham) and the *Crucifixion* (Museo Poldi Pezzoli, Milan), which have been considered by many to be Bellini's earliest extant works, negative judgements now prevail, but certain recent critics have attributed them to a different Venetian workshop; M. Olivari, *ibid.*, p. 3. For the dispute over these two panels, see A. Tempestini, *Giovanni Bellini*, Firenze, 1992, pp. 18-19, 54-55. In 1459/60, Bellini co-signed an altarpiece for the Gattamelata Chapel in Sant'Antonio, Padua, with his father and brother Gentile. For the discussion of Giovanni's contribution in this altarpiece, see C. Eisler, *The Genius of Jacopo Bellini*,

decade later that Bellini's activity can be defined with greater certainty. Although the works which are believed to belong to this period are still poorly documented, they show coherent formal characteristics and thus have been accepted as representing Bellini's formative art.

Almost all of Bellini's surviving works, dated before the 1470s, are painted on wooden panels. Documents concerning his early career, although they are small in number, also clearly point to the fact that he was building up his reputation as a canvas painter in his initial years of independent activity.³ In order to assess fully his painting method of the 1460s, it is still essential to consider the questions of his canvas method in this period. The complete loss of his early works on canvas, however, means that his technique in this medium in these years can only be approached within the comparatively larger perspective of the development of Venetian canvas painting practice. This discussion will form part of Chapter 5, where the typical technique and function of Venetian canvas painting will be considered as a background for Bellini's canvas painting method of the 1480s.

The present chapter will deal with Bellini's painting technique based upon his works on panel. The *Agony in the Garden*, c.1465, (National Gallery, London), one of the earliest works which has been unanimously attributed to Giovanni Bellini, will be analysed first to explore his prodigious interest in light and colour.⁴ Then, the restored *Blood of the*

New York, 1989, pp. 60-67; Boskovits, *ibid.*, pp. 386-93. The *Pietà* in the Accademia, Bergamo, has been generally accepted by modern researchers as one of Bellini's early works; A. Tempestini, *ibid.*, pp.20-21. However, scholars have been largely divided over the attribution of the *St Vincent Ferrer polyptych*, dated 1465, one of the most important works in Venice in this period (SS Giovanni e Paolo, Venice). R. Goffen, J. Steer, P. Humfrey, and M. Lucco have ascribed this altarpiece to Bellini with the assistance of his workshop; R. Goffen, *Giovanni Bellini*, New Haven and London, 1989, pp. 274-276; J. Steer, *A Concise History of Venetian Painting*, London, 1970, 52-54; Lucco, *op.cit.*, pp.410-480; P. Humfrey, *The Altarpiece in Renaissance Venice*, New Haven and London, 1993, pp. 181-84. Huse and Robertson both reject Bellini's participation, and argue that it was painted by his contemporary painter, Lauro Padovano; G. Robertson, 'the Earlier Work of Giovanni Bellini', *Journal of the Warburg and Courtauld Institutes*, (23), 1963, pp.45-59; N. Huse and W. Wolters, *Venedig: Die Kunst der Renaissance-Architektur, Skulptur, Malerei 1460-1590*, München, 1986, pp.215-220. The work was undergoing in restoration in February 1994.

³ As early as 1464, Giovanni Bellini completed a canvas painting with 'figure piccole, molto lodate' for the Scuola di San Girolamo: Vasari, *op. cit.*, vol.3, pp.427-441; Ridolfi, *Le Meraviglie dell'arte* (1648), Padua, 1835, pp.84-99; Zanetti, *Della pittura Veneziana...*, Venice, 1771, p.48. On 24 April in 1470, he was commissioned to paint a two-part canvas for the Sala Capitolare in the Scuola Grande di San Marco: '...fo deliberato de dar el teller in cavo de la schuola primo verso l'altar grande de campi 2 a ser Zuan bellim...'; P. Molmenti, 'I pittori Bellini: Ricerche e documenti', *Studi e ricerche di storia e d'arte*, Rome, 1892, pp.129-130. However, none of his documented canvas works, which may have played an important role in demonstrating his talent, have survived.

⁴ For the attribution of the *Agony in the Garden*, see M. Davies, *National Gallery Catalogue: The Earlier Italian School*, London, 1961, pp.53-72; Tempestini, *op. cit.*, pp.36-37.

Redeemer (National Gallery, London), which is similar in date to the *Agony in the Garden* and has a substantial amount of technical information, will be examined in detail to outline the materials and methods which Bellini adopted in the early stages of his career.

3.1 The *Agony in the Garden*

In the mid-1460s Giovanni Bellini was probably in his twenties and perhaps still at the beginning of his independent career. The *Agony in the Garden* (National Gallery, London), which is believed to have been completed in this period, shows Bellini's dependence on his earlier training from his father Jacopo Bellini and his growing interest in the artistic progress of his brother-in-law Andrea Mantegna [Plate 1]. Its composition depends on Jacopo Bellini's earlier drawn version of the same subject, dated to c.1454, whereas the influence of Mantegna's painting, notably the two panels of the same subject dated to the late 1450s and early 1460s, is noticeable in details such as the hard edges and elaborate folds in the drapery and the drastic foreshortening found in the apostle on the far right.⁵

Light

The *Agony in the Garden* has been greatly admired on the grounds that Giovanni Bellini not only succeeded in approximating the specific time of day, but, to a great extent, accomplished harmony between the form-making and symbolic function of light. Whereas Mantegna tried to show everything in daylight in his earlier versions of the same subject, no doubt to draw the forms out to their sharpest modelling, Bellini's light is the breaking light of dawn, expressed by various colours like white, blue, orange, and red.⁶ Moreover, in Bellini's *Agony in the Garden*, the forms are less clearly defined, since the dawning

⁵ Considering Mantegna's influence, Bellini's *Agony in the Garden* is dated to c.1465; Davies, *ibid.*, pp.36-7. Jacopo's drawn version of the composition is in his British Museum drawing book (ff.43v.-44); J. Wilde, *Venetian Art from Bellini to Titian*, Oxford, 1974, pp.4-9. Andrea Mantegna's panel of the same subject at Tours was originally a predella of the *San Zeno Altarpiece*, dated to c.1457-9, and his London version (National Gallery, London, No.1417) is dated to c.1460; for the discussion of the influence from Mantegna's earlier versions on Bellini, see Dunkerton et al., *op. cit.*, 1991, pp. 292-4. Giovanni Bellini's early inexperience is further to be seen in the details of landscape which has not yet been conceived as a whole, but built up by piece by piece; the foreground is not formally related to the background; the rock, where Christ is kneeling and praying, is built on the flat ground without formal continuity.

light, appearing from the lower ridge of the hills at the centre, has not yet reached most of the landscape and the foreground where Christ and three Apostles are situated [Plate 1]. Thus, a greater part of the landscape and figures remain in shade than in Mantegna's versions. By means of this precise representation of the dawn light, it is probable that Giovanni Bellini thought he could successfully reinforce the meaning of the subject matter of the picture; the significant moment in which Christ resolved to endure the Passion. Bellini's prodigious interest in light as both form-making and story-telling has been rightly attributed by modern scholars as one of the most striking evidences of his independence at this date.⁷

There is, however, some criticism of Bellini's approach to light here. Giles Robertson, for instance, claimed that the strong modelling on the sleeping Apostles' draperies spoiled this delicate light effect, and also suggests a second source of illumination.⁸ In fact, this second light source so clearly separates the foreground valley from the background that this distribution of light has even been called arbitrary.⁹ Marcia Hall further advances this theory by claiming that it is the use of tempera that leads to this problem, because by nature 'it gives the figures a sharp-edged precision that negates the low light situation'.¹⁰ In practice, it is true that it is difficult with tempera paint to soften the form to appear as though dimly emerging in half-light.¹¹

The question of whether Bellini simply failed to accomplish a more sophisticated approach to light effect and whether his failure is due to the use of tempera remains open. In my visual analysis, this second light is neither arbitrary, nor does it derive entirely from the linear modelling of drapery. First of all, the luminosity of the foreground owes more to the use of high value pigment than to the form of sharp edged drapery. Scientific

⁶ For the stylistic comparison of Bellini's *Agony in the Garden* to Mantegna's, see J. Wilde, 1974, *op. cit.*, pp.4-9; J. Steer, 1970, *op. cit.*, pp. 50-51.

⁷ J. Wilde, *op. cit.*, pp.4-9; J. Steer, *op. cit.*, pp. 50-1; P. Humfrey, *op. cit.*, 1995, pp. 63-4; N. Huse and W. Wolters, *op.cit.*, pp. 241-6.

⁸ Robertson, *op. cit.*, 1964, p. 46.

⁹ *Ibid.*

¹⁰ M. Hall, *Color and Meaning: Practice and Theory in Renaissance Painting*, Cambridge, 1992, pp. 81-82, 248n.

¹¹ Since tempera could not be blended and softened on panel and canvas, the tempera painter had to use pre-mixed colour and apply it systematically with the aid of guidelines such as preliminary drawings and underdrawing. Indeed, it was not a common practice to alter the form during the painting. As a rule, this carefully-planned working practice of tempera painting is affective on attaining a sharp-edged precision for graphic conceptions.

examination of Bellini's other works dated to the 1460s shows that he employed green earth, yellow ochre, verdigris, and malachite for landscape [Plate 3].¹² Had he used the same colours in the *Agony in the Garden*, he could have reduced the brightness somewhat and, to some extent, attained a half-light tone in the area in question. Instead, he deliberately used an orange colour, which is perhaps composed of a red or yellow ochre, as this colour looks semi-transparent and, as a result, luminous, when applied very thinly on white ground [Plate 1(b)].¹³ Furthermore, Bellini did not make any effort to reduce the tonal contrast of the drapery. He confidently used lead white to indicate highlights, and even reinforced the sharp edges by defining them by black colour.¹⁴ My observation suggests rather that the second light effect has been consciously sought by Bellini to highlight the holiness of the subject by creating an effect of unearthly luminosity around the Apostles.

In contrast, Mantegna's approach to light in the same subject is very different. The time of the story is firmly fixed in daylight in his versions of the same subject [Plate 2]. The drapery of Christ and the three Apostles is modelled with hard line and bright pure colours, but almost without shade. Here indeed, they can be singled out from the dull green landscape and, as a result, Marcia Hall's observation seems more relevant to Mantegna than to Bellini.

The representation of dawn can be interpreted as a factor which symbolizes the dawn of hope after the Night of Trial.¹⁵ Also, it must be noted that only Christ lacks a halo.¹⁶ It is likely that the rising sunlight just above the head of Christ defines His face clearly and consequently takes the place of the halo. This symbolic context also explains the use of

¹² In the *Transfiguration* (Museo Correr, Venice), dated to 1455-60, green earth and malachite were used in the landscape, whereas green earth and green ochre are found in the *Pieta* (the late 1460s, Museo Correr, Venice). After the 1470s when he used oil extensively, copper resinate became the major green colour for the description of landscape.

¹³ Although a layer of opaque yellow paint with lead white is applied over some parts of this thin layer of orange colour, the appearance in that area is very bright.

¹⁴ The blue cloak of the Apostle in the middle is highlighted by lead white.

¹⁵ Bellini used light as an important vehicle of the representation of holy story. In the *Agony in the Garden*, dawnlight was adopted to describe the Passion as a light to the world.

¹⁶ The absence of a halo for Christ was noticed as an iconographic peculiarity by Martin Davies as early as in 1961; Davies, *op. cit.*, 1961, p.59. However, since then, little discussion has been made of it.

gold only in the hatched lines of Christ's outer garment. The implication is that the use of gold signifies the presence of the heavenly light of the Son of God.¹⁷

In the *Agony in the Garden*, Bellini is not mainly concerned with a naturalistic approach, although his description of the dawning light effect is precise and certainly based on his careful observation during out-door study. In consequence, the accomplishment of harmony in the form-making and symbolic function of light remained central to Bellini's interest in the *Agony in the Garden*.¹⁸

Colour

As the realization of the formal and spiritual function of light ranked high in Bellini's agenda in the *Agony in the Garden*, so it is particularly in the sky that Giovanni Bellini showed a sophisticated interest in the use of colours.¹⁹ The atmospheric effect of dawning light is captured by a variety of colours; orange and yellow sunlight is breaking into the blue sky with interspersed grey clouds. Plate 1(a) demonstrates how thinly Bellini applied paint on the white underlayer. Perhaps lead white was employed for underpaint in order to increase the luminosity of sunlight. Furthermore, applied paints were even blended on the panel for the representation of the stream of lifting darker air.

In the modelling of figures, Bellini used lead white extensively to create light tone and very high value colours. Pure pigments were used for areas of shadow. As a result, the range of value in the drapery is divided almost into two extremes, bright and dark [Plate 1 and 1(a)], which helped Giovanni Bellini to create solid 'sculptural' form. However, due

¹⁷ This study will demonstrate that gold was frequently used as a symbol of heavenly light in Bellini's religious paintings. See pp.143-44 for the detailed discussion of Bellini's interest in gold as an important painting material throughout his career.

¹⁸ In this sense, Giovanni Bellini was following in a Venetian tradition. In Venice, where Byzantine influence was more profound than in any other European city, painters continued to render pictorial light with an hierarchy of symbolic values even in the fifteenth century. In contrast, central Italian artists, Florentine in particular, made an effort to give equality to pictorial surface by means of light as well as form since the time of Giotto; P. Hills, 'Luminary and Color Values in the Scrovegni Chapel', *Color and Technique in Renaissance Painting; Italy and the North*, ed. by M. Hall, New York, 1991, pp. 31-40. For the use of gold in contemporary Venetian paintings, see M. Simonetti, 'Techniche della pittura Veneta', *La Pittura nel Veneto: Il quattrocento*, ed. by M. Lucco, Milan, 1990, vol. 1, pp. 247-271.

¹⁹ For the traditional description of sky, see Sassetta's *Sansepolcro Altarpiece* (c. 1444, National Gallery, London). Gentile da Fabriano made an effort to create dawnlight in his predella panel *Journey from Bethlehem to Jerusalem* (Uffizi, Florence); P. Hills, *The Light of Early Italian Painting*, New Haven, 1987, pp.118-127. Gentile's lost fresco

to the lack of mid-tone, the picture looks slightly unsubtle. Also, the high proportion of pigment to medium makes the picture surface appear very tight and dry.

It is probable that the colours of the three Apostles' drapery were once more vivid. The drapery of the Apostle on the right, in particular, was originally glazed by an organic red possibly a crimson lake, but it is now rather faded [Plate 1]. In the Renaissance, organic crimson was often used as a contrast to the bright red of vermilion. Here, vermilion is visible in the cloak of the Apostle on the far left. As it is, different kinds of pigments were frequently applied to create varying chromatic impressions, even in cases of the same colour; this helped artists to demonstrate their versatility and skill and to distinguish hierarchies of value within the subjects depicted. For example, azurite is adopted for the cloak of the Apostle in the middle whereas the more precious ultramarine is reserved for Christ's garment.

The most problematic technical feature in the *Agony in the Garden* is found in the outer garment of the central Apostle, where paint was applied so thickly that it is raised above the surface of the rest of the painting [Plate 1(b)]. This suggests that Bellini could have used a different paint medium in this area, possibly an oil or oil-based paint medium. The media analysis of one sample from the blue paint taken from trees shows the presence of egg tempera [GLC]²⁰, but this would not exclude the use of oil in other areas not yet examined. The mixed technique was not unusual at that time in Italy and there is growing evidence that Bellini and his close associates employed oil from the mid-fifteenth century.²¹ The questions that arise concerning Bellini's paint media and other painting materials in his early years will be dealt with in the ensuing section.

3.2 *The Blood of the Redeemer*

The *Blood of the Redeemer* which represents the mystic subject of a kneeling angel receiving the blood from Christ's wounds in a chalice, is generally dated to the mid-

works in the Great Council Hall in Ducal Palace may have had such effects and seems to have influenced Bellini, who eventually was to replace them.

²⁰ J. Mills and R. White, 'Analyses of Paint Media', NGTB, (1), 1977, p. 57.

²¹ See following pp. 137-141.

1460s, being painted not long after the *Agony in the Garden* [Plate 6].²² The modelling of the angel's head and body seen from behind and the details of the hair have much in common with the Christ in the *Agony in the Garden*. In the case of this painting, more technical information about Bellini's early painting methods has been made available, thanks to the detailed report on its restoration in the National Gallery Technical Bulletin of 1978.²³ I will use this study to investigate general questions concerning Bellini's early treatment of both ground and underdrawing.

Preparation

In terms of the preparation of the paint layer, a thin layer of gesso ground was reported on the panel, and a thin, fine greyish-yellow line of glue is visible between gesso and paint in one or two of the cross-sections prepared.²⁴ In addition to this fine layer, lead white priming is also reported to be found. The cross-section from the area of green-turned-brown from the landscape to the right of the crucifix reveals all of these three preparatory layers [Plate 7(a)]. Only a single layer of pure pigment serves for colour in this area in contrast to the rather elaborate underlayers. The superimposition of paint layers which Bellini adopted from the 1470s onward to form deep and rich chromatic effects are not found at this stage in his career.

The specific type of the gypsum (calcium sulphate) used in this picture was not reported. Scientific analysis has detected that the gesso that Venetian and Northern Italian painters preferred to use was a softer form of gypsum, a slaked dihydrate form of calcium sulphate; 'gesso sottile' as described by Cennini.²⁵ In contrast, the favoured ground of Central Italian painting is reported to have been the burnt anhydrite form of calcium

²² For the mystic subject and dating of the *Blood of the Redeemer*, see Robertson, *op. cit.*, 1968, pp. 33-34; A. Braham, M. Wyld, and J. Plesters, "Bellini's the 'Blood of the Redeemer'", NGTB, (2), 1978, p.12; M. Davies, *op. cit.*, 1961, pp. 38-9. For the possible use of the painting as a tabernacle door, see Dunkerton et al., *op.cit.*, 1991, pp.60-61.

²³ Braham et al., *ibid.*, pp. 11-24, 47.

²⁴ *Ibid.*

²⁵ Bomford et al., *op. cit.*, 1989, p.18; R. Gettens and M. Morse, 'Calcium Sulphate Minerals in the Grounds of Italian Paintings', *Studies in Conservation*, (1), 1954, pp.174-88. This type of gesso can be identified by X-ray diffraction powder analysis. The slaked dihydrate form of calcium sulphate is reported to be used in Cima's *Incredulity of St Thomas* (National Gallery, London) and the *Judgement of Solomon* (Kingston Lacy, Dorset), attributed to Sebastiano del Piombo; see Cat. 28 and 37 in Appendix 3. Untreated raw mineral gypsum has the same chemical compounds as the slaked dihydrate form of calcium sulphate, but the porcelain-like picture surface of fifteen-century Venetian paintings suggests the main substance of gesso was more likely to be gesso sottile.

sulphate. This burnt gypsum is what Cennini called 'gesso grosso', and normally coarser than 'gesso sottile'.²⁶ As a velvet-like smoothness of ground was essential for the application of metal gilding in the fourteenth century, Cennini recommended the multiple preparation of gesso ground superimposing 'gesso sottile' over 'gesso grosso'. This rather meticulous method was less practised in the course of the fifteenth century with the decreasing medieval tradition of gilding. Yet, it seems that Northern Italian painters required comparatively less coarse ground as they continued to emphasize smooth picture surface and persistently applied metal gilding.

The use of lead white imprimatura between the gesso and the paint was fairly common in fifteenth-century Italian painting. It seems to have been more widely adopted in the North than Central Italy. Some Central Italian cases have been reported but its application was rare. Botticelli used it on top of a gesso ground in the *Primavera* (Uffizi, Florence), but its presence is not found in his other examined works.²⁷ Scientific analysis has detected that Venetian and Northern Italian painters used it more frequently and Jacopo Bellini, Antonio Vivarini, and Andrea Mantegna had all adopted it.²⁸ Lead white priming is found in all eight works of Giovanni Bellini dated to the 1460s and 70s which the present study compiled [Appendix 3]. Later, from the 1480s onwards, the frequency of lead white priming is still high. It has also been reported in his later works, the *San Giobbe* (Accademia, Venice) and *San Giovanni Crisostomo* (San Giovanni Crisostomo, Venice) altarpieces, the *Feast of the Gods* (National Gallery of Art, Washington), and the *Assassination of St Peter Martyr* (Courtauld Gallery, London).²⁹

²⁶ Bomford et al., *ibid.*

²⁷ None of the six Florentine panels dated closely to the late fifteenth century examined by the National Gallery has this preparatory layer; see Cat. from 76 to 100 in Appendix 3. See also Sassetta's *Sansepolcro Altarpiece* (c. 1444, National Gallery, London) and Perugino's *Certosa di Pavia Altarpiece* (c. 1500, National Gallery, London), for examples of the common simple gesso preparation in fifteenth-century Italian painting; M. Wyld and J. Plesters, 'Some panels from Sassetta's Sansepolcro Altarpiece', *NGTB*, (1), 1977, pp.3-17; D. Bomford et al., 'Three Panels from Perugino's Certosa di Pavia Altarpiece', *NGTB*, (4), 1980, p. 28.

²⁸ See Cat. 87, 88, and 89 in Appendix 3.

²⁹ M. R. Valazzi et al., *La Pala Ricostituita*, Exh. Cat., Venice, 1988, pp. 132-133; D. Bull and J. Plesters, 'The Feast of Gods: Conservation, Examination, and Interpretation', *Studies in History of Art* (40), 1990; L. Lazzarini, 'Lo Studio Statigrafico della Pala di Castelfranco e di Altre Opere Contemporanee', *Giorgione: La Pala di Castelfranco Veneto*, Milan, 1978, pp. 45-59; L. Lazzarini, 'Il colore nei pittori veneziani tra il 1480 e il 1580', *Bollettino d'Arte*, Supplemento 5, 1983, pp. 135-44; J. Fletcher and D. Skipsey, 'Death in Venice', *Apollo*, (133), 1991, p.5.

The exact function of priming or *imprimatura* in Italy varied³⁰, but applied on top of the ground, it primarily served to make it more suitable to receive paint. If the ground was too absorbent then the priming could make it less so and may also be used to produce a tint.³¹ Lazzarini maintains that Bellini's lead white underlayers were 'applied to obtain a whiter, more opaque and quicker-drying ground to the paint than the ground itself'.³² Fletcher adds that the white and glue primings were 'intended to reduce the porosity of the painting surface'.³³ By this definition, Bellini's lead white priming serves at least two basic functions, to provide both a suitable ground and a whiter base tone.

The term priming or *imprimatura* is often defined in the same way as underpainting, but underpainting is meant to be a preliminary layer of paint underneath a composition, aimed at altering the tonality of its surface layer.³⁴ While priming is often called a continuous film over gesso ground, underpainting is a paint partly applied on the ground.³⁵ In the case of both priming and underpainting, oil is an ideal paint medium to use above it, since it can make transparent and saturated glazes which allow light to penetrate the glazed area and to reach the underlayer. The second function of *imprimatura*, providing whiter base tone for paint layers, demands the use of transparent paint above it. Early in the fifteenth century, Cennini recommended that multi-layered gesso grounds be prepared, but preparatory layers such as *imprimatura* or underpainting were not mentioned. In contrast, one and half centuries later, Vasari refers to *imprimatura* in the context of explaining how to draw in oil; '...quando la colla è secca impiastarla su per la tavola...il che molti chiamando la *imprimatura*..' [author's italics].³⁶ Vasari thus takes priming to be a major part of the process of oil painting, and we can deduce that *imprimatura* is primarily related to an oil-based painting technique. Scientific analysis also suggests its possible link with the oil painting method. Tempera and emulsion were Botticelli's main painting media, but when he used oil glazes in the *Primavera*, he adopted lead white priming

³⁰ Paolo Uccello used lead white priming for the Dragon. His purpose of the lead white priming is interpreted for the re-use of unfinished canvas.

³¹ H. Osborne (ed.), *Oxford Companion to Art*, Oxford, 1988, p. 565.

³² Lazzarini, *op. cit.*, 1983, p. 122.

³³ Fletcher and Skipsey, *op. cit.*, p.5.

³⁴ Osborne, *op. cit.*, p. 1173.

³⁵ In early Northern oil paintings, tempera was frequently used for underpainting. In Italy, this method was prefigured in a tempera-based technique by which a greenish pigment, *terra verde*, was applied under the flesh colour.

³⁶ Vasari, *op. cit.*, vol. 1, pp.134.

[GLC]. The painting media of Jacopo Bellini's *Crucifixion* (Museo Correr, Venice) is identified as egg tempera, but the passages of lead white layer were widely used as underpainting for oil glazes in his canvas works from the Scuola di San Giovanni Evangelista. Lead white priming was also widely used in fifteenth-century Netherlandish panel paintings, such as van Eyck brother's *Ghent Altarpiece* and Robert Campin's *Portrait of a Man* (National Gallery, London).³⁷ Therefore, one can assume that it is usually used alongside oil.

Paint Media

From the technical context, it seems that the lead white priming in the ground of the *Blood of the Redeemer* may imply Bellini's experimentation with oil. It has generally been thought that he exclusively worked with tempera until the mid-seventies of the fifteenth century.³⁸ Media analysis has however produced evidence which runs counter to this traditional view of Bellini's sudden shift from tempera to oil. It identified the paint media of Bellini's early panel paintings, the *Transfiguration* (c.1458) and the *Pietà* (c.1465), both in the Museo Correr, Venice, as linseed oil [GLC/FTIR].³⁹ Tempera with little mixture of oil is reported in the *Virgin and Child* (c.1465, Museo Correr, Venice).⁴⁰ Considering the wide use of oil by his associates and the pattern of other Central Italian painters' approach to it Bellini's employment of oil in the 1460s is not unusual.⁴¹

The paint medium of the *Blood of the Redeemer* is known to be tempera. Two paint samples, blue from the sky and white from a floor tile, were identified as tempera [GLC].⁴² The lean and opaque appearance of these two areas on the surface bears out this laboratory result. However, it is difficult to rule out the partial use of oil, since some

³⁷ It seems that the purpose of lead white priming in the Northern European paintings was not much different from that of Italian painting; NGTB, (18), pp.22-24.

³⁸ Before the modern media analysis began to produce relevant data to reassess Bellini's painting method, this was a general view given by scholars since Vasari.

³⁹ The media analysis of the two samples obtained from the *Transfiguration*, one from green grass in bottom right and the other from background sky in top left, has shown all the paint layers including lead white imprimatura are painted in linseed oil. Also in the *Pietà*, the paint medium of the sample obtained in the background sky was identified as linseed oil; A. Dorigato (ed), *Carpaccio, Bellini, Tura, Antonello; e altri restauri quattrocenteschi della Pinacoteca del Museo Correr*, Milan, 1993, p. 219. These results provide crucial evidence which indicated that Bellini used oil long before Antonello visited Venice.

⁴⁰ *Ibid.*

⁴¹ See Cat. 2, 69 and 72 in Appendix 3.

⁴² Braham et al., *op. cit.*, 1978, p.24.

problematic areas suggesting the use of oil have not been considered. In visual analysis, the paint used for the two small figures - a monk or priest and his assistant - in the distance on the right hand side of landscape now looks thick and very transparent as does the paint glazed on the area of landscape [Plate 6].⁴³ This visual appearance strongly suggests the use of oil.⁴⁴ The partial use of oil for the glazing of details in tempera painting was not unusual at that time, and the leading priest in the background dressed in white cloak and dark blue outergarment, which were actually worn by Venetian priests at that time, seems to be more than landscape figures and suggest the iconographic meaning of the painting.⁴⁵

Bellini once employed oil extensively in the *Transfiguration* and the *Pieta*. If the areas in the *Blood of the Redeemer* are actually painted in oil, it seems to indicate that he handled oil very tentatively; here using it only for glazing of details, suggesting Bellini's unsettled approach to egg tempera and oil in the 1460s. In the case of the foreground of the *Agony in the Garden*, tempera was controlled as if to emulate oil. In general, oil painting was frequently translated to a tempera technique, or conversely tempera to an oil technique at this transitional period of painting methods.⁴⁶

It is important to note that Bellini's early use of oil is different from Netherlandish examples. A paint cross-section taken from van Eyck's *Ghent Altarpiece* shows how carefully Netherlandish painters of the early fifteenth century built up paint layers by

⁴³ I owe this observation to Libby Sheldon, UCL Painting Analysis Unit.

⁴⁴ Media analysis was not undertaken for green paint, but Joyce Plesters proposed the use of tempera, because of the relative insolubility of the paint film in alkali; Braham et al., *op. cit.*, 1978, p. 23. However, some parts of the browned green landscape looks transparent. This appearance does not necessarily indicate the presence of oil or oleoresinous media, since some pigments are transparent even when used in a tempera medium. In the case of the *Agony in the Garden*, for example, Bellini appears to have used red or yellow ochre. Due to their low refractive index, these pigments could give semi-transparent layers, even mixed with tempera. It is possible that the same method was used for the *Blood of the Redeemer*, but the problematic areas in this painting is raised above the rest of the painted film and looks more likely in oil. The green colour in the painting, formerly presumed to be copper resinate, has now been identified as copper carbonate in the form of globules. The big green particles from the surface in question suggest low refractive index of copper carbonate, which can also give semi-transparent paint layers even with tempera; For this type and period of painting, the dark and comparatively thick top paint layer was unexpectedly found to contain the same green 'globular' pigment particles, rather sparsely distributed and with a lot of surrounding brown matrix of paint media; Braham et al., *ibid.*, p. 23. Bellini's growing interest in the transparency of paint in the *Agony in the Garden* and the *Blood of the Redeemer* can be appreciated as a pointer indicating his change from tempera painting technique to oil.

⁴⁵ A Dominican link was proposed by the 1978 technical report on iconographical grounds; Braham et al., *ibid.*, pp.11-14.

repeated glazes of body colour to increase the depth of colour.⁴⁷ In the Adoration of the Lamb from the *Ghent Altarpiece*, Van Eyck built paint layers using four or five separate glazes on top of the ground layer to achieve specific chromatic effects. To make blue, for instance, Jan van Eyck first laid two paint layers of moderate blue using azurite with lead white, and then a layer of clear blue made up of ultramarine with a little lead white. Finally, he completed the effect with layers of very thin but rich ultramarine glaze. Thus, the colour becomes gradually darker with the addition of layers and appears intensified as it is built up. Compared to fifteenth-century Netherlandish technique in general, the glazing method employed by Jan van Eyck in the *Ghent Altarpiece* is particularly sophisticated, but the principle of his glazing technique -that is to say, deep saturated transparent film of paint applied over the previous paint of less intense hue- was frequently found in contemporary and later Northern paintings.

Bellini's paint structure in the *Transfiguration*, which media analysis has shown to contain the solid use of oil from the priming layer to paint layer, is remarkably simple.⁴⁸ The paint is generally applied in the form of a single layer on the lead white ground, the same as that in the *Blood of the Redeemer*. The layer structure of the blue paint obtained from the sky develops from the gesso ground, lead white priming and the blue painted layer consisting of ultramarine with lead white. A single paint layer of lead white and green earth with a little malachite is found again over the preparatory layer in the green landscape. The essence of Netherlandish colour effect, i.e. oil glazing, is missing. It has been reported that Bellini controlled the tonal transition based on the addition of lead white.⁴⁹ Paint cross-sections of Bellini's early oil works show almost no understanding of Netherlandish painters' modelling by glazes and, in conclusion, it is very unlikely that Bellini had had any direct influence from contemporary Netherlandish painters.

Certain Italian painters mastered the refined glazing methods around 1460, but there is no visual or laboratory evidence to suggest that Bellini's associates had any more knowledge

⁴⁶ This kind of complicated approach to oil is a general trend in Italian painting in the second half of the fifteenth century Italy. See pp.79-100 in Chapter 2, for the discussion of the transition of paint media in Italy.

⁴⁷ P. Coremans (ed.), 'L'Agneau Mystique au Laboratoire, Examen et Traitement', *Les Primitifs Flamands III, Contributions à l'Étude des Primitifs Flamands*, 1953.

⁴⁸ Dorigato, *op. cit.*, pp.219-220.

of Netherlandish oil painting technique than he did. A single glaze layer is found over lead white underpainting in Jacopo Bellini's canvas works which once formed a part of the mural decoration in the Albergo of the Scuola di San Giovanni Evangelista.⁵⁰ Mantegna is reported by the restorer to have used oil as a paint medium for the final layer in areas of blue in the *St Luke Altarpiece* (Brera, Milan).⁵¹ A paint cross-section shows that Mantegna applied one paint layer of ultramarine and azurite over lead white priming for blue colour. As far as paint structure is concerned, Giovanni Bellini and Mantegna rather continued to use the method of fourteenth century painting or, indeed, simplified it.⁵² Therefore, it seems more likely that they were not yet directly influenced by contemporary Netherlandish painters and that their method had more in common with a traditional Italian approach.⁵³ In Bellini's case, however, this empirical approach to both new and traditional materials was to be revised gradually, but firmly, towards the end of the fifteenth century when he came to have a full knowledge of Northern oil technique.

Underdrawing

Detailed and careful underdrawings can be detected by infra-red photographs of the *Blood of the Redeemer*. Hatched shadows in the folds of Christ's loin-cloth and the angel's dress and wing are visible in Plate 6(b). Joyce Plesters reports that Giovanni Bellini used bone black paint instead of conventional wood charcoal for drawing, since the particles from the black line are brownish and translucent to transmitted light.⁵⁴ The use of bone black

⁴⁹ *Ibid.*, pp.126-9.

⁵⁰ Mantegna also used copper resinate glaze in this altarpiece; see Cat. in Appendix 3.

⁵¹ Gallone, *op. cit.*, 1988, p. 67-68. This use of oil as a paint medium for such an important commission, as early as 1453 to 1455, is not peculiarly his own. The main panel of Piero della Francesca's polyptych of the *Madonna della Misericordia* (Borgo Sansepolcro), dated to 1454, which was extensively painted in oils is the comparable example. See Dunkerton et al., *op. cit.*, 1991, p.198, for the technical detail on this altarpiece.

⁵² Paint cross-sections of Jacopo di Cione's *San Pier Maggiore Altarpiece* (National Gallery, London), begun in 1370, are particularly comparable to those of Mantegna and Bellini. Normally, the paint surface is built up with two or three layers. The blue paint, for instance, is achieved with two layers of ultramarine and lead white, glazed with pure ultramarine. For pink drapery, pure red lake is glazed over lead white. See Bomford et al., *op. cit.*, 1989, pp.180-183.

⁵³ In the mid-fifteenth century two kinds of oil painting technique existed in Italy; one was a traditional Italian practice, and the other was a newly imported Netherlandish method. From the Middle Ages onward, Italian painters were building up their knowledge of oil through various experiences of mordant and varnish. As early as the early fifteenth century, Cennino Cennini was familiar with oil and said in his book *Il Libro dell'Arte*; I want to teach you how to work with oil on wall or panel, as the German are much given to do' ti voglio insegnare a lavorare d'olio in muro o in tavola, che l'usano molto i tedeschi'; Cennino, *op. cit.*, Chapter 89. However, it was certainly Northern European painters who enlightened Italians. Some diffusion of oil painting technique from France and also perhaps Austria and Switzerland into Northern Italy is also a possible explanation of the early knowledge of Mantegna and Bellini about oil in the 1450s and 1460s; Dunkerton et al., *op. cit.*, 1991, pp.193-204.

⁵⁴ Braham et al., *op. cit.*, 1989, pp.11-24.

for drawing was rare at that time when the standard black pigments were lampblack and charcoal.⁵⁵

Spolveri or dots of charcoal left from transferring a cartoon to the picture are not found. However, some sort of preliminary drawings may have been used to transfer the design to panel. The drawn lines, for instance, pick out the outline of the angel's wing without hesitations, which do not indicate a free hand study. It is probable that a drawing may have been made on the panel freehand in charcoal and then brushed away, as recommended by Cennini.⁵⁶ What one now sees are only the reinforcing lines in bone black paint. The drawn lines in bone black are soft and fluid, suggesting the use of a tiny brush, rather than the double lines of the split nib of a quill pen which makes lines broken and scratchy. Also, highly-refined nets of diagonal strokes are visible in the shading of Christ's loin cloth and the angel's dress.

Apart from underdrawing in bone black, Bellini seems to have ruled the straight lines out or into the gesso ground with a metal stylus to create the geometric design of the tiles. Later in the *Pesaro Altarpiece*, he used this technique extensively for the architectural setting and for constructing perspective. As a result, the composition is carefully worked out before work with the brush starts, and Bellini was able to apply paint on the panel systematically using underdrawing as a guideline. The x-ray [Plate 6(a)] and infra-red photographs [Plate 6(b)] indicate virtually no *pentimenti*, or alterations at the painting stage.

The strong graphic quality of underdrawing and subsequent fidelity to this original plan in the paintwork stage is the typical hallmark of both the young Bellini's practice and of his workshop products later in his career.⁵⁷ In the cases of the *Transfiguration* (Museo Correr, Venice), the *Virgin and Child* (Museo Correr, Venice), and the *Pieta* (Museo

⁵⁵ Thompson reported that ivory and bone blacks were not found in the Middle Ages; *Material and Techniques of Medieval Painting*, 1956, New York, p. 88. Cima used this kind of black, but with other pigments to create the warm grey wall colour in the *Incredulity of St Thomas* (c.1502, National Gallery, London): J. Dunkerton and A. Roy, 'The Technique and Restoration of Cima's 'The Incredulity of Saint Thomas'', *National Gallery Technical Bulletin*, (10), 1986, pp.4-27. In any case, bone black would not normally be used with a pen because it is not a fine pigment as is lamp black.

⁵⁶ Cennini, *op. cit.*, Chapter 122.

Correr, Venice), Bellini shows a more ambitious approach to hatching which, although varied, was not only employed there to conceive voluminous effects, but to create light and shade that unify forms. Bellini's emphasis on graphic preparation reflects influence from his close associates, his father⁵⁸ and Andrea Mantegna, and thus by extension Central Italian artists who visited Venice and nearby Padua. In the 1430s, Uccello and Castagno worked in Venice and Filippo Lippi in Padua. Donatello was active in Padua later in the 1440s. The only surviving pictorial work by any of these Florentine artists in the Veneto is Castagno's fresco in the choir apse of San Zaccaria. This suggests that these Florentine painters created in their pictorial projects given in the Veneto simple but three-dimensional forms, expelling decoration by gold and precious colours, producing an effect foreign to the Venetian painters in the first half of the fifteen century.⁵⁹ Andrea Mantegna was one of the Northern Italian painters who made a conscious effort to assimilate this new pictorial language within his own work and his emphasis on graphic preparation registered this.⁶⁰ Either through Central Italian artists active in the Veneto or the mediation of Mantegna, Bellini seems to have redefined the role of drawing in his early years. No doubt, he regarded drawing as a tool to create forms and space unified by light, and thus it is not unusual to discover elaborate and finished underdrawings with the same intensity as the graphic works ascribed to him.⁶¹

Colour

A reward of the recent restoration of the *Blood of the Redeemer* has been the revealing of clouds around Christ's legs. Originally, the clouds would almost certainly have incorporated the heads of seraphim and cherubim, coloured red and blue, which appear

⁵⁷ Bellini's underdrawing practice will be discussed in Chapter 7.

⁵⁸ The surviving drawing books of Jacopo Bellini show that he was a skilled draughtman. But, the Crucifixion (Museo Correr, Venice), once attributed to the young Giovanni's early works, is now believed to be executed by Jacopo Bellini on the ground that its tentative drawings and subsequent pentimenti was distinct from the underdrawing method found in Giovanni's early work; Dorigato (ed.), *op. cit.* This panel was thought to have been a predella panel of the Gattemala Altarpiece documented to be commissioned to Jacopo and his sons in 1459. Nonetheless, I am less sure that this work represents the general practice of Jacopo Bellini, unless there is further scientific evidence to support this.

⁵⁹ Donatello who was in Padua between 1442 and 1450, the period Giovanni Bellini took an apprenticeship in his father's workshop, may have influenced the young Bellini, but as we know nothing about his approach to drawing, it is difficult to posit an influence in this respect on Bellini.

⁶⁰ Mantegna's drawing technique found in the *St James leading to the Execution* will be discussed in pp.217-220 in Chapter 7.

⁶¹ See Chapter 7 for Bellini's drawing methods.

frequently in the Bellinesque paintings of sacred subjects.⁶² Now, the clouds appear as little more than swelling shapes [Plate 6]. But, it is actually in this area where Bellini employed a variety colours, probably to create a mystical focal point to the picture.⁶³

On the present surface, blue is visible at the edges of the clouds, and particles of red and gold throughout the blue.⁶⁴ The blue in the clouds was identified as ultramarine, which was also reported in the sky, and the angel's dress.⁶⁵ The red is vermilion, also used for the red of the angel's slippers and the blood of Christ. These indicate that traces of blue and red paint in the area of the clouds may be the remains of cherubim and seraphim. The forms are also gilded by powdered gold in the same way as the gilding on the classical relief to the left-hand side. These lavish materials such as ultramarine, vermilion, and gold give a significant material contrast to the naked body of Christ.

Joyce Plesters reports the analytical identification of some pigments in this picture.⁶⁶ Azurite was found in the slightly greenish blue of the distant landscape. Green pigment, copper carbonate, was originally employed for the tiles and the landscape.⁶⁷ For the porphyry-coloured paint of the background of the classical relief on the left, a mixture of vermilion, black, and lead white was used.

Use of Gold

The same method of gold gilding used in the garment of Christ in the *Agony in the Garden* was found in the left-hand classical relief and in the area of the clouds around Christ's legs.⁶⁸ Gold is generally found in the most of Bellini's early work, but also detected in some of his later works, reflecting perhaps both the strong Byzantine tradition that survived in the mosaics of San Marco and the rich material decoration of his father's

⁶²The *Saint Vincent Ferrer altarpiece* (SS Giovanni e Paolo, Venice), for instance. They also found in Mantegna's *Adoration of the King* (Uffizi, Florence). See Braham et al., *op. cit.*, p.11.

⁶³ The computer animation in the Micro Gallery -computer information room in the Sainsbury Wing in National Gallery, London- reconstructs the original image with demonstration of its sumptuous decoration.

⁶⁴ Braham et al., *op. cit.*, p. 11.

⁶⁵ *Ibid.*, pp.22-23.

⁶⁶ *Ibid.*, pp. 22-24.

⁶⁷ Florentine influence on Venetian and Padua painters in terms of pigments could be 'verditer', i.e. artificial copper carbonate. Verditer is believed to be the pigment more associated with Florentine painters; see Appendix 3.

⁶⁸ Braham et al., *op. cit.*, p. 11.

works.⁶⁹ Martin Davies reported that gold may also have been used in the chalice in the *Blood of the Redeemer*, which is now mostly modern.⁷⁰ Christ's halo, again, was perhaps gilded by gold, which was eventually stripped off, such that now only a reddish brown colour remains [Plate 6], a possibility not commented on by the restorer. In fact, the oval shape of Christ's halo in the *Blood of the Redeemer* has much in common with that of an early work, the *Dead Christ* (Museo Correr, Venice), dated to c.1460. In the latter, gold was applied by gilding, then shaded with varnish glazes of yellow colour.⁷¹ Bellini repeated this technique in the inside of the dome in the central panel of the triptych, of the *Madonna and Saints* (Frari, Venice), completed in 1488, which was again gilded, then shaded with rich, warm oil glazes. According to Thompson, this technical device was quite common in Renaissance painting, especially in sixteenth-century Germany.⁷²

All the golden decorations in the *Blood of the Redeemer* have been erased except on the classical relief, where gold was essential for modelling, but relatively indistinct, and it is possible that the gold was removed by an early owner who valued the naturalistic aspect of the picture, a factor discussed further in the following section.⁷³

Giovanni Bellini adopted gold in various details, following the tradition of medieval craftsmanship, although in Florence there had been attempts to declare the technique outdated. Indeed, the use of gold became less popular with contemporary Florentine artists such as Castagno and Pollaiuolo who were increasingly concerned with the problems of illusionistic three dimensional space. In practice, gold jumps forward from a composition and makes the surface appear flat, and consequently troubles perspective composition. The attempt to create the effect of gold through colours was also praised by Alberti as requiring greater pictorial skill.⁷⁴

⁶⁹ See Cat. 3, 4, 5, 7, and 10 in Appendix 3, for the use of shell gold and gilding in Bellini's work.

⁷⁰ Davies, *op. cit.*

⁷¹ Thompson, *op. cit.*, 1956, p. 68.

⁷² Thompson proposes that this method must look back to the ancient tradition of gold-coloured lacquering in oil varnishes on metals; *ibid.*, p. 68.

⁷³ Braham et al, *op. cit.*, p.4.

⁷⁴ Alberti wrote that 'Truovasi chi adopera molto in sue storie oro, che stima porga maestà. Non lo lodo. E benché dipignesse quella Didone di Virgilio, a cui era la faretra d'oro, i capelli aurei nodati in oro, e la veste purpurea cinta pur d'oro, i freni al cavallo e ogni cosa d'oro, non però ivi vorrei punto adoperassi oro, però che nei colori imitando i razzi dell'oro sta più ammirazione e lode all'artefice'; L. Alberti, *Opere volgari*, ed. by C. Grayson, vol. 3, Bari,

The growing tradition of this Florentine naturalism in light and colour, unlike their draughtsmanship, was not openly appreciated by Bellini. His concern at this time was with the realization of the formal and spiritual functions of light. As a symbol of the supernatural light of heaven, gold remained central to his experience of religious devotional and narrative subjects. In the *Agony in the Garden*, the gold lines of Christ's drapery played an important role in symbolising the divine presence. In the *Blood of the Redeemer*, heavenly phenomena are marked by gold- the angel's chalice, receiving the Blood; Christ's halo; the heads of seraphim and cherubim in the clouds. As a rule, gold did not lose its character as the carrier of divine significance in Bellini's early art.

Colour modelling

For the modelling of the angel's drapery in the *Blood of the Redeemer*, Giovanni Bellini added black to the blue pigment for the shade and white for highlights, reserving pure colour for the mid-tone [Plate 6]. This was a relatively advanced attempt to achieve a naturalistic effect. Earlier in the *Agony in the Garden*, he added white for light tone, but adopted pure colour for shadow without addition of black, following the method of most fourteenth-century Italian painters.⁷⁵

The addition of black to the pigment, the method which Bellini used in the *Blood of the Redeemer*, is a technique, which is often called Albertian-style modelling.⁷⁶ This technique was commonly practised in Northern Italy at the beginning of the fifteenth century.⁷⁷ Gentile da Fabriano is one of its early exponents and it is possible that he introduced the practice to Florence in 1422 when he came to work there. Marcia Hall maintains that Filippo Lippi used it in the *Tarquinta Madonna* (Galleria Nazionale, Rome) around 1437

1973, p. 88. For discussion of this passage, see M. Baxandall, *Painting and Experience in fifteenth century Italian Painting*, Oxford, 1972, p. 16.

⁷⁵ This so-called Cennini style of modelling was practised by Giotto and painters following him, and recorded by Cennino; M. Hall, 'Modelling Techniques to Color Mode', *Color and Technique in Renaissance Painting; Italy and North*, ed. by M. Hall, New York, 1991, pp.1-12.

⁷⁶ For the passage in Alberti's treatise on the use of black for shadows, see pp.96-100 in Chapter 2. For the Albertian practice in the fifteenth century Italy, see M. Hall, *op. cit.*, 1992, pp.48-52.

⁷⁷ Black pigments is used for defining forms in Giotto's *Pentecost* (National Gallery, London); Bomford et al, *op. cit.*, 1989, pp. 64-71. But, it seems that this modelling was more widely used in Northern Italy; Hall, *op. cit.*, 1991,p.4.

after he returned from the Veneto.⁷⁸ Mantegna, not surprisingly given his Paduan training, used this modelling method.⁷⁹ It seems that Bellini also came to value one of the traditional northern Italian painting techniques at the time when he painted the *Blood of the Redeemer*.

In practice, this method of painting increased the range of tonal values available to Bellini. Moreover, thanks to this technique, he could approximate the appearance of colour in shadow far more successfully than by the 'Cennini system'. It is optically true that colour loses both value and intensity in shadow as Alberti observed.⁸⁰ In the *Blood of the Redeemer*, an outdoor setting is effectively depicted and it may have seemed to an early owner that the decorative clouds around Christ's leg and the gold gilding of halo and chalice undermined the naturalistic effect of this picture, and had them removed to satisfy his or her own aesthetic.

Marco Zoppo's *Dead of Christ* (c.1470, National Gallery, London), now hanging in the same room as Bellini's *Blood of the Redeemer*, presents a different example of colour modelling in northern Italy [Plate 8]. In this painting, Marco Zoppo continued the old 'Cennini system', but he adopted a wide range of values by adding white alone. In such a small painting of 26.5x21cm, more than four degrees of tone were used. As a result, the surface appears to become fragmented, but very decorative. In fact, the Cennini system had one great merit, that of the brilliance of pure colour. By adding black to pigments, Giovanni Bellini could explore more naturalistic effects, but had to sacrifice his chromatic intensity. This method may not have been wholly pleasing to Bellini and was to be fully overcome in the following decades by his adoption of Netherlandish oil painting technique.

⁷⁸ Hall says that Lippi may have used special devices learned in Venice; *op. cit.*, 1991, p.4.

⁷⁹ *Ibid.*, p.6.

⁸⁰ See p.147 in Chapter 2.

Conclusion

Giovanni Bellini knew of oil from an early age. He extensively used it in some works and may have also employed it for glazing details in the 1460s.⁸¹ The motivation for the employment of this new paint medium was to a large extent led by his prodigious interest in light and colour. In practice, any attempt to further his earlier achievement of harmony in the formal and symbolic function of light and colour, such as the dawn in the *Agony in the Garden*, would increasingly have encouraged the use of oil.⁸² The lead white *imprimatura* in the *Blood of the Redeemer* is possibly an important factor in anticipating his later move from a painting method based on egg tempera to one using oil.

Toward the last quarter of the fifteenth century only after he came to have full knowledge of the Northern oil technique, Giovanni Bellini began to experiment more seriously with his oil painting method. Bellini's positive and experimental adaptation of oil-based painting techniques will be the subject of the following chapter.

⁸¹ My argument is contrary to the previous view that Giovanni Bellini plagiarised the new technique from Antonello da Messina during the latter's stay in Venice in 1475-6. See pp. 160-170 for the detailed discussion.

⁸² For the realization of truly transparent and saturated colours, the employment of oil is inevitable progression.

Chapter 4

The *Pesaro Altarpiece* and the Development of Oil Painting

The last chapter has made a case for arguing that right from the early days of his working life, oil was not new to Giovanni Bellini. Nevertheless, his early career as a tempera painter and the technical uncertainties of oil paint may have delayed his full employment of the new medium, until such time as the visual properties of oil began to coincide more fully with his own interest in colour and light. The present chapter will focus on Bellini's translation of the skills of tempera to the medium of oil paint and the stylistic changes that occurred after the extensive use of such a different medium in the 1470s. At the centre of this discussion is the *Pesaro Altarpiece*, Bellini's most important work of these crucial years.¹ The possible sources which may have influenced his oil method in the 1470s will be discussed at the end of this chapter.

4.1 The *Pesaro Altarpiece* and Paint Media

The *Pesaro Altarpiece* or the *Coronation*, named after the subject of the main panel, the Coronation of the Virgin with four saints -Sts Paul and Peter on the left and Sts Jerome and Francis on the right, is believed to have been executed between 1473 and 1476.² It is large and complex with an overall size of no less than 5 by 3 metres. A single-unified space of 2.6 by 2.4 metre is designed as the main central panel, which is incorporated into

¹ The commission of the *Pesaro Altarpiece* is not documented, but it is generally accepted to have been painted for the high altar of San Francesco in Pesaro; C. Wilson, 'Early Citations of Giovanni Bellini's *Pesaro Altarpiece*', *Burlington Magazine*, (131), 1989. pp. 847-9; M. R. Valazzi, 'La Pala di Pesaro nei documenti d'archivio e nella letteratura critica dal secolo XV al XIX', *La Pala Ricostituita*, ed. by M. R. Valazzi, Venice, 1988, pp. 35-39.

² Although scholars are divided over its exact dating, it seems to have been commissioned some time between 1471 and 1473; R. Longhi, *Viatico per cinque secoli di pittura veneziana*, Florence, 1946, p. 16; N. Huse, *Studien zu Bellini*, Berlin, 1972, pp.23-38; C. Wilson, *Giovanni Bellini's Pesaro Altarpiece, Studies in Its Context and Meaning*, Ph.D. diss., Institute of Fine Arts, 1976; M. R. Valazzi (ed.), *La Pala ricostituita*, Venice, 1988; R. Goffen, *Giovanni Bellini*, New Haven and London, 1989, pp. 123-138; M. Lucco, 'Venezia', *La Pittura Veneto*, ed. by M. Lucco, Milan, 1990, pp.440-50; P. Humfrey, *The Altarpiece in Renaissance Venice*, New Haven and London, 1993, pp. 192-193, 345. For other datings, see M. Meiss, *Giovanni Bellini's St Francis in the Frick Collection*, 1964, pp.41-42; G. Robertson, *Giovanni Bellini*, Oxford, 1968, pp. 66-68; J. Wilde, *Venetian Art From Bellini to Titian*, Oxford, 1974, pp. 22-29; see A. Tempestini, *Giovanni Bellini*, Florence, 1992, pp.82-6 for the full literature of the *Pesaro Altarpiece*.

the pinnacle(107x84cm, Pinacoteca, Vatican), seven predella panels(40x36 or 40x42cm), and eight panels on the both standing pilasters (61x25cm) [Plate 9].

The *Pesaro Altarpiece* has long been claimed as the first true oil painting of importance among Bellini's works.³ The use of oil was confirmed by the media analysis carried out during the 1987 conservation [GLC], from which the conservator was able to establish that the overall figural area was painted in oil in a homogenous way.⁴ Since recent media analyses of Bellini's earlier works have detected similar cases -the *Transfiguration* (Museo Correr, Venice) for instance-, the identification of oil in the *Pesaro Altarpiece* can not be viewed as a dramatic shift, as has traditionally been believed. However, the application of oil in such a complicated and challenging project and his increasing use of oil as a main paint medium soon after this work still qualifies the *Pesaro Altarpiece* as a turning point in Bellini's painting technique.

The painted surface of the *Pesaro Altarpiece* shows technical features characteristic of oil paintings in the transitional period. First of all, drying cracks are detectable in the red cloak of St Paul in the main panel and the dark brown drapery of Mary Magdalen in the upper panel.⁵ The exact technical problem which led to the crackle of the *Pesaro Altarpiece* has remained undetected since chemical analysis has not been applied within the damaged area, but the state of the damage suggests that they may have been caused by miscalculating the drying time of each paint layer.⁶ These defects are found in works executed by acclaimed oil painters like Titian, such as the *Bacchus and Ariadne* (National

³ See footnote 35 in p.19, for scholastic discussions of Bellini's oil painting technique employed in the *Pesaro Altarpiece*. For its recent discussion, see Goffen, *op. cit.*, p. 121; and P. Humfrey, *Painting in Renaissance Venice*, New Haven and London, 1995, p 192.

⁴ Three samples were analyzed by GLC; (1) red garment of St Paul (main panel); (2) pavement (main panel); and (3) light brown colour in the San Terenzio panel (predella). Together with media analysis, a considerable amount of scientific information pertaining to the *Pesaro Altarpiece* was produced during the 1987-8 restoration, and published as a catalogue of the exhibition; M. R. Valazzi (ed), *La Pala ricostituita*, Venice, 1988. For the debate over the medium of the *Pesaro Altarpiece* in this report, especially see M. Cordaro, 'La patinatura perduta e alcuni problemi di pentimenti, e di varianti', *La Pala ricostituita*, Venice, 1988, pp.78-84.

⁵ The uncertainty found in Bellini's approach to oil medium in the *Pesaro Altarpiece* has been pointed out by Wilde, *op. cit.*, p. 26. Drying cracks are not commented upon in the 1988 technical report.

⁶ The pigments containing lead, for instance, speed the rate of drying.; see L. Ettlinger, *Antonio and Piero Pollaiuolo*, London, plate 84. The more drastic crackle even causing the loss of paint film, for instance, can arise when tempera paint is sandwiched between oil layers. The damage to the green lining of the Virgin's mantle in Botticelli's *Virgin and Child with St John the Baptist* (Walters Gallery, Baltimore), c. 1490, were caused by this problem; M. Johnson and E. Parkard, 'Methods in the Identification of Binding Media in Italian Paintings of the Fifteenth and Sixteenth Centuries', *Studies in Conservation*, (16), 1971, pp. 145-164.

Gallery, London), but since these are not the technical faults expected in tempera paintings their presence in the second half of the fifteenth century marks the change of painting media. Similar drying defects, for instance, are found in the Pollaiuolo brothers' *Martyrdom of St Sebastian* (c.1470, National Gallery, London) and Piero della Francesca's *Brera Altarpiece* (1471-2, Brera, Milan), closely dating to the *Pesaro Altarpiece*.

Giovanni Bellini used a technique involving the impression of finger prints in the details of landscape [Plate 9(a)-2.]. This so-called 'finger print technique' is now regarded as one of the most characteristic features which define the methods of several masters of the transitional period of paint media, but its specific purpose has still to be established.⁷ When Brachert analysed Leonardo da Vinci's use of finger prints, she put forward the idea that the finger print technique is a typical mark of the painting technique of the period, c.1475 to c.1520 in the change to the 'painterly' style which carried with it a preference for coarse fabrics and pasty application of paint.⁸ The increasing concern about the plastic quality of paint brought about by the development of oil painting was, no doubt, one of the important motivations for the use of this method, but it is difficult to accept her view that finger prints were used simply to create the effect of coarse fabrics during this period. In fact, the application of oil on canvas was only practised to a limited extent in Venice, and even there the emphasis on coarse fabrics began to be developed only in the early decades of the sixteenth century; that is to say, towards the end of the period that Brachert defines as the period of finger print technique.⁹

In my observation, the explanation of the use of finger prints in this period could vary considerably. Finger prints could be impressed on the painting surface accidentally or simply as a result of artists examining the painting by hand to know whether the oil paint had dried enough to apply the next layer of paint or varnishing. In cases where finger prints were applied extensively, they were adopted for other reasons. X-rays have shown that Leonardo da Vinci often pulled his finger over the wet oil surface and/or intensively

⁷ T. Brachert, 'A distinctive aspect in the painting technique of Ginevra de' Benci and Leonardo's early works', *Report and Studies of the History of Art*, Washington, 1969, pp.85-104.

⁸ *Ibid.*

impressed it in a limited area.¹⁰ The reason Leonardo da Vinci, who never had a serious interest in textile support, used this method extensively, is more likely to be linked with his life-long concern with achieving gradual changes of tone.¹¹ Such extensive impressions of finger print in jelly-like oil paint, in painting, could serve further to blend colours on the surface of painting, as if they were on a palette, and obscure the boundaries of different tones. It was probably for the same reason that Giovanni Bellini explored the finger print method. His finger prints do not appear as extensively as those of Leonardo, but a series of impressions of fingers appear over the edge of the area built up by glazing [Plate 9(a)-2], and suggest that the aim of Bellini's finger print method was to increase the subtle graduation of tonal transition. The impressions of finger prints are also visible in the distant landscape in Cima's *St Peter Martyr Altarpiece* (Brera, Milan) and may have been adopted for a similar purpose.¹²

Apart from the technical characteristics referred to above as characteristics of early oil painting, there is some evidence indicating the survival of tempera-based technique in the *Pesaro Altarpiece*. The modelling of flesh areas, for instance, is built up by cross-hatched strokes, typical of a tempera painting [Plate 9(a)-1]. Similar cross-hatching, found in the undermodelling of the face in the *Portrait of Doge Loredan* (c.1505, National Gallery, London), provides evidence of Bellini's continuing use of tempera-based techniques.¹³

The tight brushstrokes in the *Pesaro Altarpiece* could suggest the presence of egg tempera as an underlayer of oil glazes, one of the mixed techniques preferably adopted by Italian painters in this transitional period. The three samples taken for media analysis in the *Pesaro Altarpiece* all indicated the presence of oil [GLC]. The number of samples, however, is relatively small to assess the painting method employed for such a large scale

⁹ See Chapter 5, for the development of oil-on-canvas painting in Venice.

¹⁰ Brachert, *op. cit.*, pp.85-90.

¹¹ For Leonardo's practice of colour modelling, see J. Shearman, 'Leonardo da Vinci's Color and Chiaroscuro', *Zeitschrift für Kunstgeschichte*, (25), 1962, pp. 13-47; M. Hall, *Color and Meaning: Practice and Theory in Renaissance Painting*, Cambridge, 1992, pp.92-122.

¹² Finger prints are also found in Bellini's *Assassination of St Peter Martyr* (Courtauld Galleries, London), *Virgin and Child with St John and a Female Saint* (c. 1504, Accademia, Venice) and the *Feast of the Gods* (National Gallery of Art, Washington); J. Steer, *A Concise History of Venetian Painting*, London, 1970, pp.74-5; D. Bull and J. Plesters, 'The Feast of Gods: Conservation, Examination, and Interpretation', *Studies in the History of Art*, (40), 1990, p. 37; J. Fletcher and D. Skipsey, 'Death in Venice: Giovanni Bellini and "The Assassination of Saint Peter Martyr"', *Apollo*, (133), 1991, pp.4-9.

work of such a complex structure, and still requires additional effort in approximating Bellini's painting practice in this work. In my opinion, the use of egg tempera is plausible. The results of the media analyses of Bellini's later works, in fact, suggest that he employed tempera consistently throughout his life, although oil came to replace tempera as the predominant medium from the 1470s onward. In the *San Giobbe Altarpiece* (Accademia, Venice) dated to the late 1470s, tempera was juxtaposed alongside oil [GLC]. Some twenty years later, Giovanni Bellini still continued to use tempera together with oil for the *Madonna of the Meadow* (National Gallery, London), dated about 1500-1510. An analysis of blue underpaint from this panel has identified the medium as egg but with a trace of added drying oil [GLC].¹⁴ Furthermore, while media analysis of samples of paint from the *Assassination of St Peter Martyr*, ca. 1505 (Courtauld Galleries, London), establishes the presence of a heat-boiled walnut oil, one sample still shows some egg tempera mixed with oil [GLC].¹⁵ A number of cross sections from the *Virgin and Child with Saints*, c.1510 (canvas, the Walters Art Gallery, Baltimore), were tested and identified the comprehensive presence of egg, although the copper resinate was bound with oil [staining method].¹⁶

These scientific findings imply a more complicated situation as regards the paint media of the *Pesaro Altarpiece* than emerged from the 1987-88 report. This theory must remain speculative pending laboratory analysis. In principle, however, this does provide a plausible working hypothesis to explain Bellini's development of oil during these transitional years in the use of paint media.¹⁷

¹³ Dunkerton et al., *op. cit.*, 1991, pp. 199-200.

¹⁴ Bellini's tempera-based oil technique is illustrated by the back of the paint film exposed by the removal of the gesso during the transfer from panel to canvas of this painting in 1949; For details of this transfer, see H. Ruhemann, *The Cleaning of Paintings*, London, 1968, pp.156-161. The oil glazes are used for the fine detail and the modelling of the drapery; A. Braham et al., 'Bellini's "The Blood of the Redcemer"', NGTB, (2), 1978, p. 24.

¹⁵ The samples were analyzed using gas chromatography and mass spectrometry by Raymond White of the Scientific Department of the National Gallery, London; Fletcher and Skipsey, *op. cit.*, 1991, pp.8-9.

¹⁶ With the exception of the underlying copper-green background which tested positively for oil, the medium used throughout the original portions of the picture was found to be egg tempera; C. Packard, 'A Bellini Painting From the Procuratia di Ultra, Venice', *Journal of the Walters Art Gallery*, (33-34), 1970/71, pp. pp.64-84.

¹⁷ Following this hypothesis, it is likely that Giovanni Bellini may have started the *Pesaro Altarpiece* with tempera underpaint and then softened the final modelling with oil glazes. This so-called 'mixed method' emerges from media analysis as a standard practice of oil painting in Italy during the transitional period. See Table 6, for the list of the media analyses undertaken on Italian Renaissance paintings.

4.2 From Graphic Quality to 3-Dimensional Volume

In spite of the difficulty arising from the distinctively different nature of oil from conventional aqueous media, Bellini extended its use to monumental paintings such as the *Pesaro Altarpiece*. This important shift in his paint material would, then, appear to have had a close link with his interest in the aesthetic properties of oil paint, for which he willingly adapted his early practice of tempera. The *Pesaro Altarpiece* has been admired by art historians for the fact that Bellini achieved a more consistent composition and created simple and voluminous forms. Thus, the question of why Bellini decided to adopt oil for the *Pesaro Altarpiece* can also be approached by examining the corresponding stylistic change in his painting.

Underdrawing

The major change in Bellini's working practice, after his extensive use of oil paint, can be found in the increasing number of *pentimenti* at the painting stage. This indicates that he not only began to use underdrawing in more flexible ways, but that he was prepared to correct his original idea during the execution. A varied range of underdrawing has been detected by infrared scanning in the *Pesaro Altarpiece*.¹⁸ Black outlines with hatched shadows are visible in infra-red reflectograms of the face of the Virgin Mary [Plate 9(b)]. The uneven, but flowing outlines may have been effected with the freer use of the brush and water-colour black. In the design of architectural settings, Bellini used a cartoon or cartoons. Traces of *spolveri* are found in the right side, in part of the decoration of the throne.¹⁹ Created on the basis of their guidelines, the design employed for architectural details most eloquently testifies to the fine craftsmanship of his early work. All the lines, found in the framework of the throne and the patterns of the pavement tiles, are incised into the ground with metal stylus. These incised lines are so precise, the conservator reports, that their ends do not even overlap, as is usually the cases with such incisions [Plate 9(d)].

¹⁸ Giovanni Bellini's working procedure in the *Pesaro Altarpiece* can now be thoroughly examined by the infra-red reflectograms published in the 1988 restoration report; M. Cordaro, *op. cit.*, pp.79-83; C. Bertorello and G. Martellotti, 'Per una lettura critica dei dati tecnici', *La Pala ricostituita*, Venice, 1988, pp.85-97.

¹⁹ *Ibid.* This area is not essential for the overall composition, but may relate to a repeat design. Cartoons were essential tools to the successful creation of design on the picture field and the underdrawings of figurative design

The use of these various underdrawing techniques indicated that the overall composition of the *Pesaro Altarpiece* was pre-planned, but not to the extent one sees in earlier examples, such as the *Blood of the Redeemer*. Bellini's paintwork in the *Pesaro Altarpiece* did not follow the guidelines exactly and is seen to become freer and more open. The x-ray and infra-red reflectogram of the *Pesaro Altarpiece* illustrate that Bellini made many alterations during the execution.

*Pentimenti*²⁰

As some of the underdrawing was done freehand, one would expect to find alterations or *pentimenti* in the course of the brushwork. These subsequent changes within the painting process were made for diverse reasons; in order to make changes in the details of objects, for instance, and to improve spatial structure and the application of perspective.

The infra-red photograph reveals that the first drawing of the sword of St Paul features two concentric circles with a rose diamond inside, where the final version shows the diamond-tipped knob.²¹ Besides this type of change in small details, Giovanni Bellini also made alterations in the outlines of the composition. Thus, Plate 9(b), for instance, shows there to be a slight rotation in the contours of the heads of Christ and of the Virgin in the main panel.²² In the final version, both heads have been given a further turn into a three-quarters view; Bellini corrected the right eye in the Virgin's face, which relates it to the line of the neck, while the face of Christ was turned more clearly to face the viewer. The right forearm of Christ placing the crown on the head of the Virgin Mary, became more curved. The conservator also reports that there has been correction of the upper outlines of some heads, which, in the final version, become narrower as in St Peter in the main panel, or, else, a little elongated as with Joseph of Arimathea in the upper panel.²³

were also aided by it. *Spolveri* are not found in the details of the figures, and the underdrawings for the Virgin Mary are rather brief and imprecise, suggesting free hand drawing [Plate 9(b)].

²⁰ The discussion of this *Pentimenti* section is based on the findings made by the infra-red study of the 1987 conservation; M. Cordaro, *op. cit.*, pp.79-83; C. Bertorello and G. Martellotti, *op. cit.*, pp.85-97.

²¹ *Ibid.*

²² *Ibid.*

²³ *Ibid.*

Giovanni Bellini seems to have made alterations in order to create more simple and realistic volumes. The infra-red reflectograms of the *Pesaro Altarpiece* reveal a number of instances where the elaborated broken lines of drapery in the underdrawing were minimised in the execution. In the case of St Francis, for instance, the hood appeared higher up on the neck and the shoulders, with irregular outlines in the underdrawing [Plate 9(c)-1].²⁴ In the final version, the hood appears more stretched and forms almost a triangle, which perfectly follows the oval-shaped volume of the shoulders and chest. In the upper panel, the sleeve which enfolds the entire left arm of Mary Magdalen, was originally designed to cover up to the elbow [Plate 9(c)-2].²⁵ The green clothes of St Paul in the main panel now look like a grooved column: however, the drapery lines were not originally vertical, but fanned out from the hem to the ankle [Plate 9(c)-3].²⁶

The *pentimenti* of the *Pesaro Altarpiece* imply that Giovanni Bellini was in the process of changing his early Mantegnesque linear style for the realisation of a more volumetric approach. It is disputable whether his change was made under the influence of Central Italian painters, but the observation of the pattern of his alterations to the *Pesaro Altarpiece* shows that Bellini made the most of his experience of oil-based painting technique. In practice, the use of *pentimenti* is not advisable in tempera painting. Opaque or, semi-transparent at best, tempera has a covering power which is actually good for concealing changes of composition, but if applied in multiple layers, tempera colour loses its brilliancy and becomes dull. Moreover, it was precisely the manner in which tempera paint was handled that made alteration to composition less possible in fourteenth- and fifteenth-century painting. The modelling of tempera painting, where colour is systematically applied with a small brush to make a form, virtually forced the painter to prepare a well-defined plan in the form of underdrawing before brushwork could start, and to desist from change to his original plan during the colouring. An example of this tradition can be found in Giovanni Bellini's way of working in the *Blood of the Redeemer*, which is believed to have been painted mostly in tempera. The x-ray and infra-red reflectogram shows that Bellini applied colour thinly over the picture surface, adhering to

²⁴ *Ibid.*

²⁵ *Ibid.*

²⁶ *Ibid.*

a carefully prepared underdrawing [Plate 6(b)]. No alteration seems to have been attempted and since almost all of the paint matches the final composition, even the x-ray and infra-red reflectogram appear rather like black-and-white photographs of the upper paint surface.

By contrast, the underdrawing of the *Pesaro Altarpiece* in figurative areas had the basic function of a guideline; the plan at that stage did not display the full range of final form. Here, Bellini was exploring a certain property of oil painting, by which the painter is permitted to build up multiple layers without loss of colour intensity and makes only perfunctory use of the careful underdrawing and the schematic colour changes of tempera painter. While oil has less concealing power than tempera, paradoxically, it imparts a more delicate colour as the layers are built up. In addition, the sticky viscosity that makes possible a thick paint layer or an impasto, encourages the painter to apply his brush in a more bold and open way. It would seem that these very properties empowered Bellini with a sense of comparative freedom, spontaneity, and, significantly, an opportunity to depart from his early more linear style in favour of a naturalistic concept of volume and space. In effect, the alterations he made in the *Pesaro Altarpiece*, should be interpreted as a manifestation of his change of style in the light of his application of the new paint medium.

His effort, clearly encouraged by the property of oil, was not an isolated one. There are examples demonstrating a desire to break away from the medieval painting practice which, regardless of paint media, respected a careful process of picture-making and demanded the preparation of a calculated design and subsequent paintworks according to it.²⁷ Jan van Eyck, for instance, made consistent alterations during the painting process. His corrective method is registered by the infra-red reflectogram of his *Portrait of the Arnolfini* (National Gallery, London), in which a number of corrections were made in the

²⁷ Using careful methods, alteration was not a recommendable practice in fifteenth-century Netherlandish painting; J. Ayres, *The Artist's Craft*, London, 1985, p.99; P. Coremans (ed.), *op. cit.*; P. Brinkman et al., *op. cit.*, pp. 26-49. For underdrawing practice in the Netherlands, see *Le dessin sous-jacent dans la peinture*, Université Catholique de Louvain; Colloques I et II (1979), III (1981), IV (1982), V (1985). For underdrawing by Gerard David, see M. Ainsworth, 'Northern Renaissance Drawings and Underdrawings: a Proposed Method of Study', *Master Drawings*, (28), 1990, pp.5-38.

details of gesture and Arnolfini's head.²⁸ Extensive *pentimenti* are also found in the works painted in oil by Bellini's contemporary central Italian artists. Alterations are visible in the legs of St Sebastian and in the right-hand archer in the *Martyrdom of St Sebastian* (c.1470, National Gallery, London) by the Pollaiuolo brothers.²⁹

As Bellini extended his interest in his oil-based painting methods, the emphasis on working procedure as described was to become one of the outstanding characteristics of his later art, and, even further, of Venetian painting of the century to come. As the century in which Bellini was born drew to a close, the younger generation of Venetian painters increasingly tended to skimp on the preparatory drawing and underdrawing stages, and to place the emphasis on the direct application of paint.³⁰

4.3 The Structure of paint layer and Colour Modelling

Giovanni Bellini's breakaway from his early technique is well-represented by the paint structure of the *Pesaro Altarpiece*. In the 1460s, he mainly worked on the basis of a single paint layer.³¹ The paint structure of the *Pesaro Altarpiece*, however, as revealed by

²⁸ See the paper 'The Making of Early Netherlandish Painted Portraits', given by L. Campbell to *The Image of the Individual c.1400-1550*, the joint conference held by the British Museum and the Warburg Institute in March 1995, and later published in N. Mann and L. Syson's *The Image of the Individual; Portrait in the Renaissance*, London, 1998, pp.105-112. See also R. Billinge and L. Campbell, 'The Infra-red Reflectograms of Jan van Eyck's Portrait of Giovanni(?) and Arnolfini and his Wife Giovanni Cenami(?)', *NGTB*, (16), 1995, pp.47-60.

²⁹ See the file of this work in the National Gallery Library. Botticelli often made minor and major alterations with the brush; H. Ruhemann, 'Technical Analysis of an Early Painting by Botticelli', *Studies in Conservation*, (2), 1955/56, pp. 17-40. For the technical examination of the *Holy Trinity with Saints* (Courtauld Institute of Art, London), see the paper, given by R. North for the 14th Gerry Hedley Student Symposium, Courtauld Institute of Art in June 1996.

³⁰ The method of sixteenth-century Venetian painters can be contrasted to their central Italian counterparts, who increased emphasis on drawing and the underdrawing in the course of the sixteenth century; for Florentine drawing theory within the context of the *disegno* and *colore* controversy in the mid-sixteenth century, see D. Rosand, *Paintings in Cinquecento Venice*, New Haven and London, 1980, pp.15-26. Michelangelo, for instance, adopted oil painting method sometime after the *Manchester Madonna* (ca.1497, National Gallery, London), but his working procedure clung to his original idea with little change afterward. He, in fact, had a concept of painting and art as capable of achieving an ideal perfection and, therefore, would not find the possibility of revealing the plastic possibilities of painting appealing. From the unfinished *Entombment* (ca. 1500, National Gallery, London), one can understand how Michelangelo worked from one part to the other, precisely following definite guidelines by means of the preparatory drawing; M. Hirst and J. Dunkerton, *The Young Michelangelo*, London, 1994, pp.83-127. It seems that not a single change was conceived during his brush work. For Raphael's working process based on underdrawing, see K. Christiansen, 'Examination and Treatment of Paintings by Raphael at the National Gallery of Art', *Studies in the History of Art*,(17), 1986, pp. 47-50.

³¹ It seems that little change was made in the method of preparation of the *Pesaro Altarpiece*, as the same multiple preparatory layers of the 1460s were generally used. A cross-section from the main panel shows the orderly application of the gesso, glue, and lead white layer [Plate 10]. This complicated method, which enables the painter to obtain a brighter and quicker drying ground, was more necessary, as Giovanni Bellini extended his oil technique.

cross-section, is composed of more than two or three layers. A cross-section from the red garment of St Paul, for instance, shows the application of a transparent layer of a brown-violet colour over an underlayer of lead white with a little red lake added to it [Plate 10(b)]. Elsewhere, a transparent layer of yellow lake and copper resinate is applied over a brighter lead-white and orpiment underlayer [Plate 11(b)].

Structure of paint layer

Giovanni Bellini increased the range of possible glazes and concentrated on his earlier interest in lake pigment in order to achieve transparency of colour in this altarpiece. Red lake is a dominant pigment for red in the main panel; the red vestment of St Paul and the Virgin Mary are identified as red lake. Vermilion is also used, but always together with red lake as underlayer.³²

Apart from lake pigments, Giovanni Bellini extended the use of brown ochre in the *Pesaro Altarpiece*. In practice, due to its low refractive index, brown ochre becomes very transparent and loses its original colour when mixed with oil binding medium.³³ For the representation of grey soil in one of the predella panels of St Terreno, this almost translucent brown colour is applied over an opaque lead-white underlayer, and then glazed with some yellow lake [Plate 10(d)]. Again, for a grey ground, Bellini applies a transparent brown colour, possibly a mixture of brown ochre and ultramarine, over a lead-white underlayer [Plate 10(e)]. Moreover, it seems that Bellini was perfectly familiar with the change of hue in brown ochre when used with oil medium; for when he actually needed a brown colour, he used a little bone black in the medium.³⁴ The above examples suggest that in the *Pesaro Altarpiece* Giovanni Bellini's use of glaze falls into a certain pattern; that is, he applied a dark transparent layer over a bright opaque underlayer.

There are, however, variations or developments in his glazing method. Cross-sections from the upper panel, the *Pietà*, show a more systematic and, it would seem, advanced

³² Lake pigments, which give a semi-transparent film even when used with tempera, become more transparent when combined with oil; L. Sheldon and C. Hassall, 1992, *op. cit.* Both yellow lake and red lake were used in the *Pesaro Altarpiece*, but red lake is more prevalent; M.R. Valazzi, 1988, *op. cit.*, pp.130-31.

³³ J. Dunkerton et al., 1991, *op. cit.*, pp.182-187.

³⁴ M. R. Valazzi, 1988, *op. cit.*, p.132.

approach to building colour layers than is the case with the main *Coronation* panel and predella panels. A cross-section of the red cloak of St Paul [Plate 10(b)] in the *Coronation* panel shows that a transparent layer of brown-violet colour was applied over the opaque underlayer of lead white with a little red lake added. While a dark transparent colour comes after the bright opaque layer, little account is taken of the chromatic relationship between glaze and underlayer. In the case of the upper panel, though, the underlayer consists to a greater degree, of a more or lesser admixture of pigments relating to the colour of the final glaze. The brown colour in the garment of Mary Magdalen, for instance, is pitched to this carefully calculated glazing procedure. The paint layer consists of a lead-white and orpiment underlayer, a superimposed layer of yellow lake and copper resinate, and finally the yellow lake glaze [Plate 11(b)]. This technique can equally be found in the reddish-violet garment of Nicodemus, where ultramarine mixed with lead white is applied first, followed by a thin layer of lead-white and red lake, and, finally, the admixture of crystalline vermilion, ultramarine, and some green pigment as a glaze [Plate 11(a)].³⁵ In brief, Bellini's reddish-violet chromatic effect is created by using the two underlayers of blue and red to support the tonality of the final glaze.

The further difference between the *Pietà* panel and the other parts of the altarpiece can be found in the discussion of modelling method and leads to the hypothesis that the upper *Pietà* panel was executed two or three years later than the main panel.

Modelling

The benefit of glazing technique is clear in the modelling method of the main *Coronation* panel. Plate 11(a) shows that the light and mid tones of the drapery of St. Paul in the main panel rely on a considerable admixture of lead white and vermilion, while pure red lake colour is used for the shade. This restricted glazing method seems to have replaced Bellini's earlier effort to create naturalistic shading by adding black to his pigment. The change in method helped him to increase the number of mid tones available to produce a naturalistic three-dimensional form. In the previous decade, his forms were modelled with the two extreme values, bright and dark. As discussed in Chapter 3, this is an effective

³⁵ *Ibid.*, p.136.

method to achieve a solid sculptural form, but, due to the lack of mid-tone, the picture surface can look flat and dull. In the *Pesaro Altarpiece*, however, two or three mid-tones were used to link light tone to shadow, and, by glazing method, Bellini achieved deep-toned shadows without sacrifice of chromatic intensity. Considered together with his emphasis on a more flexible working procedure, this soft modelling method, based on gradual tonal transition, seems to have provided the technical basis for Bellini's achievement of voluminous three-dimensional form, and should be regarded as a great achievement of his art in this period.

However, one must bear in mind that the area where glazing is applied is relatively minor in the main *Coronation* panel. The overall colour modelling is still controlled by adding a ratio of lead white to body colour [Plate 10(b) and 12(a)]. Due to this presence of a large amount of lead white, the colours in the main panel appear comparatively cool and dry.

By contrast, the red colour in the drapery of Joseph of Arimathea in the upper *Pietà* panel looks deep and intense, and its tonal transition from light to dark is more gradual, making a sharp contrast with the brown garment of Mary Magdalen [Plate 12(b)]. Lead white was not used here. In fact, the use of vermilion and red lake without lead-white was reported.³⁶ The appearance of the drapery colour suggests that the red lake may have been glazed over the vermilion underlayer. Bellini's effort to approximate natural tonal change, found in the main panel, is more successfully achieved in the *Pietà* panel.

The glazing method used by Giovanni Bellini in the *Pietà*, is reminiscent of Northern oil painting technique. As we saw in the previous chapters, Jan van Eyck and other Netherlandish masters worked from light to dark tonal area using three or four layer progressions, increasing the proportion of the intended colour in an ordered sequence.³⁷ What makes Giovanni Bellini's method unique compared to that of his contemporaries is

³⁶ *Ibid.*, p.137.

³⁷ A similar way of developing paint layer from bright mid-tone to dark glaze can be found in the reddish-violet garment of Nicodemus in the upper panel of the *Pesaro Altarpiece* [Plate 11(a)]. Plate 10(b), likewise, shows how Bellini obtains a brown colour by experimenting with different coloured layers; orpiment first and then an admixture of yellow lake and copper resinate.

that for the final glazing he uses an admixture of two or three colours. It seems that by doing this Bellini may have been attempting to capture a more subtle chromatic effect.³⁸

From Bellini's technical progression towards the use of glazes, we may deduce that the upper panel of the *Pesaro Altarpiece*, in which the Netherlandish method is more obviously evinced, may have been executed later than the other panels. This hypothesis can be supported by recent scholarship, which dates the upper panel separately from the main panel and concludes that it was made around 1478-9.³⁹ The supposed chronological gap separating the pinnacle panel from the other parts of the altarpiece carries critical implications, since it can help to pin down the date of an important unfolding of Bellini's painting method. If the dating of the pinnacle panel is correct, it is likely that Giovanni Bellini's proficiency in adapting the Netherlandish method of oil painting was established at some point between 1476 and 78.⁴⁰

4.4 The Introduction of Netherlandish Light Effects

How did Giovanni Bellini come to use oil and to develop the potential of oil techniques? The question is now a complex one. The present study may at least show that his art fell into three phases. Before the 1470s his approach to oil was tentative, either reserving it for details or applying it in conventional tempera-based technique, as discussed in Chapter 3. In the first half of the 1470s, he began to use oil as a principal paint medium, exploiting techniques associated with it as seen in the main panel of the *Pesaro Altarpiece* but his oil method was yet to be refined. In the second half of the 1470s, he began to apply oil glazes

³⁸ An oil glazing method in Giovanni Bellini's art which approaches Netherlandish technique more closely is found in the *Barbarigo Canvas*, dated 1488; see pp.187-91 in the next chapter.

³⁹ P. Humfrey, *op. cit.*, 1993, pp.345. Conti, for instance, dates it around 1478-9 on the basis of documentary evidence; A. Conti, 'Giovanni Bellini fra Marco Zoppo ed Antonello da Messina', *Antonello da Messina*, Messina, 1987, pp. 275-303. This does not necessarily mean that Bellini handed over the work in its entirety either in 1479 or later; presumably, he delivered first the altarpiece without the pinnacle to Pesaro and, then, two or three years later, he sent on the completed pinnacle.

⁴⁰ In terms of their technique, it would appear that the *San Giobbe Altarpiece* (Accademia, Venice) and *St Francis Panel* (The Frick Collection, New York) were executed not long after the pinnacle of the *Pesaro Altarpiece*. In the *San Giobbe Altarpiece*, the brilliancy of colour that had been Bellini's prime concern since the beginning of his career has given way to greater concern with form and space, and the interplay of light and dark. The dual function of light, both formal and spiritual, that were epitomised in the *Agony in the Garden* [Plate 1], are now unified in the landscape of the St Francis panel, where the composition is more consistent and naturalistically observed. These two

more systematically and succeeded to an extent in approximating naturalistic colour change, for example in the pinnacle of the *Pesaro Altarpiece*. Thus, it is likely to have been around 1475 or soon after that he became fully adept in the Netherlandish way of painting in oil.

Nevertheless, my argument that Giovanni Bellini's assimilation of oil painting technique was gradual runs counter to the traditional account of his having plagiarised or picked it up, in 1475-6, from Antonello da Messina -who was himself supposed to have learnt it in the Low Countries.⁴¹ In reality, this notion has never been substantiated and modern scholars have rejected it on the ground that Antonello may in fact have refined his own technique when he was travelling in Northern Italy in the 1470s, where this new technique was already making its appearance.⁴² However, it remains a possibility, of course, that Antonello's method may have given a fresh incentive to Giovanni Bellini, to whom the northern method was still unexplored territory.⁴³

Bellini's Jörg Fugger Portrait

Before examining Antonello's role in the development of oil painting method in Venice, it is necessary to point out the increasing understanding of Netherlandish oil painting technique in Venice and its neighbouring cities in the middle of the fifteenth century. As discussed earlier in Chapter 2, when Antonello visited in Venice in 1475, it is unlikely that oil painting in Italy would have been the secret preserve of a handful of painters.⁴⁴

Strong evidence of Netherlandish influence on Venetian art is found in Giovanni Bellini's small *Pietà* (Accademia Carrara, Bergamo). Painted around 1460, this small panel shows how far the young Bellini was absorbed with different aspects of the artistic languages available to him; the harsh and linear form of Paduan painting, for instance, were adopted

paintings, particularly the *San Giobbe Altarpiece*, will be discussed in pp.168-9 in this chapter and pp.195-204 in Chapter 6 in which it will be examined with reference to the later development of tonal painting in Venice.

⁴¹ The critical incentive for Giovanni Bellini's change has repeatedly been explained by a hypothesis that he owed much to beneficial contacts with other painters using an advanced technology. See pp.16-17 in Introduction.

⁴² Dunkerton et al., *op. cit.*, 1991, p.197.

⁴³ Goffen, *op. cit.*, 1989, p.122; N. Huse and W. Walters, *Venedig: Die Kunst der Renaissance- Architektur Skulptur, Malerei 1460-1590*, München, 1986, pp.217-20; Humfrey, *op. cit.*, 1993, pp.195-229. Antonello's two-year-long presence in Venice may have provided a catalyst for the development of Bellini oil painting method; see p.163ff in this chapter.

in the panel. However, the most striking feature of this painting is Bellini's attention to the tragic facial expressions of figures, borrowed from Netherlandish art, in particular the work of Rogier van der Weyden. This borrowing is most evident in the tragic mask of the Virgin and St John, where Bellini followed Netherlandish painting almost slavishly.⁴⁵

Together with its formal similarity, Netherlandish glazing technique can also be found in the *Pietà*. It appears that the Virgin Mary's brilliant red cloak was modelled with transparent glazes over a lighter underlayer, and not using the tight brushstrokes employed for the blue garment of St John. The question as to his use of oil paint in this panel should be further examined by scientific analysis, since this type of soft modelling can also be obtained, to a limited extent, with traditional paint media.⁴⁶ Nevertheless, this method indicates that Giovanni Bellini was not only familiar with Northern paintings, but was aware of both technical value and formal expression in Netherlandish painting in his formative years.

Bellini's understanding of Netherlandish formal qualities and methods in the first half of the 1470s - the period when his workshop was in the course of the execution of the *Pesaro Altarpiece* -, is well demonstrated in the *Jörg Fugger Portrait* (Norton Simon Museum, Pasadena), which once had an inscription on the back reading "JORG FUGGER ADI XX ZUGNO MCCCCLXXIIII" [Plate 13].⁴⁷ The face of the young man named Jörg Fugger is depicted in three-quarter view, rather than in profile; the latter was the standard formula for Italian portraits in the first half of the fifteenth century. Mantegna explored a three-quarter view portrait as early as 1460, for instance, in his *Cardinal Ludovico Trevisan* (Gemäldegalerie, Berlin). However, in the case of the *Jörg Fugger Portrait*, it seems more likely that Bellini had in mind Netherlandish portraits like the *Marco*

⁴⁴ For Netherlandish influence on Bellini, before the time of Antonello's arrival in Venice, see pp.94-5 in Chapter 2.

⁴⁵ Huse and Wolters, *op. cit.*, pp.221-2. For the Italian notion of 'devoto' figures which were particularly admired in the work of Netherlandish painters and especially important for devotional subjects such as the *Pietà*, see P. Nuttall, *The Influence of Netherlandish Painting in Florence: acquisition, ownership and influence, c.1435-1500*, Ph.D. diss., Courtauld Institute of Art, London, 1989; P. Nuttall, 'Decorum, Devotion and Dramatic Expression: Early Netherlandish Painting in Renaissance Italy', *Decorum in Renaissance Narrative Art*, ed. by F. Ames-Lewis and A. Benarek, London, 1992, pp.70-77.

⁴⁶ The question as to what paint medium Bellini used in the *Pietà* is significant for the understanding of the evolution of Venetian oil painting. Since no scientific analysis has been made, it is difficult to gauge its paint media with any certainty, but some technical points can be drawn from visual inspection.

⁴⁷ T. Pignatti, *L'opera completa di Giovanni Bellini*, Milan, 1969.

Barbarigo (National Gallery, London) which may have been in Venice, having been painted by a follower of Jan van Eyck during the sitter's visit to London in ca. 1449. The tight brush work and the opacity of the shadow of Mantegna's work are not found in Bellini's portrait of Jörg Fugger. In fact, the Bellini is reported to have been executed in oil paint.⁴⁸ It is evident in the x-ray of the *Jörg Fugger Portrait* that the amount of lead white which had been mixed with the flesh colour was significantly reduced in comparison, for example, with the *Blood of the Redeemer* and, furthermore, its application was limited to the bright areas on the cheekbone, lower lip, and nose. One can find a similar formation of the facial structure in the x-ray of Jan van Eyck's *Portrait of a Man in a Turban* (National Gallery, London). This way of applying lead white seems to confirm the restorers' account that Bellini achieved the soft modelling of the facial structure of Jörg Fugger by oil glazes.

Apart from the compositional formula and painting methods, the relative size of the *Jörg Fugger Portrait*, which measures only 26 by 20 centimetres is identical with that of Netherlandish portraits. The Portrait of *Marco Barbarigo* (National Gallery, London) measures 24 by 16 cm, and Jan van Eyck's *Portrait of a Man in Turban* has roughly the same dimensions, 25.7 by 19 cm. Apart from altarpieces, the majority of surviving Netherlandish portraits and devotional images are modest in size. The question remains open as to whether these small-size oil paintings were produced for market demands, or whether this was determined, to some extent, by technical difficulties arising from their meticulous methods, but it is probable that Bellini was deeply interested in the various aspects of Netherlandish paintings in 1474 when he finished the *Jörg Fugger Portrait*.

Antonello da Messina and Netherlandish Light Effects

In 1475, Antonello da Messina visited Venice to paint an altarpiece in the parish church of San Cassiano, a commission from the Venetian patrician Pietro Bon.⁴⁹ The following year he left,

⁴⁸ Goffen, *op. cit.*, 1989, pp.197-202. Analytic method of paint media was not mentioned.

⁴⁹ The *San Cassiano Altarpiece* is documented by a letter, written by its donor Pietro Bon dated 16 March 1476. He wrote to Galeazzo Maria Sforza that Antonello had begun the work the previous August, and that when it was completed the picture would be one of the most excellent works in painting within and beyond Italy; *Antonello da Messina*, exh. cat., Rome, 1981, p.236; G. Robertson, 'The Architectural Setting of Antonello da Messina's San Cassiano Altarpiece', *Studies in Late Medieval and Renaissance Painting in Honor of Millard Meiss*, ed. I. Lavin and J. Plummer, New York, 1977, pp. 368-72; Humfrey, *op. cit.*, 1993, p. 345. The fame of the work is attested by Sanudo, who included it in a select group of only four Venetian altarpieces he thought worthy of mention; M.

but continued to send his works to Venice until his death. Antonello is unique as an Italian painter in the degree to which he tried deliberately to associate himself with Netherlandish painting style and methods, and it is likely that his two-year-long presence in Venice had a certain influence on Bellini, who had also been interested in Northern paintings and their method.⁵⁰

Recent scholars have rejected Ridolfi's view that Bellini plagiarized Antonello's oil painting technique during the latter's stay in Venice, and have suggested mutual influence between these two painters. Whereas the unified composition of Antonello's *San Cassiano Altarpiece* was based on Bellini's earlier *St Catherine Altarpiece*, Bellini was able to improve his oil methods thanks to Antonello.⁵¹ This account provides a more plausible explanation than previous studies which overemphasized Antonello's role, but many questions are still left unsolved. For example, it remains unclear from where Antonello took his inspiration for a new altarpiece design, the so-called 'Sacra Conversazione' composition, since such a composition emerged in Central Italy and Venice simultaneously. Furthermore, given the counter-evidence, it is unlikely that it was only after Antonello's arrival that Bellini began to refine his glazing method and consequently to achieve gradual tonal transition. Bellini's oil painting method of the 1470s was not only self-determined, to a large extent, in his earlier works such as the *Agony in the Garden* (National Gallery, London) and the *Blood of the Redeemer* (National Gallery, London), but developed empirically and experimentally, unlike what appears as a rather sudden breakthrough of Netherlandish oil glazing methods in Cosimo Tura's work.⁵² In the subject of the present thesis, then, the problem arises of defining the actual influence of Antonello on Bellini in the area of painting technique.

Sanudo, *De origine, situ et magistratibus venetae ovvero La città di Venetia* (1493), ed. by A. Caracciolo, Milan, 1980, p.52; Humfrey, *ibid.*, pp. 345-6.

⁵⁰ Antonello has often been categorized as part of the Venetian school; B. Berenson, *The Italian Painters of the Renaissance*, Oxford, 1952. For documents concerning his life, see Wright, *op. cit.*, pp.41-52. The Venetian main islands are geographically small, such that one painter could not miss the activity of others. Yet, Antonello's specific relationship to the local painters remains unknown. It emerges from documents that the Venetian guild of painters was uneasy with painters from outside. Dürer's commissions during his visit to Venice in 1507 were halted due to growing hostility from local painters; see A. Dürer, *Schriftlicher Nachlass*, ed. by H. Rupprich, I, Berlin, 1956, pp.43-4.

⁵¹ Huse and Wolters, *op. cit.*, pp. 217-20; R. Goffen, *op. cit.*, 1989, p.119-139, 197-202; Humfrey, *op. cit.*, 1993, pp. 195-201; Humfrey, *op. cit.*, 1995, pp. 71-81,100-108.

⁵² It should be emphasized again that oil paint and its related methods were increasingly accessible in Northern Italy in the 1470s; see above pp.91-95.

Little is known about Antonello's early life including his training. From Vasari's time, the most heated controversy over his life concerned how he learned Netherlandish oil painting technique. Vasari said that Antonello travelled to the North and received direct lessons about oil painting method from Jan van Eyck.⁵³ But, Vasari's account has been rejected by present day scholars on the chronological grounds that van Eyck was already dead at the time Antonello appears to have started his career.⁵⁴ Joanne Wright put forward the idea in 1980 that Antonello learned directly from contact with one of van Eyck's followers, probably Petrus Christus in the 1450s.⁵⁵ The new catalogue of the National Gallery, London, suggests that Antonello's oil painting methods were refined during his stay in Northern Italy in the 1470s, and then dates his most Eyckian panel, the *Saint Jerome in his Study* (National Gallery, London) to ca. 1475.⁵⁶ This painting, which has often been dated much earlier, shares a number of stylistic resemblances with his *Crucifixion*, inscribed with the date 1475 (National Gallery, London), and can be said to indicate that Antonello's mastery of Netherlandish painting method was obtained in the 1470s, as the National Gallery has maintained.⁵⁷

It is likely in any case that the *St Jerome in his Study* (National Gallery, London) was in Venice from 1475, where the Eyckian elements found in this picture, caused controversy over its authorship as early as in the sixteenth century. The Venetian collector Marcantonio Michiel said that the little picture of St Jerome reading in his study in Cardinal's attire is believed by some to be by the hand of Antonello of Messina but more precise judgement, attribute it to Jan van Eyck or to Memlinc.

...Alcuni credono che el sii stato di mano de Antonello da Messina, ma li più, e più versimilmente, l'attribuiscono a Giances, ovvero al Memelin.⁵⁸

Michiel's account was written in 1529, but it seems likely that this picture was in a Venetian collection as early as 1475 when Antonello came to Venice in order to execute a large

⁵³ Vasari, *le Vite...*, vol. 1, ed. by R. Bettarini and P. Barocchi, Florence, 1987, pp.132-33. For the passage, see p.17 in Introduction.

⁵⁴ J. Wright, *op. cit.*, 1980, pp.41-52. I agree with Dr. J. Wright's hypothesis that Antonello had direct contact with a Netherlandish painter. Antonello's painting technique must presuppose that he actually saw a Netherlandish painter at work or was trained by one.

⁵⁵ J. Wright, *ibid.*

⁵⁶ Dunkerton et al, *op. cit.*, 1991, p.41.

⁵⁷ *Ibid.*

⁵⁸ M. Michiel, *Notizie d'Opere del disegno*, ed. T. Frimmel, Vienna, 1888, pp.98-100; D. Chambers and B. Pullan, *Venice: A Documentary History, 1450-1630*, Oxford, 1992, p.427.

altarpiece for the church of San Cassiano; Antonello may have painted it there, or brought it to Venice after finishing it one or two years earlier.⁵⁹

Apart from his attention to microscopic details and still-life imagery, it is Antonello's treatment of light enhanced through a complicated architectural setting that is most striking in the Saint Jerome panel. Saint Jerome's study is framed by painted architecture, and placed in a dark vaulted structure, where no dominant direction of light was provided; the light appears to enter both from the front, through the beholder's side, and from behind. This approach to light can be said to be Netherlandish influence. The depiction of dim light entering through limited light sources was preferred by Netherlandish masters including van Eyck.⁶⁰ In contrast, their Italian counterparts mainly used a full bright daylight, which is ideal for the representation of volumetric values and the clarification of space.⁶¹ In order to achieve sophisticated tonal change and to represent the naturalistic textural effect of painted objects, the control of light is essential. Antonello used a Netherlandish inspired half or dim light, and form and space are described by deep shadow. For instance, daylight streaming into architectural space reflects on the surface of the ceramic tiles, but its pattern becomes illegible as it is enveloped in darkness.⁶²

A similar light effect seems to have been employed again in the *San Cassiano Altarpiece* (Kunsthistorisches Museum, Vienna) [Plate 14].⁶³ Only a fragment of the composition has survived, but it shows that the altarpiece was originally designed with an indoor setting in contrast to Bellini's earlier unified pala, the *St Catherine Altarpiece*, dated to c. 1470.⁶⁴ In Antonello's work, the light and shade are important tools to create naturalistic 3-dimensional form; the light is shown as flowing from a 45 degree angle from the right and casts a deep shadow covering one third of the body of the Virgin Mary.

⁵⁹ Humfrey, *op. cit.*, 1995, p.72.

⁶⁰ E. Gombrich, 'Light, Form, and Texture in Fifteenth Century Painting North and South of the Alps', *The Heritage of Apelles*, New York, 1976, pp. 19-35.

⁶¹ 'The sunlight streaming into open landscape and imparting to the whole scene that radiant serenity so characteristics of Piero della Francesca and Domenico Veneziano...'; Gombrich, *ibid.*, p. 20.

⁶² Dunkerton et al., *op. cit.*, 1991, p.318; J. Wright, *op. cit.*, p. 50.

⁶³ J. Wright, *ibid.*

⁶⁴ For the reconstruction of Antonello's altarpiece based on the seventeenth-century copies, see J. Wilde, 'Die "Pala di San Cassiano" von Antonello da Messina', *Jahrbuch der kunsthistorischen Sammlungen in Wien*, (3), 1929, pp. 57-72; G. Roberston, *op. cit.*, 1977. Humfrey revised Wilde's reconstruction, and proposed a lesser monumental setting; Humfrey, *op. cit.*, 1993, pp.197-201.

By reducing full bright day light into half light, Antonello could give further emphasis to the presentation of rich surface texture. Light is shown sparkling in Lucy's glass vessel and the jewels of St Nicolas's clasp [Plate 14(a)]. The stiff brocade of St Nicolas's vestments is decorated with metallic golden threads, while the Virgin's robe has exactly the appearance of soft velvet [Plate 14].⁶⁵ This technique was already employed by Jan van Eyck in works such as his *Virgin with Canon van der Paele* of 1436 (Bruges) and thus can be said to show Antonello's awareness of Netherlandish light and texture, together with his mastery of Netherlandish oil glazing methods. The application of oil paint is essential for textural variety. Unlike aqueous media, the viscosity of oil paint allows painters to represent naturalistic reflection more successfully by the application of 'impasto' or thick paint. Yet, the range and richness of the rendering of texture found in Antonello's work cannot be effectively achieved without the overall control of light. In the details of the *Martyrdom of St Sebastian* (c.1475, National Gallery, London), for instance, the Pollaiuolo brothers used oil paint with interest in Netherlandish light effect, as found in the rendering of the Moors' luminous armoury and other details in the background. However, the glow and gleam from metal and other materials become obscured in the full sun light depicted here. The same explanation can be applied to Piero della Francesca's treatment of light and texture in his late altarpieces - the *Madonna and Child with Angels and Saints, adored by Federigo da Montefeltro* (1472, Brera, Milan) for instance, Piero della Francesca emphasized the description of texture in his rendering of materials, but under a full bright light setting, the subtlety in reflection and sophisticated textile effects found in Antonello is missing.

Employing half light as a vehicle for creating voluminous form, and naturalistic reflection and texture, Antonello's altarpiece seems to have made an extraordinary impression on its Venetian audience, including Giovanni Bellini who had been deeply concerned with the depiction and effects of light from his formative years.⁶⁶ It is probable that, at the time Antonello worked in Venice, there were already various sources which may have encouraged Bellini to investigate Netherlandish light effect and colouring method in depth. Furthermore, the naturalistic representation of texture and the creation of voluminous form and well-

⁶⁵ It is also observed by Humfrey, *ibid.* Humfrey regards it as evidence of Antonello's mastery over Northern oil painting technique, but more precisely, it seems to indicate Antonello's interest in Netherlandish light effects.

structured space had already been, to a limited extent, attempted in Bellini's works.⁶⁷ Nevertheless, Antonello was able to demonstrate how such complicated methods, previously seen in Venice only in relatively small-size imported Netherlandish devotional panels and portraits, could be adapted to the public and monumental context of the altarpiece.⁶⁸

Antonello's influence is most distinctive in Bellini's later works. The systematic application of oil glazes in the upper panel of the *Pesaro Altarpiece* (c. 1476, Pinacoteca, Vatican), may indicate some influence of Antonello on Bellini, but it is the *San Giobbe Altarpiece* (Accademia, Venice), dated to the late 1470s which shows more clearly Bellini's response to Antonello's use of colour and light. The image in this altarpiece is given an interior setting, which is completely sealed off by architecture, arguably for the first time in Bellini's work.⁶⁹ The stylistic similarity of Bellini's *San Giobbe Altarpiece* to Antonello's *San Cassiano Altarpiece* has been frequently mentioned, but it is the treatment of light that makes these two works so much closer. The half or dim light, found in Antonello's *St Jerome in his Study* and *San Cassiano Altarpiece*, was used in the *San Giobbe Altarpiece*, and plays an important role in reinforcing the spatial geometry of the painting and in creating the three-dimensionality of the figures.⁷⁰

Regarding the Netherlandish method for rendering texture, Bellini's approach seems to be more cautious. In the *San Giobbe Altarpiece*, the special light effect is unlikely to have been adopted to create textural variety. A sense of material texture is hardly found in the elaborate drapery of the Virgin and three angels, which are defined by hard structural lines [Plate 22]. The golden brocade of St Louis of Toulouse's vestments lacks the subtle treatment of highlights which was employed in St Nicolas's vestment in Antonello's *San Cassiano Altarpiece*. However, Bellini began to recognize the plasticity of oil paint in the next decade

⁶⁶ For a discussion of Antonello's influence on Venetian painters in their approach to light, see J. Steer, *Alvise Vivarini; his art and his influence*, Cambridge, 1982, pp.22-6.

⁶⁷ See pp.187-91 in the following chapter, for Bellini's impasto technique in the *Barbarigo Canvas*.

⁶⁸ Humfrey, *op. cit.*, 1993, pp.197-98.

⁶⁹ As discussed in the previous chapter, Giovanni Bellini had been concerned with the form-revealing and symbolic function of light from his formative years. In Bellini's work, however, the light source mainly comes from one direction in open landscape, regardless of daylight or dawning light; Bellini, in fact, had hardly employed indoor setting until the 1470s.

⁷⁰ The magnificent deep shadow in the formulation of the voluminous body of St Sebastian in the *San Giobbe Altarpiece* is found in the depiction of the same saint which Antonello later executed for a Venetian church (Gemäldegalerie, Dresden); Huse and Wolters, *op. cit.*, pp. 217-8.

and to explore it in order to capture the sense of material texture. Bellini's increasing emphasis on light to make the painting of different textures more naturalistic will be discussed in the following chapter which will focus on Bellini's painting method in the 1480s.

Conclusion

As a result of increasing interest in oil painting in Italy, and his early contact with Northern paintings, Giovanni Bellini was in a position to improve his technique of oil painting from various sources in the first half of the 1470s, the time before Antonello's visit to Venice. Bellini's changing painting methods in this period has been discussed with reference to the *Pesaro Altarpiece*, in which he not only developed oil as his main paint medium, but tried to adapt the whole process of picture-making previously based on tempera in order to fulfil the potential of oil painting. It has been noticed that his modelling method became more systematic, whereas his underdrawing became a more relaxed instrument. His handling of pigment was modified in the attempt to increase the range of possible glazes to create more naturalistic three-dimensional volume.

Antonello's visit in 1475 may have provided a critical incentive to Bellini's approach to oil paint. Much has been said about his influence on Bellini's glazing method, but the present chapter has argued that it is his use of a Netherlandish-inspired light effect which clearly appealed to Bellini. By reducing the full bright day light into half light, Antonello proved how oil paint could be applied as a medium for creating voluminous form, and naturalistic reflection and texture. Again, it seems that Bellini had been gradually responding to Antonello's treatment of light by observation of paintings by the latter which were available to him in combination with his previous knowledge of Netherlandish oil painting method. The present chapter has discussed the possibility that Antonello's influence could be first found in Bellini's *San Giobbe Altarpiece*.

In the next decade, Giovanni Bellini's technical and formal resources of the 1470s, based on the extensive use of oil paint, reached another important turning point, when they were combined with the use of a textile support. Chapter 5 will concentrate on Bellini's career as a canvas painter and examine the development of oil-on-canvas painting in Venice.

Chapter 5

Venetian Canvas of the fifteenth century and Bellini's *Barbarigo Canvas*

Giovanni Bellini's eminence among Venetian painters was established in 1479 when the Venetian Government decided that he should take the place of Gentile Bellini for the redecoration of the Hall of the Great Council in the Ducal Palace.¹ His successes, after this commission, are remarkable. In 1483, he was appointed official painter to the state, and one year later he became a member of the powerful Scuola Grande di San Marco.² One of the most important features which defines this distinctive period in Giovanni Bellini's career is his involvement in large-scale canvas painting. It was this support that he employed to substitute the fading fresco work in the Hall of the Great Council.³ Canvas was again chosen as a support for the large-scale devotional painting, the *Virgin and Child with Saint Mark and Augustine, and Doge Agostino Barbarigo* (1488 signed, S. Pietro Martire, Murano) for the Ducal Palace. This canvas, commissioned by Doge Agostino Barbarigo, is another landmark in Bellini's career as a state painter. Shortly after this work, his workshop began to execute a pair of large canvases for the organ shutters in Santa Maria dei Miracoli, now in the Galleria dell'Accademia in Venice.⁴

The questions of the choice of textile support for these works instead of fresco and the technical considerations for accompanying this support are essential to the appreciation of Bellini's painting method during his mature years. However, due to a lack of interest among researchers prompted partly by the almost complete loss of his early canvas works, including the wall decorations for the Great Council Hall, these questions have seldom

¹ For a detailed discussion of Bellini's activity in the Great Council Hall, see following pp.183-87.

² G. Lorenzi, *Monumenti per servire alla storia del Palazzo Ducale di Venezia*, Venice, 1868, doc.197, p.92.

³ Bellini's works in the Great Council Hall were destroyed by fire in 1577, but it is clear from the surviving documents that textile supports were employed for mural decoration, rather than conventional fresco. For details, see pp.183-87 in this chapter.

⁴ Giovanni Bellini's commitment to work on large-scale canvas painting continued into the sixteenth century. See Conclusion chapter, especially for the significance of canvas to the work of his later years.

been addressed.⁵ Therefore, the aim of the present chapter is to investigate the development of Bellini's canvas painting technique until the 1480s. In order to shed light on the context of Bellini's early approach to painting on a textile support, I will examine the canvas works of the most influential figure in Bellini's artistic development, his father Jacopo, and discuss the innovative application of canvas painting which had emerged in Venice in the middle of the fifteenth century, when Bellini began his career. In order to address his later development of canvas methods, such as those employed in the wall decorations of the Great Council Hall, this study will focus on the earliest surviving example of such work, the *Barbarigo Canvas*. This work, dated to 1488, was executed during his term of service in the Ducal Palace, and as it originally served as the mural decoration of a chamber in the same palace, it is believed to have had a similar purpose and importance as the lost canvases for the Great Council Hall.⁶ The timing and characteristics of the convergence of Bellini's experience of oil-based method and his use of textile support will be examined at the end of this chapter. Firstly, however, one needs to examine the general state of canvas painting in Venice before the mid-fifteenth century.

5.1 Tradition of Canvas Painting in Venice Before 1450

Textile, as one of the materials most easily accessible to painters, may have been appreciated as a support in Venice from the Middle Ages, but no paintings on textile supports dated before the fifteenth century have survived in Venice. Nonetheless, there is documentary evidence which indicates that religious images on textile were popular in Venice in the fourteenth century and that the newly developing mendicant orders played an important role in this trend. In 1335, a certain notary, Oliviero, recorded that Maestro Marco, a Venetian painter living with the Frati Minori, executed the pictures on cloth 'in the German method' for the Church of San Francesco in Treviso. Oliviero wrote that

⁵ For the mural decorations of the Great Council Hall, see N. Huse, *Studien zu Giovanni Bellini*, Berlin, 1972, pp. 51ff. It is a great frustration to note that almost all of his early canvas works, have perished, excepting a problematic canvas in the Ducal Palace, *Pieta with Virgin, St John, St Mark, and St Nicholas* (Palazzo Ducale, Venice). This canvas is often attributed to his brother or one of his workmen, Lauro Padovano; A. Tempestini, *Giovanni Bellini*, Florence, 1992, pp.56-7 ; G. Robertson, *Giovanni Bellini*, Oxford, 1968, pp. 46-47; R. Goffen, *Giovanni Bellini*, New Haven and London, 1989, pp. 73-75; see pp.146-8, for the detailed discussion of this canvas.

Maestro Marco also executed similar pictures on cloth for the institutes in Venice which belonged to the Franciscan Order.

Et nota quod magister Marcus pictor qui moratur Veneciis penes locum fratrum Minorum, fecit panos Theotonicos qui sunt Tarvisii ad sanctum Franciscum Minorum-qui pani sunt picti etiam Veneciis in loco fr. Minorum
⁷

Oliviero further recorded that Marco's brother Paolo was a painter and had provided drawings of St Francis's death and of the glorious Virgin Mary on paper for the Franciscan convent in Treviso. He added that these drawings were for the canvas paintings to be executed in the German methods.

Et nota quod supradictus Magr Marcus pictor, qui moratur penes Sanctam Mariam fratrum Minorum de Veneciis, habet unum fratrum Paulum, pictorem, qui moratur penes dictam Sanctam Mariam fr Minorum: qui habet in carta designatam mortem Sancti Francisci et Virginis gloriose, sicut picte sunt ad modum Theotonicum in pano ad locum Minorum in Tarvisio.⁸

It is interesting to note Northern influence on the technique of Venetian painting as early as the fourteenth century. Oliviero further wrote that a German painter worked in Venice and Venetian painters like Maestro Marco copied his method; 'Nam quidam Frater Theotonicus fecit omnia ab antiquo ibi in Veneciis, et Magister Marcus exemplavit.'⁹ Yet, it is difficult to define German method in canvas painting 'panos Theotonicos' or 'modum Theotonicum in pano'.¹⁰ It may refer to glue-on-canvas painting which was to be popular in the Northern Europe later in the fifteenth century, but this remains hypothetical because

⁶ B. Roeck, 'Arte per l'anima, arte per lo stato: Un doge del tardo quattrocento ed i segni delle immagini', *Quaderni del Centro Tedesco di Studi Veneziani*, (40), 1991, p.44.

⁷ This is a public record at Treviso and was extracted in G. Zanetti, *Nuova Raccolta delle Monete e Zecche d'Italia*, Bologna, 1775, vol. 4, p. 151; C. Eastlake, *Methods and Materials of Painting of the Great Schools and Masters*, New York, 1960, vol.1, pp. 90-100.

⁸ G. Zanetti, *ibid.*

⁹ *Ibid.*

¹⁰ For discussion of this document with reference to the surviving Italian trecento canvas paintings, see C. Villers, 'Paintings on Canvas in Fourteenth century Italy', *Zeitschrift für Kunstgeschichte*, (58), 1995, pp. 338-358.

of the lack of surviving primitive Northern canvas paintings.¹¹ One should note here that surviving Italian trecento examples rather show tempera-based technique.¹²

Canvas paintings have survived better in Padua. The *Virgin and Child* (117x82cm, Duomo, Padua), painted on canvas glued on panel, has formal qualities comparable to Byzantine icons but with the faces treated in the style of Giotto.¹³ Its attribution and authenticity have long been controversial, but it is now believed to be a seventeenth-century copy of the trecento canvas work, which also provided a prototype for the *Virgin and Child* on canvas, attributed to Giusto de'Menabuoi (100x70cm, Duomo, Padua).¹⁴

Two larger canvases, both showing the *Virgin of the Misericordia*, have survived in Padua. The one in the Musei Civici (230x170cm) dated to 1408, originally adorned the Franciscan Confraternity of Santa Maria dei Servi,¹⁵ and the other, now housed in the Oratorio di Santa Maria della Neve (241x189cm) dated to 1419, was for the Scuola della Carità in Padua.¹⁶ In spite of the eleven-year time gap, these works are identical in composition, method, and dimension, and are believed to have been executed by one painter. Middeldorf attributed them to Niccolo di Piero, but the 1974 exhibition catalogue *Da Giotto al Mantegna* suggests an anonymous painter who lived permanently in Padua.¹⁷ These works seem to confirm what is suggested by the record of the Trevisan notary that canvas painting in the Veneto had a Franciscan link. The Confraternity of Santa Maria dei Servi was dedicated to St Francis and the canvas work for the Scuola della Carità has St Francis as an intercessor on the left hand side of the Virgin. Textile support certainly cost less than panels and it can be assumed that canvas may have been regarded as an ideal material to represent one of the Franciscan credos, Poverty. Yet, the

¹¹ The altarpiece of St Clara at Cologone, originally belonged to the high altar of the cloister, is the only one Northern example. It consisted of canvases, panels and statues; Wolfthal, *op. cit.*, p.5.

¹² Villers, *op. cit.*, 1995.

¹³ *Da Giotto al Mantegna*, Exh. Cat., Padua, 1974, Cat.2.

¹⁴ *Ibid.*, cat.2 and 51.

¹⁵ *Ibid.*, cat.71. See also U. Middeldorf, 'Due Tele Padovane del Primo Quattrocento', *Bollettino del Museo Civico di Padova*, (2), pp.14-22.

¹⁶ *Ibid.*, cat.72. Brandolese recorded its original setting in 1795; P. Brandolese, *Pitture, Sculture, architetture, ed altre cose notabili di Padova nuovamente descritte da Pietro Brandolese*, Padova, 1795, p.245.

¹⁷ *Da Giotto al Mantegna*, 1974, cat. 71.

decorative painting methods also associated with this fabric support make it difficult to define the intention of the choice of canvas material in the Franciscan Order. The painter of these two Paduan canvases employed highly-raised pastiglia in haloes and applied extensive gilding on the garments of heavenly beings though against a simple green background. In the large, unified picture field of c.240x180cm, the painter created a pictorial image that has a visual appearance something between that of a panel and a fresco.

The surviving Paduan examples show that early canvas works in the Veneto served more permanent purposes than banner and hangings. The two half-length Virgin and Child compositions show that canvas was used as a support for small devotional images. There is a possibility that one of the *Virgin of Misericordia* works was once an altarpiece. The inscription on the one in the Musei Civici read that

MCCCVIII A DI VIII DE SEPTENBRIO. A LAVDE DE DIO E DE A NOSTRA
MADRE VERGENE MARIA FO FATTA QVESTA ANCONA. DE BEN
DE LA FRAIA A MADONNA SANTA MARIA DI SERVI. IN EL TEMPO DI
VENERENDI HOMINIS MESSER FRA FRANCESCO PRIOR DEL DICTO
ORDENE E DE MAISTRO/
MICHELE ... TRAZAR ... VARDIAN DELLA DITTA FRAIA E DE LA DITA
FRAIA (author's underlining)¹⁸

It is difficult to fully establish this work as an altarpiece on the basis of a single word 'ancona',¹⁹ but the application of canvas for an altarpiece was not impossible at that time, and is implied by a Venetian document dated to 1421.²⁰ This records that a painter called Jacopo di Pietro painted two canvas works for the altar of the Scuola di San Marco; one for the altarpiece and the other a 'cortina azura de telle' probably for protecting it.²¹ The painter could be Jacopo Bellini or an unknown painter, but this evidence shows that Venetian confraternities decorated their altars with canvas paintings as early as the 1420s.

¹⁸ *Ibid.*, cat. 71.

¹⁹ This is the view of Caroline Villers; Villers, *op.cit.*, 1995.

²⁰ The inventory of Scuola di San Marco listed an altarpiece on canvas depicting St Mark by Jacopo Bellini; Eisler, *op. cit.*, p.524.

²¹ *Ibid.*

These types of canvas paintings, whether the Paduan examples or the two recorded Venetian canvases, indicate that Antonio Vivarini and Giovanni d'Alemagna's gigantic canvas work, the *Virgin and Child enthroned with St Gregory, Jerome, Ambrose, and Augustine* (Accademia, Venice) was a logical development. This work, inscribed 1446, is one of the earliest surviving Venetian canvas paintings and has the impressive dimension of a unified picture field, measuring 344x203cm, with the canvases stretched in 3 parts. It is still in the building for which it was intended, the Albergo of the Scuola di Santa Maria della Carità, but initially faced the wall on which Titian later depicted the *Presentation of the Virgin*.²² Its function is obscure, and this canvas is often mistaken for an altarpiece, because of its gigantic size and apparently tripartite or so-called 'triptych' form. Although it was originally commissioned to replace an existing panel work, there is little evidence that the painting, which was not placed over an altar in the Albergo of the Scuola, ever served an altar-related function. In addition, a multi-part canvas is not unique to Venetian canvas practice; as Giovanni Bellini, for instance, later executed a two-part 'campi 2' canvas for the Scuola di San Marco in 1470.²³ Its exceptional size and location would suggest that it was intended as a mural decoration with a related devotional function, but different from that of an altarpiece which would have had a more traditionally defined religious function.²⁴

The method used here by Vivarini and d'Alemagna is identical to their panel painting.²⁵ They used a fine weave fabric but applied gesso preparation sufficiently thickly to conceal the weave.²⁶ They gilded the paint surface quite heavily in the dress and jewellery using

²² Antonio Vivarini and Giovanni d'Alemagna's work was moved to its current site in 1811 when the Albergo opened a stairway. See P. Pignatti, *Le Scuole di Venezia*, Milan, 1981.

²³ P. Brown, *op. cit.*, 1988, p. 269.

²⁴ For a large scale devotional Virgin and Child with Saints in an institutional context, mural but not an altarpiece, see Fra Angelico's Madonna delle Ombre, c.1450, in W. Hood, *Fra Angelico at San Marco*, New Haven, 1993, Chapter 12 and fn.12, pp.320-321 for its function.

²⁵ Villers, *op. cit.*, 1995, pp. 350-351.

²⁶ Scientific examinations have not yet been made of Vivarini and d'Alemagna's canvas since it was last restored in 1950. Michiel recorded that this work was done in glue 'a guazzo'. He mistook the support for wooden panel: 'La nostra donna in testa delalbergo, cun el puttino in braccio, cun li altri dui santi un per lato a guazzo, in tavola, et magiorr del natural, furono de man de Antonio da Muran'; *Notizia d'opere del disegno*, ed T. Frimmel, Vienna, 1888, pp.116-18. The thick darkened varnish makes it difficult to detect paint media with the eye. Nevertheless, tight brushwork, thick gesso ground, and the extensive wax moulding suggest to me the high probability of tempera being employed.

pastiglia. In practice, fabric support does not reflect enough light, but as a result of these elaborate methods, this canvas reflects the abundant natural light from the window facing it, creating an astonishing devotional image on a giant scale.

Careful consideration of light is one of the characteristics of Venetian canvas treatment. Jacopo Bellini had shown the same interest in his canvas work, the *Crucifixion* (310 by 180 cm, Museo del Castelvecchio, Verona), dated to c. 1440.²⁷ The body of Christ is set off by the monochromatic field of the deep blue sky, which was probably coloured by azurite. The strong pictorial light falls from the top left to enhance the three dimensionality of the body, providing an austere devotional image with a strong sense of Christ's physical presence.

The Linen Industry in Northern Italy

The initial development of canvas painting in Venice was inconceivable without the influence of the *terra ferma*. The tradition of painting on cloth was well established in Northern Italy, and considering the provenance of surviving trecento examples, Bologna could be said to be a focal point alongside Padua.²⁸ The popularity of canvas as a painting support for various purposes in Northern Italy could be explained by its flourishing linen industry since the Middle Ages. The raw materials of linen, hemp and flax were cultivated throughout the Italian peninsula in the twelfth century, but Northern Italy was termed 'fiandre italiane' because of its approximation to the Netherlands in terms of climate and soil, and offered a real environment for these plants.²⁹

Not to mention every day uses, hemp and flax were invaluable raw materials for ropes and sails, essential for the shipbuilding industry on which the entire Venetian citizens' business life depended and, as such, the Venetian government took every measure to ensure their

²⁷ Its function is thought to have been as a religious hanging; C. Eisler, p. 525.

²⁸ See Villers, *op. cit.*, pp.349-351.

²⁹ See 'Origini e tradizioni della coltura del lino' in the exhibition catalogue, *Il Lino e la Civiltà Contadina*, Exh. Cat., Venice, 1978, p.11. Flax and hemp are the major raw materials of canvas. Their identification is only possible by analytical methods such as microscopic examination.

safe supply to the Arsenale.³⁰ According to Venetian government documents, Bologna monopolized their trade.³¹ The Venetian government made subsequent efforts to find alternative sources, but Bolognese products remained the best in quality.³² The large collection of primitive canvas paintings in the Pinacoteca, Bologna, seems to reflect its dominance in linen trade in the Middle Ages.³³ Ambitious chapel decoration consisting entirely of canvases found later in the fifteenth century in Bologna also confirm this image.³⁴ This distinct pictorial practice in Bologna could have influenced Venice through their close artistic relationship. Emilian painters were strongly active in Venice in the fourteen century, and Bologna was destined for Venetian altarpieces.³⁵

In contrast to its raw materials, the trade in ordinary linen cloth itself is not properly documented, probably because of its low cost. Linen was often listed in the shipment of merchant galleys to the East, but seems to have been used as a wrapping material rather than as an item of international trade.³⁶ Unlike the production of wool and silk, manufacturing linen was, more or less, a peasant culture before the Industrial Revolution. Yet, the Venetian Government had an organized workshop consisting of 25 women in the Arsenale to meet the increasing demand for sails, while purchasing further linen cloths through private contracts with Venetian *hospedali*, who presumably also manufactured linen cloth.³⁷ Documents show that the Arsenale consumed an enormous amount of sail cloth and provided a similar amount of the used, but still workable old sail cloth 'fustagne

³⁰ Rope, for instance, is the life line of sailors at sea. The Venetian Government closely supervised its production to maintain its quality. F. Lane, 'The Rope Factory and Hemp Trade in the Fifteenth and Sixteenth Centuries', *Journal of Economic and Business History*, (4), 1932, pp. 830-47.

³¹ *Ibid.*

³² *Ibid.*

³³ For the fourteenth and early fifteenth century canvases preserved in Bologna, see Villers, *op. cit.*, 1995.

³⁴ The decoration of the Cappella di San Sebastiano in the Basilica of San Petronio is consisted of one altarpiece, *Martyrdom of St Sebastian*, and the twelve works depicting the Apostles, all on canvas; See *Arte a Bologna*, (3), 1996. Three canvases in the Bentivoglio Chapel, San Giacomo Maggiore, were executed by Lorenzo Costa in the 1490s.

³⁵ M. Simonetti, 'Tecniche della pittura Veneta', *La Pittura nel Veneto: Il quattrocento*, ed. by M. Lucco, Milan, 1990, vol. 1, p. 247. Antonio Vivarini and Giovanni d'Alemagna's *Certosa Altarpiece* (c.1450, Pinacoteca, Bologna), for instance, was commissioned for the high altar of San Gerolamo alla Certosa in Bologna.

³⁶ J. Dotson, *Merchant Culture in Fourteenth century Venice*, New York, 1994. Some good quality products from the Netherlands were highly valued, but their wide use as painting supports is yet to be investigated; see Italian Woolen Trade.

³⁷ F. Lane, *Venetian Ships and Shipbuilders of the Renaissance*, Baltimore, 1934, pp.161-168; and R. Davis, *Shipbuilders of the Venetian Arsenal*, Baltimore, 1991, p. 107.

vecchie' to the textile market.³⁸ The Venetian Arsenal yearly supplied around 4000 yards of second-hand sails, which were for instance bought by rag dealers for 6 ducats per 40 yards in 1641 which is still comparatively expensive.³⁹ This is a very high price as Palma Vecchio was paid L.4 10s. for his purchase of canvas in the execution of *St Stephen with four Saints* (Madonna dell'Orte, Venice) in 1523.⁴⁰ This work measures 280x180cm, which is about 10 yards, and what Palma bought was cheaper than the second-hand canvas.⁴¹ It is not known if Venetian painters recycled this kind of worn-out sail cloth for their pictorial compositions in the same way that they recycled dyestuffs. What is certain is that a large amount of the linen cloth of various forms was busily traded in the Venetian market.

It is tempting to assume that canvas was more acceptable as a painting material to the Venetian patrons, many of whom were merchant marines and acquainted with huge canvas fields for sails. This remains highly speculative, but the massive pictorial representations of their familiar historical and religious narratives on this in public buildings later in the fifteenth century suggests its new role as the hallmark of the maritime republic. This is in addition to the advantages of its easy availability and practicality compared to frescoes in the climate of the lagoon.

Venetian Banners

Two surviving Venetian contracts for banners show typical pictorial decorations with fabric support in Venice in the fifteenth century. One recorded the 1452 agreement between Jacopo Bellini and the Scuola di Santa Maria della Carità to paint a banner of grandeur and gigantic size, and the other contract shows the terms and conditions of the banner commissioned from Alvise Vivarini in 1501 by the Scuola di San Marco.⁴² The costs of these banners were incomparable to their Central Italian counterparts. According

³⁸ R. Davis, *ibid.*, p.58.

³⁹ *Ibid.*, p. 220.

⁴⁰ One ducat was L.6 s.4 or 124 soldi; see pp.31-2 in Chapter 1. For document, see Doc. 29 in Appendix 4.

⁴¹ I do not attempt to suggest the use of second-hand canvas by Venetian painters on the basis of these limited evidence. For the moment I only propose that its relatively high price suggest its reasonable quality.

to the contracts, Jacopo Bellini was to be paid 140 ducats, whereas Vivarini was to receive 100 ducats.⁴³ These sums of money for banners well outclass the 35 ducats given to Piero della Francesca for the banner of the Confraternity of Santa Maria Annunziata in Arezzo, which is known to have been the most ambitious project for a banner in Central Italy.⁴⁴

Piero della Francesca's contract contains lengthy, detailed conditions, as do those of Jacopo Bellini and Vivarini. The use of ultramarine and gold was less frequently stipulated in Venetian contracts, but here was strictly termed, along with the delivery dates.⁴⁵ It is interesting to note that Jacopo's contract further states the structure of the fabric support. It stipulated that the banner should consist of the seven sections of canvas, each measuring seven *braccia*; '*unum penelum magnum pro dicta eorum scola de septem tilis sindonis et longum brachiis septem...*'.⁴⁶ The width of linen cloth was not stated, probably because it was dictated by contemporary loom size. The exact loom-size for cloths used in Venice is not known, but considering the width of the strips of linen cloth of surviving Venetian mural canvases, it could have fallen into in the range of 70 to 80cm.⁴⁷ On this basis, Jacopo's banner was intended to be as large as 5mx4m, like the one shown flying on the poles in front of the Basilica of St Mark, depicted in Gentile Bellini's *Procession in the Piazza San Marco* (Accademia, Venice). These banners were certainly intended to declare the wealth and grandeur of the confraternities.

⁴² P. Paoletti and G. Ludwig, 'Neue archivalische Beiträge zur Geschichte der venezianischen Malerei', *Repertorium für Kunstwissenschaft*, (22), 1899, pp.274-5.

⁴³ Alvise Vivarini's payment included his expenses of materials except the silk. See Doc. 18 in Appendix 4.

⁴⁴ Michael Bury analyzed the surviving Central Italian contracts for banners, 'Documentary evidence for the use of Banner in Umbria'; in a study day held at the Courtauld Institute of Art, on 16th May 1998, on *European Paintings on Fabric Supports in the 14th and 15th Centuries; Techniques, Function, and Display*. For Piero della Francesca's contract, see E. Battisti, *Piero della Francesca*, vol.2, Milan, 1971, p. 615.

⁴⁵ See Doc. 17 in Appendix 4.

⁴⁶ P. Paoletti., *Raccolta s di documenti inediti per servire alla storia della pittura veneziana nei secoli XV e XVI*, vol.1, Padua, 1894, pp.7-8.

⁴⁷ One braccio a panno measures 68cm in Venice; see R. Zupko, *Italian Weights and Measures from the Middle Age to the Nineteenth Century*, Philadelphia, 1981.

5.2 Canvas as a Support for Mural Cycles

The early surviving works and documentary evidence of canvas painting in Venice, like other Italian cities, has a strong link to the activities of confraternities. Their initiative in commissioning paintings on fabric supports went a step further in the mid-fifteenth century, as they attempted to decorate their meeting rooms.⁴⁸ Antonio Vivarini and Giovanni d'Alemagna's canvas work in 1446 for the Albergo of the Scuola della Carità is an early example, but from the 1450s more ambitious pictorial projects, using cloth paintings, are known. Venetian confraternities began to commission cycles of canvas paintings to adorn their meeting rooms and to arrange the works to form a continuous narrative band, equivalent to a 'spalliera'. Jacopo Bellini's canvas narrative cycle for the Scuola di San Giovanni Evangelista, for instance, exemplified this function for canvas which emerged particularly strongly in Venice.

Jacopo Bellini and the Scuola di San Giovanni Evangelista.

The changing function of Venetian works on canvas can be inferred from Jacopo Bellini's commission to create a narrative cycle for the north wall of the Sala Maggiore, on the piano nobile of the Scuola di San Giovanni Evangelista, around 1460. In this project, he did not use fresco, the more conventional vehicle of large-scale mural decoration but canvas.⁴⁹

The canvas cycle was all dismantled in the late sixteenth century and since then its original setting has long been the subject of discussion. Ridolfi wrote that it was consisted of at

⁴⁸ The decoration of secular or semi-secular location by canvas painting in Venice was commented by Villers, *op. cit.*, p.351.

⁴⁹ For this commission, see P.F. Brown, *Venetian Narrative Painting in the Age of Carpaccio*, New Haven and London, 1988, pp.266-277; H. Collins, 'Major Narrative Paintings by Jacopo Bellini', *Art Bulletin* (64), 1982, p.466-72; C. Eisler, *op. cit.*, 1988, pp.521-523. The Pollaiuolo brother's lost canvas cycle of the *Labours of Hercules*, in the Palazzo Medici are dated to c. 1460; L. Ettlinger, *Antonio and Piero Pollaiuolo*, London, pp.164-5. It has yet to be discussed who was responsible for the choice of textile supports for such prestigious places. The Pollaiuolo may have suggested canvas for paintings which would otherwise have had to be painted *in situ*, and which have placed heavy pressure on the walls of an upper floor room. Nevertheless, this must have been a matter for discussion with the patron. Considering the heroic subject together with the monumental size, the canvas cycles, *Labours of Hercules*, may have impressed their viewers, but, unlike in Venice where a number of large canvas works came to be produced after the mid-fifteenth century, such an attempt remains as an isolated case in Florence during that period; for the reconstruction and significance of the *Labour of Hercules*, see A.Wright, *op. cit.*, pp. 130-149.

least eighteen canvases depicting the life of the Virgin and Christ, but Jacopo Sansovino, who certainly saw the paintings in their original setting mentioned stories from the Old Testament.⁵⁰ The whereabouts of these works was not known until the nineteenth-century Venetian painters Natale Schiavone and Francesco Canella reported seeing the eight canvases allegedly from the Scuola di San Giovanni Evangelista.⁵¹ These eight works were subsequently sold piecemeal. The *Birth of the Virgin* and the *Annunciation* are now in Turin (Galleria Sabauda), and the *Marriage of the Virgin* and the *Adoration of the Magi* in Riverdale, New York (Stanley Moss Collection).⁵² The whereabouts of the other four canvases remains unknown. It is possible that they may constitute four of the apparently five canvases which are known to be in an English private collection, that of the Earl of Oxford.⁵³ These canvases in the English collection -the *Meeting at the Golden Gate*, the *Visitation*, the *Presentation of Christ in the Temple*, and the *Miracle at Cana* - are now kept in Somerset, in the West of England and were scientifically inspected in 1997 for possible auction [Plate 15, 16, and 17]. These works have been heavily repainted, but still show Jacopo Bellini's hand.⁵⁴ There is no doubt that these canvases and the other four surviving examples in Turin and New York once formed part of the same cycle. They have virtually identical dimensions of 110x150cm with a few centimetres in variation and, above all, their subjects match Ridolfi's statement.⁵⁵

Four works of the five in England were examined by Ms Catherine Hassall, UCL Painting Analysis, in 1997. Based on visual examination and cross-section study only, the examination was not a full-scale analysis. Yet, it produced important data for the understanding of the methods associated with canvas painting in Venice.

⁵⁰ F. Sansovino, *Venetia città nobilissima et singolare*, vol. 6, Venice, 1581, pp.283-84; C. Ridolfi, *Le Meraviglie dell'Arte* (1648), Padua, 1835, p.36.

⁵¹ P.F. Brown, *op. cit.*, p.266; Eisler, *op. cit.*, p.522.

⁵² K. Christiansen, 'Some observations on Mantegna's Painting Technique', *Andrea Mantegna*, Exh. Cat., London, 1991, p.78.

⁵³ Eisler, *op. cit.*, pp. 521-523; Collins, *op. cit.*, p. 466.

⁵⁴ It is no doubt that these canvases and the other four surviving examples in Turin and New York once formed the same mural cycles. They all have identical dimension of 110x150cm and their subjects are matched with Ridolfi's statement. The works in the English collection have been heavily repainted, but still shows Jacopo Bellini's hand.

Catherine Hassall observed that the medium is basically tempera, but with extensive oil glazes on it. Although substantial repaints and the lining of support do not permit any media analysis, the microscopic examination of cross-sections supported her analysis.⁵⁶ Over a thin opaque paint layer, a real transparent glaze was often detected. The red from the veil of the Virgin Mary in the *Presentation of Christ in the Temple* has a transparent red lake glaze over the underpaint of red lead with addition of little vermilion and red lake [plate18]. In addition, the presence of copper-resinate glaze in the background landscape also suggests the presence of oil.⁵⁷

The pigments Jacopo Bellini employed are generally inexpensive ones. The complete absence of ultramarine makes these works unique in Venetian paintings in terms of colours. Azurite is the only blue found in the examined samples, whereas cheaper red, red lead, was also extensively employed and the finely ground vermilion also suggests its lower grade.⁵⁸ He may have been forced to consider the expense of carrying out such a demanding project consisting of at least eighteen canvases of 150x110cm.

It is in his use of gold and silver that the distinctive quality of Jacopo's method emerges. Haloes were burnished in gold leaf, tonal highlights were articulated with shell gold, and draperies were adorned with silver and gold gilding [Plate 15, 16, and 17].⁵⁹ Gold and silver could give a brilliancy to the surface of early canvas painting and also, to some extent, compensate for the low reflective quality of its fabric surface and the extensive use of inexpensive colours.

These canvases by Jacopo Bellini are believed to be the earliest canvas works to perform the function of a fixed mural cycle. Jacopo's approach to canvas appears tentative and even primitive in its conception as a mural cycle, when compared with later examples. The

⁵⁵ Ridolfi, *op. cit.*, p.36. See also P.F. Brown, *op. cit.*, pp.267-8; Eisler, *op. cit.*, pp.522-3.

⁵⁶ All the discussion and conclusions presented here are based on the author's examination, except the opinion about paint media.

⁵⁷ Personal communication with Catherine Hassall, but no cross-section was taken in this area.

⁵⁸ The use of verditer, the pigment associated with Florentine painters suggests Jacopo's link with central Italy.

⁵⁹ Collins, *op. cit.*, p. 466.

dimensions of each canvas, c.110x150cm, is modest as a mural decoration. If all the paintings, probably originally nine on the north wall, are displayed, the overall size of the cycle is 14 metre long, but only 1.1m high.⁶⁰ Howard Collins's reconstruction of its original setting on the north wall of the Sala Maggiore in the Scuola of San Giovanni Evangelista indicates how far Jacopo's canvas cycle is different from the later project in which the same material was used. A century later, Jacopo's canvases were replaced by four larger canvases, five-times the size of the earlier ones, by Domenico Tintoretto, Sante Peranda, and Andrea Vicentino.

Soon after the mural project of San Giovanni Evangelista, Jacopo and his sons were commissioned to produce canvases for the mural painting of the Sala Capitolare in the Scuola Grande di San Marco.⁶¹ Textile support was again chosen for the mural paintings of the Scuola di San Girolamo, of 1464.⁶² It was canvas, furthermore, that the Bellini brothers used when they began the significant new restoration scheme in 1474 for the deteriorating frescoes in the Hall of the Great Council.

Giovanni Bellini and the Hall of the Great Council

None of Giovanni Bellini's surviving canvases date from before the *Barbarigo Canvas* of 1488. All the works discussed in Chapter 3 and 4 were executed on wood panel. His surviving canvas paintings are exclusively later works. However, it is almost certain that Giovanni Bellini was engaged in canvas painting from his early years. He may even have had some part in his father's project to paint the canvas-cycle for the Scuola di San Giovanni Evangelista.⁶³ In addition, when Jacopo and his sons were commissioned to produce canvases for the mural painting of the Sala Capitolare in the Scuola Grande di San Marco, Giovanni was independently entrusted with the production of a two-part

⁶⁰ *Ibid.*, pp.464-72.

⁶¹ An inventory was made of the Scuola possessions on 13 in April, 1466. It lists two canvases by Jacopo Bellini and two 'teleri' by the hand of Squarcione; P. F. Brown, *op. cit.*, p. 269.

⁶² *Ibid.*, p. 270.

⁶³ In terms of style, Longhi found the *Marriage of the Virgin* and *Adoration* to be predominantly by Gentile, with Giovanni's hand more evident in the Turin canvases and concluded 'all are the works of Jacopo in concept and composition, but appear to have been executed in good part, if not entirely, by his sons.'; 1946, pp.53-54; Collins,

canvas of the life of Noah.⁶⁴ He, once again, used textile support for the lost paintings of the Scuola di San Girolamo, dated 1464.⁶⁵

Nothing is known about the method the young Giovanni Bellini used for canvas works, but it seems very likely that he adopted the traditional canvas painting method, using tempera. As matters stand, the paint medium of Jacopo's Scuola di San Giovanni Evangelista canvases, in which Giovanni may, on the basis of stylistic analysis, have assisted, is reported to be generally tempera with oil glazes.⁶⁶ Andrea Mantegna used canvas from his early years and matched it primarily with glue medium since 1460 after he work for the Mantuan court. His status as court painter, however, working in a different milieu makes a direct comparison to Bellini complicated.⁶⁷

An opportunity to acquire mastery in canvas-painting techniques was made available to Giovanni Bellini in 1479 when he was commissioned to continue his brother's job in the Hall of the Great Council. The project aimed to cover up the damaged narrative frescoes with unusually large-scale canvas, and had originally been approved by the Venetian Senate in 1474, with a virtually unanimous 943 to 29 votes with 21 undecided.⁶⁸ In this initial document, only Gentile Bellini was recorded.⁶⁹ Giovanni, however, seems to have taken an important part in the early stages, since he ran a joint workshop together with Gentile who was appointed as head around 1470 or 71.⁷⁰ The joint workshop is implied in

op. cit., p. 469. Eisler notes that 'the known canvases for the Scuola cycle could plausibly come from Jacopo's studio, but their condition is too poor to permit an exact assignment of hand'; Eisler, *op. cit.*, p. 523.

⁶⁴ Commission of 24, April, 1470, see P. F. Brown, *op. cit.*, p. 269.

⁶⁵ P.F. Brown, 1988, *op. cit.*, p. 270.

⁶⁶ See following footnote 78 for Bellini's contribution to this canvas cycle.

⁶⁷ The influence of Mantegna's canvas painting technique is discussed later in pp.240-243 in Conclusion.

⁶⁸ Lorenzi, *op. cit.*, 1868, doc.188-89, pp.85-6.

⁶⁹ *Ibid.*, doc.192, pp.88-9.

⁷⁰ Immediately after the death of Jacopo, in 1470 or 1471, Giovanni's elder brother, Gentile, was the likely heir to Jacopo's fame as the leading Venetian painter and the head of the Bellini family. Gentile was probably appointed head of the Bellini family, one or two years before his father's death. This decision was made because of Gentile's seniority; P. Humfrey's review on Meyer zur Capellen's *Gentile Bellini* (Stuttgart, 1985); 'The First monography on Gentile Bellini', *Arte Veneta*, (40),1986, pp.244-45. Then, it was Gentile who was knighted by the Emperor Frederick III in 1469, and later, in 1474, commissioned to redecorate the Hall of the Great Council. Recent scholarship reduces Gentile's role in this commission and proposes that the decision of the Venetian Senate to commission Gentile with the task of replacing the frescoes was 'due to his position as principal heir of Jacopo's workshop rather than his own personal talent'; P. Humfrey, *ibid.*, p. 244. At any rate, in its early stage, Gentile may have been in charge of the project. Four or five canvases were actually attributed to Gentile.

the letter written by Elisabetta Frangipane from Veglia on 11 May 1471, to Pietro and Marco di Paolo Morosini in Venice, asking them to arrange for both Gentile and Giovanni to teach *la rason desegno* to *pre Domenego nostro*.⁷¹ Indeed, the continuation of Gentile's work in the Hall during his absence in service to the Sultan in Constantinople in 1479 was entrusted to Giovanni.⁷² After Gentile's return, Giovanni was confirmed as his collaborator on the work.⁷³

The Bellini family's activity in the Ducal Palace began long before the year 1474 when the Venetian Senate voted for the redecoration of the Great Council Hall project by Gentile. It has been proposed that this project itself could originally have been given to Jacopo Bellini before this resolution. This hypothesis, suggested by P. Humfrey in 1986, seems to provide a more plausible explanation for the decision of the Venetian Senate to commission Gentile with the task of replacing the frescoes which depicted historic subjects like the founding movements of the Venetian state, combining myth and history.⁷⁴ The most important evidence for the Bellini family's involvement in the decoration of the Ducal Palace is the canvas of the *Pietà with St Mark and St Nicholas* (1.8x3 metre, Ducal Palace, Venice), which is dated to c.1472 and still remains in the Ducal Palace. The attribution of this canvas has long been regarded as problematic, but it seems that the larger part of the picture was executed by Gentile Bellini.⁷⁵ This canvas work was intended to decorate a governmental office, and thus has a similar function to the lost

⁷¹ Robertson, *op. cit.*, 1968, p. 12.

⁷² On 29 August 1479 the Venetian Senate gave Giovanni Bellini permission to work in his brother's stead. It seems probable that Giovanni had joined this project before, but the 1479 contract appears to have provided better payment. The Great Council decided that Giovanni Bellini should not even have 'the first vacant *sansaria* (brokership) of the Fondaco of the Germans just like his brother Gentile', but receive '80 ducats a year from the Salt Office as the fee for his work, in addition to the expenses of colours and other'; G. Lorenzi, 1868, *op. cit.*, pp.88-89. The document made clear that the council offered money, because 'Giovanni Bellini needs to feed himself and his family and have a mind for painting'; *ibid.* The Senate determined to pay money 'from month to month with the emoluments and usages for which Giovanni looks for his convenience and the feeding of his household'; *ibid.*, doc.192, p.89. His method of payment is generous in comparison with the other painters, such as Alvise Vivarini and Titian, who joined the project. Vivarini offered to work without initial payment, and await the decision of the Council, after the work's completion; *ibid.*

⁷³ After returning, however, Gentile is unlikely to have been as fully involved in the project as before; his name is rarely found in the documents and it was Giovanni Bellini who took the lead. In 1507, Carpaccio, Vittore Belliniano and a certain Hieronimo were appointed to assist Giovanni Bellini. Later in the second decade of the fifteenth century, Titian issued at least two petitions to get the position of Giovanni Bellini in this project.

⁷⁴ Humfrey, *op. cit.*, 1986, p. 244.

⁷⁵ From its ruinous state, it appears difficult to draw any firm conclusion.

canvases in the Great Council Hall. It has recently been reported to have been painted in tempera.⁷⁶ Thus, it is probable that this tempera-on-canvas method was adopted again for the canvas cycles of the Great Council Hall in their initial stage.⁷⁷

There is some possibility that Giovanni Bellini used oil as a main medium on canvas later in the 1470s, or at least by the 1480s when he was familiarising himself with oil painting on panel, and also being repeatedly commissioned to produce canvases for mural decoration as discussed above.⁷⁸ As the previous Chapter argued, Bellini extended his use of oil as principal paint medium in the course of the 1470s. He painted the *Pesaro Altarpiece* (Museo di Civico, Pesaro), mainly executed c.1472-75, in oil, and gained proficiency in the Netherlandish oil painting technique in the late 1470s. There is certainly some evidence for the suggestion that Bellini began to apply his achievements in oil paint to the different support already in this period, or slightly later.

That he and his brother were credited with a particular method could be inferred from the document addressed to the Venetian senate in 1488 by Alvise Vivarini asking for employment in the Hall. It claims that he will work with the same method as the Bellinis; '... *Zoe depenzerlo in la Salla de gran Conseio nel modo che lavorano al presente li do fradelij Bellinj...*'⁷⁹. This statement may indicate that Vivarini was simply concerned to make a work harmonious with the Bellini, but I would argue that it is more

⁷⁶ A. Dorigato (ed.), *Carpaccio, Bellini, Tura, Antonello: e altri restauri quattrocenteschi della Pinacoteca del Museo Correr*, Milan, 1993, p.42.

⁷⁷ It is unlikely that some thick paint in the crown of the thorns of Christ was done by Giovanni Bellini for 'impasto' effect, as R. Goffen suggested; Goffen, *op. cit.*, 1989, pp. 73-75, 300n. Bellini's impasto has strong relationship with the representation of light, but the Ducal Palace Pietà canvas lacks the careful consideration of light as found in his works.

⁷⁸ Giovanni Bellini was already familiar with canvas-painting at the time when his father, Jacopo Bellini, was commissioned to paint the canvas-cycle for the North wall of the Sala Maggiore, piano nobile in the Scuola di San Giovanni Evangelista in 1453. In fact, these canvases for the Scuola are reported to have involved much studio participation, including the assistance of Gentile and Giovanni. Again, Jacopo and his sons were commissioned to produce canvases for the mural painting of the Sala Capitolare in the Scuola Grande di San Marco. On this occasion, Giovanni was independently commissioned to produce a two-part canvas of the life of Noah. Again, he used textile support for the now lost paintings of the Scuola di San Girolamo, dated 1464. Unfortunately, all Bellini's large-scale canvas works from the sixties and seventies perished. Nevertheless, examining his canvases as a group may reveal an unknown aspect of his early career. It is increasingly possible to say that Giovanni Bellini was a mural painter by means of canvas. A significant portion of his canvases were executed for wall decoration. See further details of his canvas technique, see following discussion and the Conclusion.

⁷⁹ Lorenzi, *op. cit.*, 1868, doc. 221, p. 102; Robertson, *op. cit.*, 1968, p.85.

likely to signify the use of special technique.⁸⁰ Due to the complete loss of Bellini's works by the fire in the Ducal Palace of 1557, his actual method employed in this project has remained unknown. Considering the painting methods of the surviving Venetian canvas works dated to the 1460s and 70s, it is probable that Bellini carried out this commission in its initial stages with a conventional canvas technique; particularly, tempera-based canvas painting. However, in the 1480s when he was credited with a distinctive method by the Venetian Government and considering his increasing tendency to use oil painting method from the mid-1470s, it is unlikely that Bellini continued this prestigious commission with the conventional canvas technique. Practically, the viscosity and transparency of oil can provide the fabric support not only with the necessary protective layer, but could also contribute to its characteristic shiny and saturated colour surface.⁸¹ With this innovation, it became increasingly possible to complete durable and chromatic large-scale narratives on canvas. With reference to the application of oil paint on canvas, we return to the main subject of this research; Giovanni Bellini.

5.3 The *Barbarigo Canvas*

Giovanni Bellini certainly used oil on canvas by 1488.⁸² In fact, the paint medium of his surviving canvas work, the *Virgin and Child with Saints and Doge Agostino Barbarigo* (S. Pietro Martire, Murano), dated 1488, is oil [Plate 19].⁸³ The *Barbarigo Canvas*, in

⁸⁰ 'Modo' was translated as 'manner' by Chambers; *op. cit.*, 1972, pp. 80-81. But, 'modo' which should not be confused with 'maniera' in Italian, is closer to 'method' than 'manner' in English. Giles Robertson suggested the method the Bellini brothers employed in the Council Hall is likely to be based on oil on canvas; 1968, *op. cit.*, p.85. Michelle O'Malley argued that the term 'modo et forma' which was often referred to in the contracts commissioning altarpieces, is mainly concerned with the subject matter; *The Business of Art: Contracts and Payment Documents for Fourteenth- and Fifteenth- Century Italian Altarpiece and Frescoes*, Ph.D. diss., Warburg Institute, London, 1994, pp. 152-55. However, she drew her conclusion without thorough technical investigation of the surviving documented altarpieces.

⁸¹ Oil is a more flexible medium than tempera and glue. The other attributes of oil-based technique are exactly opposed to those of the conventional aqueous media. See Chapter 2, for detailed discussion.

⁸² In the 1480s Giovanni Bellini seems to have developed a particular technique, which was particularly admired by the Venetian public. In 1488 the Venetian government stipulated the method of the Bellini as a condition of contract, when negotiating with Vivarini. The document does not specify the method in question, but it is likely that in the 1480s the Bellini workshop jettisoned the traditional tempera- and glue- based technique, and that Bellini tried to explore the potential of oil painting on fabric surface further in the course of this project. For the detailed discussion of this document, particularly the meaning of *modo*, see following footnote 80 in p.187 in this Chapter.

⁸³ Caroline Villers has said that the *Barbarigo Canvas* is one of the earliest surviving Venetian oil paintings on canvas; C. Villers, 'Artists Canvases; a History', 6th ICOM Committee for Conservation, Ottawa, 1981, pp.3-4.

which the Doge Agostino Barbarigo is presented to the Virgin and Child by St Mark and St Augustine is not only the nearest in function of Bellini's surviving works to the lost history cycles in the Great Council Hall, but was painted during the term of his service in the Great Council Hall, and as such, should be discussed in detail.

Materials and Methods

The *Barbarigo Canvas* which had suffered a series of poor retouchings, came to receive careful modern restoration in 1979, and the technical data compiled during this restoration was published in 1983. The conservation report points out that the canvas used in this work is a fine linen, of about 17 by 20 threads per square centimetre, and the support is made up of four strips of canvas, used horizontally and measuring 69, 34, 37 and 66cm each in width [Plate 19(e)].⁸⁴ The gesso ground is a feature of the canvas surface of the *Barbarigo Canvas* which is common to his panels such as the *Pesaro altarpiece* and the *Blood of the Redeemer*.⁸⁵ In the textile support, however, the gesso ground, at c.0.2mm, is so thin that it must have been intended to fill the gap between the threads, a practice also employed by Jacopo Bellini and Mantegna, as discussed earlier.

Although the conservation report notes the presence of underdrawing and *spolveri* in the *Barbarigo Canvas*, it is difficult to gauge to what extent Bellini relied on these different methods of registering the design. Presumably, these guidelines were important for constructing the background setting, but in the figurative areas its purpose seems to have been greatly reduced. In fact, freer and bolder brushwork is found in the x-ray in the area of the drapery [Plate 19(b) and 19(c)], indicating either that Bellini did away with any detailed guideline, or alternatively that the design was largely accomplished at the painting stage. A more radical measure can be found in the hair of the angel on the left, where the modelling was achieved by the contrast of light and shade [Plate 19(a)]. Here, the

Besides this work, Bastiani's two oil canvases for the Scuola di San Girolamo, close in date to Bellini's lost canvases, have been dated to the 1470s or a little later on the basis of style; P.F. Brown, 1988, *op. cit.*, pp.270-71.

⁸⁴ L. Lazzarini, 'La Pala Barbarigo di Giovanni Bellini; Le analisi di Laboratorio', *Quaderni della Soprintendenza ai Beni Artistici e Storici di Venezia* (3), 1983, p. 23. The practice of sewing together pieces of canvas was a normal preparation for large-scale canvas paintings until the nineteenth century. See Conclusion for detailed discussion.

⁸⁵ Lazzarini, *ibid.*, pp.23-25; A. Braham et al., 'Bellini's "The Blood of Redeemer"', *NGTB*, (2), 1978, pp.11-24.

brushstroke is so spontaneous that J. Wilde observes ‘... one perceives the strokes before seeing the modelling which they produce’.⁸⁶ This freer brushwork which was created by artist’s own instantaneous action rather than by pre-planned underdrawing, can be seen as evidence of a new, experimental application of canvas-painting technique.⁸⁷

Light effect

What strikes one most in the *Barbarigo Canvas* is the sense of the canvas’s suffusion with light. Set in open air, the light is stronger than that Bellini used in the *San Giobbe Altarpiece*, but not to the extreme level which he later adopted to create a magnificent luminosity in the *San Zaccaria Altarpiece*. By using form-revealing, subtle light, he accurately described the texture of materials, particularly for the representation of Doge Barbarigo and St Augustine, and further emphasized the intensity of colour in the composition of the Madonna and St Mark [Plate 19]. The brilliant luminosity and a sense of verism in Bellini’s canvas can only be accounted for by the fact that he worked in a completely different way, and that his effects are due to his particular method of applying oil colours. A cross-section from the shade of the drapery of the angel on the left, for instance, shows how Bellini applied darker tones over a light ground; saturated red lake with a little carbon black is glazed over an opaque underlayer, consisting of lead-white, ultramarine, and red lake [Plate 19(d)]. This paint structure reveals how Bellini created a chromatic subtlety that seems to shine through the depths of the picture itself.⁸⁸ In conjunction with this glazing method, consistent with his oil technique on panel, his rendering of various textural effects in the *Barbarigo Altarpiece* can be seen as a definitive testimony to his mastery of the oil medium. A sense of material texture is found in the golden brocade of St Augustine and the jewellery of Doge Agostino’s *corona*, the brilliance of which is created by the subtle treatment of highlights [Plate 19(a)]. The X-ray of Doge Agostino’s *corona* shows how Bellini applied his brush to capture naturalistically

⁸⁶ J. Wilde, *the Venetian Art from Bellini to Titian*, Oxford, 1974.

⁸⁷ Bellini’s underdrawing method on textile support will be discussed in details in Conclusion chapter.

⁸⁸ Opulent light effects were to remain a central preoccupation in Bellini’s canvases of large size; transfusions of light and shadow on canvas dominate the *Martyrdom of St Mark* (Brera, Milan), the *St Mark in Alexandria* (Brera, Milan), and the *Annunciation* from the organ-shutters of Santa Maria dei Miracoli; Robertson, *op. cit.*, 1968, p.83; Goffen, *op. cit.*, 1989, p.278. In all these canvases, the binding medium, is oil.

the gleam of pearls [Plate 19(b)]. He was able efficiently to create such intensified highlights, because of his understanding of the plasticity of oil colour.⁸⁹

‘Scumble’

The system of producing subtle tonality by applying transparent dark colour over a bright ground had been a central focus of Bellini’s art from his early years, as discussed in the *Agony in the Garden* in Chapter 3, and was carried to greater perfection in the *Barbarigo Canvas* probably with his increasing understanding of Netherlandish oil glazing methods. Bellini’s interest in oil glazing methods has raised the question of whether he simply continued the Northern practice of oil painting without serious modification until the 1480s. This question was first raised by Sir Charles Eastlake, who concluded that Bellini’s method had been consistently based on simple glazing technique and should be seen to belong to the tradition of Netherlandish practice.⁹⁰ Eastlake is one of the earliest modern scholars who valued Bellini’s painting technique, but due to his preoccupation with the great Venetian oil masters of the next generation, such as Giorgione, Titian, Veronese, and Tintoretto, he failed to recognize a number of Bellini’s technical qualities. For instance, in the *Barbarigo Canvas*, Bellini employed what might be called the ‘scumble’ method, a technique in which an upper layer of paint is used to modify the colour of the surface to which it is applied, especially to create an effect of highlight.⁹¹ Although Eastlake argued that this method is one of the most important technical inventions of the sixteenth century Venetian painters, he did not mention it in connection with Bellini’s work. According to Eastlake, Veronese is the most important painter who pioneered this scumble technique, but it appears that Bellini had already used this technique extensively and masterfully in the outer garment of Doge Barbarigo in the *Barbarigo Canvas* [Plate 19(a)]. The crisp broken highlight, tinted by lead white or lead-tin yellow, defines the highlight of the drapery and creates a brilliant textural effect. This method is different

⁸⁹ For the similar effect, see Antonello’s *San Cassiano Altarpiece*, see pp.163-69 in the previous chapter and also the following discussion of scumble technique in the *Barbarigo Canvas*.

⁹⁰ Eastlake, *op. cit.*, vol.2., pp.278-9, 364-5.

⁹¹ The scumble is based on a light over dark layer structure, the opposite process to glazing, and can be more successfully achieved when the upper light colour layer is opaque, irregular and thin. For detailed discussion of this

from the one he used in the other figures; St Mark's red and blue drapery, for instance, was modelled by increasing the proportion of lead white to the body colour, and was later shaded by glazing [Plate 19]. The x-ray photograph illustrates that lead-based paint such as lead white and lead-tin yellow is sparsely applied on the folds in Doge's garment, whereas it was widely detected in the drapery of St Mark [Plate 19(b)] .

It cannot be proven that Giovanni Bellini invented this scumbling technique. However, it seems indisputable that the unprecedented vibrancy of surface, created by the scumbling in the drapery of Doge Agostino Barbarigo was, to a great extent, inspired by his increasing interest in working on textile with oil paint. Bellini must have realized that paint, if stroked over the woven threads, left a broken, interrupted mark, which could be effectively exploited by applying a brush loaded with light coloured oil paint over a darker base. Indeed, this method of scumbling is more often detected in his later works on canvas than in his panel paintings.

Conclusion

At the time when the Bellini's workshop was busy working with the state projects on canvas such as the Barbarigo Canvas and the canvas cycles for the Great Council Hall, paintings on a textile support were not standard for mural painting, certainly not on this large scale, and may have been viewed with surprise by those familiar with the existing uses of canvas.⁹² Even a hundred years later, Vasari comments on the typical use of canvas as mural decoration in Venice in his biography of the Bellini;

method in Venice, see C. Eastlake, *op. cit.*, vol. 2, pp. 272-296; see also H. Osborne (ed.), *The Oxford Companion to Art*, 1969, p. 1055.

⁹² Mosaic was a practicable substitute and, indeed, flourished to a greater extent in Venice at that time than in any other Italian city. Andrea del Castagno, the skilled Florentine fresco master, had to work out the cartoon for the mosaic of the 'Dormition of the Virgin' in the Cappella dei Mascoli in San Marco; Robertson, *op. cit.*, 1968, p.4. Panel was also produced for cycles; a seventeenth-century document notes that a cycle of fourteen panels had existed in the *Scuola della SS. Annunziata* in the early fourteenth century; P.F. Brown, *op. cit.*, p.258.

it is much the custom in Venice to paint on canvas, either because it does not split or become worm-eaten, or [because] they can make pictures whatever size they wish.⁹³

What caused the interest of Bellini's patrons in canvas as a support for wall painting is not known exactly but, to a large extent, as Vasari noted, it seems to have been due to practical reasons. As argued in Chapter 2, the geographical environment of Venice, the lagoon on which Venice and its greatness was built, brought problems for the preservation of fresco. The generation-long project of the representation of the history of Venice in the Hall of the Great Council, for instance, illustrates how deeply both painters and the public cared about and were committed to the attainment of appropriate mural decoration in the fifteenth century. Between c.1365 and c.1419, fresco cycles were optimistically carried out in the Hall of the Great Council, but already by 1422 the frescoes were in need of restoration, and a conservator was appointed.⁹⁴ Although the frescoes continued to be restored, they seem to have been in ruinous condition as early as the 1470s when the Venetian senate decided to abandon them in favour of the alternative material of canvas.⁹⁵ This project can be seen as the institutionalization of canvas as a major painting material in Venice. Soon after, there was a virtual epidemic of large-scale canvas mural projects undertaken by major Venetian painters.⁹⁶ These projects included paintings for: the Scuola di Sant'Orsola, c.1490-1500; the Scuola Grande di San Giovanni Evangelista, Albergo, c.1494-1505/10; the Arte dei Setaiuoli, c.1495-99; the Scuola di San Giorgio degli Schiavoni, c. 1502-1507; the Scuola di Santa Maria degli Albanesi, c.1502-1508; the Scuola Grande di San Marco, Albergo, c.1504-1534; the Scuola di

⁹³ Vasari, *op. cit.*, vol.3, pp.427-441.

⁹⁴ 'unum sufficientem et aptum magistrum pictorem' was to be appointed 'at a salary of 100 ducats per year to keep them in good repair'; P.F.Brown, *op. cit.*, doc.7, p. 261.

⁹⁵ P.F. Brown, *ibid.* In churches, narrative fresco cycles are almost never found. Amongst rare examples is the apse fresco of the Florentine Andrea del Castagno, who visited Venice in 1442, in the chapel of San Tarasio at San Zaccaria; Robertson, *op. cit.*, 1968, p. 4. On the other hand, fresco was often used for decorative designs on Venetian church walls.

⁹⁶ Neither mosaic nor panel could be regarded as an adequate alternative support to compensate for the huge narrative scenes in fresco which were demanded for public buildings. Mosaic is a predominantly decorative format, and there is a practical limit to the use of the wooden panel for mural support because of its weight. The requisite large-scale representations of familiar religious and historical scenes and episodes remained effectively out of reach for the city of Venice. It was through the evolution of large compositions on canvas that Venetian painters were able to embark on mural painting on a massive and prolific scale.

Sant'Alvise, c. 1508; the Scuola della Croce, c.1508; and the Scuola di San Stefano, c.1511-1520.⁹⁷

The successful representation of familiar religious and historical narratives on a monumental scale on canvas would have remained the pride of the Venetian citizen and furthermore made a deep impression on visitors from other states like Vasari.⁹⁸ When Vasari had to mention an important composition executed on textile support in his introduction to the *Vite*, the canvas cycles in the Hall of the Great Council, which he certainly visited during his stay in Venice in 1541, were referred to as prime examples.⁹⁹

It should be noted that this extensive use of large-scale textile support with oil paint was almost unprecedented. Until then in Europe, oil had been matched mainly with panel, whereas tempera and distemper were consistently used on textile support until the early sixteenth century. As mentioned earlier, Mantegna's method was mainly based on traditional tempera- and distemper-based technique, although he worked with canvas throughout his life. Early Netherlandish art, on the other hand, survives only in the form of oil painting on panel and tempera and distemper on canvas.¹⁰⁰

Giovanni Bellini worked continuously with oil and canvas at the turn of the century. His late painting technique will be discussed later in the concluding part of this study, in which an emphasis will be given to his mastery of canvas painting.

⁹⁷ See P.F. Brown, *op. cit.*, pp.258-298.

⁹⁸ Jacopo Sansovino said in his dialogue that it is canvases in the Ducal palace that foreigners who have an interest in Venetian painting must see; D. Chambers and B. Pullan, *Venice: a documentary History 1450-1630*, Oxford, 1992, pp.391-392.

⁹⁹ 'E perché questo modo è paruto agevole e commodo, si sono fatti non solamente quadri piccoli per portare attorno, ma ancora tavole da altri et altre opere di storie grandissime, come si vede nelle sale del palazzo di S. Marco di Vinezia et altrove-, avengaché, dove non arriva la grandezza delle tavole, serve la grandezza e 'lcommodo delle tele'; Vasari, *op. cit.*, vol.1, p. 137. For the 'sale del palazzo di S. Marco di Vinezia', Vasari had in mind the Great Council Hall in the Ducal Palace.

¹⁰⁰ Wolfthal, *op. cit.*, p.xiii.

Chapter 6

The Late Fifteenth and Early Sixteenth Century

The monumental project of redecorating the Great Council Hall in the Ducal Palace developed slowly and took several decades to complete. It seems to have constituted the major part of Giovanni Bellini's later activity, particularly in the late fifteenth and early sixteenth century. A letter written on 2 March 1501 by Michele Vianello to Isabella d'Este, shows that Bellini himself said that he was constrained by the Venetian state to continue with the work begun in the Ducal Palace.¹ That his commitment to this project became virtually compulsory can be further deduced from the sudden drop in Bellini's painting output in the 1490s. From the 1450s until the 1480s, the rate of production of Bellini's paintings progressively increased; eighteen paintings, dated to the 1450s, have survived: thirty from the 1460s: thirty-four from the 1470s: forty from the 1480s. For the 1490s, the figure drops sharply with only fourteen paintings recorded [Table 7]. After that, his workshop seems to have recovered from the heavy duties in the first decade of the sixteenth century, and its output returned to the level of the 1470s and 1480s.

Table 7. The Output of Giovanni Bellini's Workshop.²

	1450s	1460s	1470s	1480s	1490s	1500s	1510s
Surviving works	18	30	34	44	14	44	25

In contrast to the declining quantity of his artistic output, ironically, Bellini's activity at the turn of the century is clearly documented due to his involvement with Isabella

¹ Bellini told the Venetian humanist and collector Vianello, responding to the request of Isabella d'Este for a 'storia', that he had to work all morning in the Ducal Palace; C.M. Brown, *Isabella d'Este and Lorenzo da Pavia: Documents for the History of Art and Culture in Renaissance Mantua*, Geneva, 1982, pp.157-67. See pp.234-6 in Conclusion for detailed discussion.

² The statistics of this table are based on the catalogue of Bellinesque works given by T. Pignatti, *L'Opera Completa di Giovanni Bellini*, Milan, 1969.

d'Este's studiolo project from 1496 until 1505.³ 45 letters have survived which document the correspondence between Isabella d'Este and Bellini through mediators, including one letter written by Bellini himself.⁴ Most of these concern the Marchioness's complaints about his delay in fulfilling her commission and Bellini's excuses for his tardiness, but there are a number of important references to Bellini and his attitude toward art, an issue which would otherwise remain a complete blank. From the point of view of painting material and method, the view of a contemporary peer on Bellini's painting technique is first revealed at this time. In July 1504, Lorenzo di Pavia wrote to Isabella d'Este about her final payment to Giovanni Bellini and commented on the quality of Bellini's art. According to him, Bellini was recognized by his contemporaries as a master of colouring. It is interesting to note that Pavia used the term highly-finished, *ben finite*, to describe Bellini's technical speciality at this time.

... de invencione nesuno non pò arivare a messer Andrea Mantegna, che invero l'è ecelentissimo e el primo, ma Giovane Belino in colorir è ecelente, e tuti che à visto questo quadroto, ogneuno l'à comendato per una mirabila opera, et è ben finite quele cose...⁵

Serving as Venetian mediator for Isabella d'Este, Lorenzo di Pavia, musical instrument maker, had written frequently to her about the progress of her commission since 1501.⁶ He was an associate of the Venetian humanist circle and seems to have been well aware of the current debate on Venetian painting.⁷ Therefore, it can be said that his report, to some extent, reflects the general assessment of Venetian intellectuals on Bellini's art in this period.

The present chapter is concerned with Bellini's painting technique at the turn of the century. Its emphasis is given to his colouring method, which was admired by his

³ For documentations, see C.M. Brown, *op. cit.*, 1982, pp.157-167; see also J. Fletcher, 'Isabella d'Este and Giovanni Bellini's "Presepio"', *Burlington Magazine*, (113), 1971, pp. 703-12.

⁴ Bellini wrote a letter of apology to Isabella d'Este on 2 July 1504, asking her forgiveness for the delay which was due to the pressure of work and not to any neglect of her orders; C.M. Brown, *ibid.*, pp.166-67.

⁵ C.M. Brown, *ibid.*, doc. 92, p. 84. The meaning of the term 'ben finite' will be analyzed with Bellini's contemporary painting technique at the end of this section.

⁶ Vianello was her main helper with Bellini. Lorenzo di Pavia was brought in by Vianello because he possessed technical expertise in wooden panel; Fletcher, *op. cit.*, 1972, p.707.

⁷ Lorenzo di Pavia was close to Vianello and also had friends in the Aldine Press circle. For the biography of Lorenzo, see C.M. Brown, *op. cit.*, 1982, pp.13-35.

contemporaries. Key questions concern Bellini's approach to colour in this period, his method of implementation and the meaning of Lorenzo's phrase 'highly finished' in terms of Bellini's technique. At the centre of the discussion is the *San Zaccaria Altarpiece: the Virgin and Child with Sts Peter, Catherine, Lucy, and Jerome* (signed in 1505, San Zaccaria, Venice).⁸ It was restored in 1976 and some technical information exists concerning it.

6.1 The *San Zaccaria Altarpiece*

The *San Zaccaria Altarpiece* in which the Virgin and Child occupy the apex of the composition and a group of four standing saints are distributed to either side, reflects Bellini's earlier work, the *San Giobbe Altarpiece* (Accademia, Venice), dated to the late 1470s [Plate 20 and 21]. The format of these two altarpieces is so similar that it would appear that the thirty-year gap between them cannot divide these two works completely.⁹ The similarity of the two works can also be demonstrated in their architectural backdrop where the apse is decorated with gold mosaic.

The *San Zaccaria Altarpiece*, completed in 1505, was no doubt a variation of the *San Giobbe Altarpiece*, but in Bellini's work, it is a variation which changes 'the whole character of the work', and 'resulted in a new invention'.¹⁰ It has been said that Bellini succeeded in creating a more meditative devotional image in the *San Zaccaria Altarpiece* by reducing a great deal of the physical drama enacted through the figures' movements in the earlier work, and by producing a simpler and more spacious setting.¹¹ The novelty of the *San Zaccaria Altarpiece* in comparison with its earlier

⁸ This altarpiece was in his workshop when Lorenzo da Pavia wrote the above letter. He may often have seen Bellini to discuss Isabella's commission during the period. According to Lorenzo di Pavia's letter dated 1502, Bellini never showed anybody his works until they are finished, but this practice is applied to the modest-size works, not to the large altarpiece like the *San Zaccaria Altarpiece*. It is also possible that Bellini's secretive working practice seems to have been cultivated by Bellini himself to cover up the delay of his work for the Marchioness. In fact, in the next year 1503, Lorenzo di Pavia wrote to Isabella that Bellini had done very little work on the picture. See C. M. Brown, *ibid.*, p.74.

⁹ They are all in the pattern of the Venetian *Sacra Conversazione*, the initial development of which Bellini played important role in earlier in the 1470s; For its development, see P. Humfrey, *The Altarpiece in Renaissance Venice*, New Haven, 1993, pp. 184-188, 201-217.

¹⁰ Quoted from J. Wilde who mentioned this when he made a comparison between Bellini's early and late works; J. Wilde, *Venetian Art from Bellini to Titian*, Oxford, 1974, p. 19.

¹¹ Not a single movement is made in the *San Zaccaria* painting except the Child who is raising his tiny hand to bless. The space where the story takes is more natural in the *San Zaccaria Altarpiece*, where the extreme low eye

model, however, depends not so much on the increased emphasis on motionless figures in a timeless composition, as on the change of colour and its application. In fact, it is precisely the intense chromatic effect of the *San Zaccaria Altarpiece* that most distinguishes it from the earlier *San Giobbe Altarpiece*, where the colour is less brilliant by comparison.¹²

The contrast between the two works in the use of colour is distinctive first in the description of the figures. In the *San Giobbe Altarpiece*, a more subdued range of colour used for the figure group, dominated by plague and mendicant saints; two of the saints, Job [San Giobbe] and Sebastian, being nude, while St Francis is clothed in a dull dark green garment, and St Dominic wears a black and white garment [Plate 20].¹³ In contrast, the *San Zaccaria Altarpiece* depicting Sts Peter, Catherine, Lucy, and Jerome from left to right, gives Bellini more opportunities in terms of colour. They are, as it is, represented by extensive colour fields [Plate 21]. St Catherine, the female saint on the left hand side, wears a red robe and green mantle; St Lucy on the right hand side has a blue-grey robe and green-orange mantle; St Peter on the far left has a grey-blue robe and orange outer garment; and St Jerome on the far right wears a red mantle with white lining.¹⁴

The differences between these two works in the approach to colour can be further related to their manner of describing light. In the *San Giobbe Altarpiece*, the light appears to have no dominant direction, and its source is too diffuse to produce a

level of the *San Giobbe Altarpiece* is amended. Moreover, the composition itself is much simpler in the *San Zaccaria Altarpiece*. The number of saints is reduced from six in the *San Giobbe Altarpiece* to four, and the angels from three to one. The four saints are placed symmetrically in the *San Zaccaria Altarpiece* with the two male saints in the front row and outside, the two female saints in the second row and inside.

¹² The modern conservation given to help us in approximating their original condition. The *San Giobbe Altarpiece* has received full modern conservation in 1993-4, and the *San Zaccaria Altarpiece* was restored in 1976. It is almost miraculous that the *San Zaccaria Altarpiece* has preserved the luminous colour surface in spite of damage from the series of man-made and natural disasters to which it has been exposed. The worst danger occurred between 1797 and 1816, when Napoleon took it as booty to Paris. In Paris, it was transferred to canvas, and reduced in height by a total of 76cm; P. Humfrey, *op. cit.*, 1993, p. 353. Robertson's description of the light and colour of the *San Zaccaria Altarpiece* is accurate; G. Robertson, *Giovanni Bellini*, Oxford, 1968, pp.109-127.

¹³ The commission of the *San Giobbe Altarpiece* was associated with the 1478 plague; R. Goffen, *Giovanni Bellini*, New Haven, 1989, pp.143ff. The different approach to colour between the *San Giobbe* and *San Zaccaria Altarpieces* does not fully depend on the subject matter. Titian's *St Mark enthroned with Sts Cosmas, Damian, Roch, and Sebastian* (c. 1511-12, Santa Maria della Salute, Venice) is also linked with the plague, but is more colouristic than Bellini's *San Giobbe Altarpiece*.

¹⁴ G. Robertson, *op. cit.*, 1968, pp. 109-27.

lustrous effect [Plate 20], whereas in the *San Zaccaria Altarpiece* there is a definite, conscious attempt to recreate full light, falling from the upper left, imitating the actual fall of light onto the altarpiece as it stands on the left wall of the church [Plate 21]. In short, the light of the *San Giobbe Altarpiece* is half light, as argued in Chapter 4, but that of the *San Zaccaria Altarpiece* is full bright natural light.¹⁵ In the *San Giobbe Altarpiece*, light provides a means of reinforcing the spatial structure of the painting and, also, of modelling the figures in three-dimensions. In the *San Zaccaria Altarpiece*, by contrast, Bellini shifts the emphasis of light as a means of realising form towards that of light as an agent in revealing the coloured object.

The above characterisations of the *San Zaccaria Altarpiece*, underline the special qualities of Bellini's late art.¹⁶ A number of other juxtapositions between his late works and those of the 1470s and 80s can further confirm the differences we have found in the comparison of the *San Zaccaria* and the *San Giobbe Altarpieces*. It is the half-length Madonna and Child composition, which remained the favoured subject of Bellini's workshop production in the sixteenth century, that provides examples of Bellini's artistic development. In terms of abstract form, immutable compositions, emphasis on colour, and abundant light, Bellini's late Madonnas such as the *Brera Madonna* (signed 1510, Brera, Milan), the *Detroit Madonna* (c. 1510, Institute of Art, Detroit), and the *Madonna of the Meadow* (National Gallery, London), are close to the *San Zaccaria Altarpiece*, and form a contrast to the more volumetric but less colouristic Madonnas from the 1480s; the *Madonna degli Alberetti* (1488 signed, Accademia, Venice) and the *Bergamo Madonna* (c.1480, Accademia Carrara, Bergamo), for instance.

¹⁵ It can be said that the different light effects of these two altarpieces are due to the different light sources. The story in the *San Giobbe Altarpiece* has an interior setting, which is completely sealed off by architecture, whereas the *San Zaccaria Altarpiece* is a semi-open air scene in which the landscape appears on both sides and provides sufficient reason to deflect natural daylight onto the figures. The sides of the painting open to the landscape. Nevertheless, the luminous light in the *San Zaccaria Altarpiece* also depends on the change of Bellini's modelling method. See following pp.199-204 for detailed discussion.

6.2 Colour Modelling

Questions may arise as to the application of colour in the *San Zaccaria Altarpiece* from the point of view of painting material and method, since its colouristic effect depends on the application of paint itself. Indeed, what is significant in the *San Zaccaria Altarpiece* for the present chapter is Giovanni Bellini's colouring method; the colour in this panel is used in the most systematic way among the paintings that have so far been discussed.

One can immediately perceive with the naked eye alone that extreme values such as highlight and dark shadow were deliberately avoided and, thus, the middle range of values is consistently dwelt on in the most of the colour in the *San Zaccaria* painting [Plate 21(a)]. These mid-tone values can be roughly divided into three different parametres, which have been named, for the sake of convenience, light, half light, and shade [Plate 21]. If one imagines a five value scale, for instance, 1 highlight; 2 light; 3 half-light; 4 shade; 5 dark shade, Bellini uses here primarily the three middle values. The blue drapery of the Virgin is mostly built up schematically on the combination of the three tones from 2 to 4 [Plate 21]. This modelling method is also found with little variation in the attendant saints and angel, whose draperies consist of only a few bands of colour [Plate 21(a)]. As a rule, the plasticity of form in the *San Zaccaria Altarpiece* can be divided into these three ranges of value, each of which has equal importance, and plays an active role in the creation of form.

This method of colour modelling in the *San Zaccaria Altarpiece*, is indicative of Bellini's technical development at the turn of the century. In the *San Giobbe Altarpiece*, probably executed in the late 1470s, it is difficult to sum up the overall tonal change. The modelling of both the Virgin Mary and the standing saints is built up gradually, but the emphasis is on lower-value tones such as the half-light, the shade, and the dark shade, which dominates the form [Plate 20]. In contrast, the modelling of the three musician angels in the *San Giobbe Altarpiece* is divided into the two extreme

16 A similar colouristic effect is found in his altarpiece the *Baptism of Christ* for San Corona in Vicenza (c.1503, San Corona, Vicenza); For description of colouristic effect in this picture, see Wilde, *op. cit.*, pp.43-4 .

values [Plate 20]. The bright tone in the drapery of the angel in the middle for instance, represents the highlight or light (the first or second value grade), while the one found in the shade is close to the deep shade (the fifth grade). If the extreme contrast of the tonal systems found in the group of the angels, is not too disturbing visually, this is partly because the angels are positioned so close to the floor level that they are not in our direct line of vision, and partly because Bellini used the same range of dark shadow as in the other attendants. This deep shadow occupies more than half of all the forms in the *San Giobbe Altarpiece* and leads not only to the unified effect of tone in the painting, but to its sculpture-like three-dimensionality. This is not surprising since shortly after he began his extensive use of oil paint, Bellini was preoccupied with the realisation of the bulky cylinder-like body as discussed in the *Pesaro Altarpiece*, in Chapter 4.

In the *San Zaccaria Altarpiece*, Bellini minimises highlight and dark shades, and emphasises the middle tones where the brilliancy of the individual hue of colour is at its best. Here, it is evident that Bellini returns to his early artistic priority, discussed with reference to the *Agony in the Garden*, i.e. colour. Yet, what is new about his use of colour here is that his concern has shifted from colouristic diversity and quality of pigment to its subtle appearance created by his systematic painting method based on the potentials of the new paint medium.

Thanks to the 1976 restoration, the way in which Bellini controlled the tone value of colour in the *San Zaccaria Altarpiece* is now demonstrable. The cross-section from the blue drapery of the Virgin, for instance, shows the systematic development of the three successive blue layers from pale blue to the final blue glazing: the colour is built up through lead white with little ultramarine for the lightest area; then, an admixture of lead white and ultramarine for half-light; and finally, a transparent blue layer composed of ultramarine in a medium of high quality for the area in shade.¹⁷

¹⁷ L. Lazzarini, 'Il colore nei pittori veneziani tra il 1480 e il 1580', *Bolletino d'Arte*, Supplemento 5, 1983, pp. 135-44.

An orderly colouring method is again found in the cross-sections from the dark green of St Catherine's robe, the red drapery of St Jerome, and the yellow drapery of St Peter [Plate 21(b)]. Bellini's excellence in oil method is particularly apparent in the dark green of St Catherine's robe, where he used a double layer of glazing. Through this method, he could achieve a deep-toned green shade without recourse to darkening agents.

However, it remains open to question whether Giovanni Bellini used the same painting process in the lighter tones. Lazzarini does not refer to it, but his interpretation implies that Bellini may have used only one or two paint layers to get lighter tones. However, on the basis of direct observation it can be mooted that Bellini could have reduced the proportion of pigment to medium in order to reveal a bright underlayer through the final glazing layer of the light and half-tone. As for the light tone, one can observe particularly in the blue drapery of the Virgin Mary, that he creates the light effect by applying opaque lead white on the paint layers. This light over dark paint structure as surmised in the light tone of Bellini's *San Zaccaria Altarpiece*, is likely to have been an extension of his earlier experiment with scumbles in the *Barbarigo Canvas*.¹⁸ What is new here, however, is that he matches it with a pure glazing method in the shade, and succeeds in creating more subtle tonal changes. All the three major tones -light, half light, and shade- are set together, with no abrupt transitions between them.

Since all of the cross-sections referred to above come from the area of shade, it is difficult to prove this reading of the paint structure of *San Zaccaria Altarpiece*'s light and half-light areas. Nonetheless, this hypothesis is supported by the fact that the depth of the paint in the light tone is as high as in the shade which cannot be explained only in terms of a thicker paint. That is to say, the paint structure of lighter tones is as complicated as those of the shade. Only the paint layer of the mid-tone is rather thin, and appears to sink between the light and shade tones. This method is found again in Giovanni Bellini's *Circumcision* (National Gallery, London), which is close in date to the *San Zaccaria Altarpiece*.

¹⁸ See pp.190-191 in Chapter 5, for the details.

6.3 Pure Glazing and Colour Composition

Bellini's modelling method in the *San Zaccaria Altarpiece*, the systematic use of glazes for the shades, the proportion of paint media to pigment for the lighter tones, and, also, the application of an opaque colour like lead white as a final layer for the delicate high light effect, contrasts with his earlier method of modelling based on basic glazing, and can provide a pointer to the mystery of the jewel-like clarity of colour and rich surface effect of his art at the turn of the century. It was in the 1470s and 1480s that Bellini was concerned with colour particularly in terms of its capacity to represent the fall of natural light. It was certainly for this purpose, that he so completely adopted oil paint. However, unlike Northern painters, he often added brown and black pigment to the final glazing layer as a neutralising agent to attain the deep shade.¹⁹ The cross-sections from the *Pesaro Altarpiece* and the *Barbarigo Canvas* confirm this [Plate 10 and 19(d)].

With regard to the *San Zaccaria Altarpiece*, though, there is little evidence so far that Bellini used darkening pigments in the final glazing layer. Even in the underlayer, the use of black and brown pigment is minimal. Black pigment is found neither in the cross-sections of the shaded areas of St Catherine's green, of St Jerome's red, or of the Virgin Mary's blue robe [Plate 21(b)-3]. A small amount of carbon black is used only with the red lake for the underlayer of the orange robe of St Peter [Plate 21(b)-4]. As a direct result of the pure-colour glazing method used, the *San Zaccaria* painting, in effect, looks more luminous and transparent than his earlier works or that of any of his contemporaries. His mastery of oil glazing technique furthermore allowed him to obtain a more subtle colouristic effect by using the double layer of glazing found in the green garment of St Catherine [Plate 21(b)-2].²⁰

¹⁹ Bellini added black to the pigment for shade as early as 1465 for the *Blood of the Redeemer*, see Chapter 3 for the detailed discussion of this. He may have found this method applicable to oil medium; see pp.156-160 in Chapter 4 and pp.188-191 in Chapter 5.

²⁰ For Venetian examples which show similar complicated glazing methods in green colour, see pp.57-8 in Chapter 1.

However, this modelling method, relying as it does on pure colour glaze, could cause a practical problem, since every colour has its own intrinsic value. With reference to the five value scale with (1) highlight; (2) light; (3) half-light; (4) shade; (5) dark shade, then yellow, for instance, is in the second range of value at the best, and cannot move into (3) and (4) without the help of darkening agents, while blue and red are naturally in the third and fourth band. This may have been a principle well-known to painters since the Middle Ages. Cennini, for instance, advised the use of 'hue-change method'-bright colour in light tone, and dark in shade.²¹ The practice of darkening the value by adding black, was a method recommended by Alberti. After the widespread introduction of oil paint, some Italian painters came to develop a method which would achieve a unified and consistent range of values by controlling the tone of underpaint.

This study has shown that Bellini was aware of various colouring systems, and that he had taken an empirical approach to his use of these since the beginning of his career. In the case of the *San Zaccaria Altarpiece*, it has been noted that Bellini used mainly the three middle values, 2 to 4, to avoid contamination of the beauty of each individual hue of colour by neutralizing pigments. The question arises of how he achieved the overall unity of tone in the *San Zaccaria* painting by using only the pure-colour glazing method. In particular, we may ask how he handled high-key colours like white and yellow.

Reading the disposition of colour in the *San Zaccaria Altarpiece* can demonstrate that Bellini was concerned not just with the beauty of each individual colour, but also with the contrast and co-ordination between colours. It is from the latter that the tonal unity of the work entirely depends. The Virgin Mary who wears a white veil, red dress and a blue outer garment with a green lining, provides a good example of Bellini's colour composition. The white veil covers not only her head, but also the shoulder to our left. In other words, the white colour (first and second value grades) is used where the figure appears to reflect the most light, since the most powerful light comes from the

²¹ Cennino Cennini used the term hue-change or *cangianti* for modelling in fresco; C. Cennini, *Il Libro dell'Arte*, Chapter 77-80, Vicenza, 1971, pp. 90-92; D. Thompson, *The Craftsman's Handbook*, 1960, pp. 53-54. For

left. The other colours then develop down the body, from the light-red dress (second and third grades), the green lining (third grade), the blue outer garment (third and fourth grades), and the red dress in the shadow (fourth grade). If one considers the five-value scale, the colour of the Virgin Mary's drapery can be said to be gradually darkened from the head downward in accordance with the transition of light. Again, the yellow outer garment of the angel is in full light and appears to advance, whereas the green is in the shade and seems to recede.

This method should be distinguished from the one recommended by Cennini, since Cennini's hue-change is aimed at the creation of an artificial three-dimensional form. It is more likely that Giovanni Bellini was to some extent aware of the medieval colour rule that brighter colours should be used for areas of projection and low-key colours for areas appearing to recede from the spectators to give a sense of space or depth.²² Indeed, this disposition of colour is used effectively in the drapery colouring of the four saints. The tone value of the two male saints, occupying both ends of the altarpiece and appearing to stand one step closer to the viewer, are brighter than the two female saints. St Peter is in orange and grey blue, and St Jerome in red and white, whereas St Catherine is mostly in dark green, and St Lucy wears a blue-grey robe and green mantle. It is also worth pointing out that there is a division in the use of colour in the saints. The primary colours, yellow and red, are given to the male saints which are also traditional colours for the dress of St Peter and Jerome, whereas the secondary colours, green and grey, are given to the females.

It is, at any rate, clear from the above reading of the overall colour composition that it is the Virgin Mary and the Child who are reinforced as the focal point not only by their position in the centre, but also by their light and colour. They not only receive the full bright light from the left, but are more high-key in colour than the figures around them.

detailed discussion of the *cangiante*, see M. Hall, *Color and Meaning: Practice and Theory in Renaissance Painting*, 1992, Cambridge, pp. 14-23.

²² There was an artistic tradition that warm colours like the orange sector tend to advance, and cool colours to recede when situated in the same plane at equal distances from the eye. Experiment during the 1940s, however,

6.4 'Ben finite'

One of the important features of Bellini's painting method in the first decade of the sixteenth century is its consistency within the painting. The successive development of the three-paint layer, from light to half light to shade, is a norm in all four cross-sections from the *San Zaccaria Altarpiece* indicating that Bellini treated the overall painting surface, not only with multiple paint layers but also with equal emphasis. This systematic application of glaze contributes to the 'highly-finished' effect noted by his contemporary Lorenzo di Pavia.²³ Yet, it seems that Bellini's perfectionist technique is further based on the method by which he prepared the ground layers, on which these glazes were to be built. Although these ground layers are not seen in the final painting, together with support, they can affect the general appearance of the picture. Bellini continued in his late years to adopt the orderly application of multiple gesso layers, and glue and lead white priming, the preferred method of his formative years. Providing an ivory smooth ground, these preparatory layers seem to have been essential in his late years, as he often employed gilding as an important decorative device and, more importantly, this practice is consistent with his increasing interest in jewel-like paint surface.²⁴

The cross-sections from Bellini's panels in his late years show how carefully gesso ground was prepared in his workshop. The division between gesso layers is well indicated by the cross-sections from the *Assassination of St Peter Martyr* (c. 1505, National Gallery, London), where a number of gesso layers are found with at least two distinctive separate layers.²⁵ Although such layering had been recommended by

suggests that this impression may be due rather to brightness or luminescence rather than hue; H. Osborne (ed.), *The Oxford Companion to Art*, Oxford, 1970, p.258.

²³ Lorenzo di Pavia is not the only art historian who valued the perfectionist approach of Bellini's late works. Ruskin made similar observation about Bellini's technique in the *San Zaccaria Altarpiece*; see pp.16-17 in Introduction.

²⁴ Bellini decorated the column in the *San Zaccaria Altarpiece*, dated ca. 1505 by gold gilding. For his use of gold, see pp.142-44 in Chapter 3.

²⁵ For a discussion of Bellini's preparation method employed in the *Assassination of St Peter Martyr*, see J. Plesters, 'Cross section and Chemical Analysis of Paint Samples', *Studies in Conservation*, (3), 1955, pp. 183-93. It is difficult to tell from the cross-section whether this separate division is a result of reducing the proportion of gesso to glue towards the upper layers, or the use of the different forms of gesso, *gesso sottile* and *gesso grosso*. At that time, *gesso sottile* or raw mineral gypsum (calcium sulphate dihydrate), was often used in Northern Italy; J. Dunkerton et al., *Giotto to Dürer*, New Haven and London, 1991, p.163. *Gesso sottile* has been recorded in Giovanni Bellini's *Madonna of Meadow*; *Ibid.*, pp. 183-93.

Cennino Cennini, these multiple gesso layers were rather unusual even in the fifteenth century, when a single layer of gesso was becoming more popular.²⁶ Yet, Bellini insisted on using these multiple gesso layers even in the early sixteenth century as the basis of his systematic glazing layers.

Besides a number of gesso layers, it was Bellini's practice to apply a glue layer and lead white priming for preparation.²⁷ Cross-sections from several late works demonstrate the application of glue and lead white layers over the gesso [Plate 36]. This complicated method, which enables the painter to obtain a brighter and quicker drying ground, would have become more necessary, as Bellini developed his oil technique further.²⁸ In fact, one of the most distinctive preparatory methods in Bellini's late panel works is his use of pure oil priming over gesso ground, as reported in the *Circumcision* (National Gallery, London).²⁹ It appears that the oil underlayer has the same function as glue-size priming, and could have wide implications in understanding Bellini's use of paint media. It is a rule that oil paint, a fatty substance, can be applied over lean substances like tempera and glue, but the process should not be reversed, because tempera and glue over an oil underlayer would readily crackle. Consequently, oil priming over gesso ground found in the *Circumcision* meant that Bellini could now work with oil from the inception of a work.³⁰

For Bellini, who was interested in the chromatic brilliancy of the painting surface, the carefully-prepared gesso ground with a glue layer and a lead-white priming was an essential ingredient of his technique, and seems to have played an important role in the

According to Plesters, the paler colour of the lowest gesso layers in the *Assassination of St Peter Martyr* is accounted for as a coloured ground; Plesters, *ibid.*, p.124. However, her opinion is open to question since there is a possibility that the gesso in the upper layer is stained by the superimposed paint layer.

²⁶ Plesters, *ibid.*, p.124; Dunkerton et al., *op. cit.*, 1991, p.163.

²⁷ In fact, little change was made to this method of multiple preparatory layers, once it was developed in the 1460s. For the details, see pp.133-36 in Chapter 3.

²⁸ Nevertheless, Bellini needed to adapt this method in the case of textile support, which diverges greatly by nature from wooden panel. His approach to preparatory layers in canvases will be separately discussed in the following part.

²⁹ Dr. J Kirby in the Science department in the National Gallery kindly wrote this result to me.

³⁰ It is difficult to tell whether an oil preparatory layer became Bellini's principal method of preparation in his late years, as he continued to utilize his early glue or tempera-based underlayers. All the same, this method shows Bellini's diversified approach to painting practice as well as his increasing emphasis on oil paint.

final appearance of his late work.³¹ Together with the systematic application of multiple glazing method, these preparatory layers may have helped Bellini to create the well-finished surface effect and the clarity of colour associated with this period.

Interestingly, Giovanni Bellini's perfectionist approach to glazing and preparatory layers, is reminiscent of Jan van Eyck. When one remembers that the virtuosity of van Eyck's technique was often compromised by later Northern painters in favour of economy of brushwork, Bellini could be considered a real heir of Jan van Eyck in technical terms. At the same time, Bellini's use of other methods, such as lead white scumbles, his colour composition, and his response to full, bright natural light, qualify him for the title of technical innovator, rather than imitator.

Conclusion

Bellini was not only concerned with the chromatic brilliancy of the picture surface, but established colour as a vital element of composition in the late fifteenth and early sixteenth century. As a result, the words related to colour quality have often been used to describe this tendency in his work. Particularly, the term 'tone' has been widely employed. Johannes Wilde, for instance, uses 'tone-values of pure colour' for the description of the *San Zaccaria Altarpiece*, whereas Marcia Hall adopts 'tonal painting' as the most important quality of sixteenth-century Venetian painting and assigns Bellini as its founder.³²

However, one should be careful when using the term 'tonal painting' in a description of Bellini's art in the *San Zaccaria Altarpiece*, as the word 'tone' itself is a vague term, given the three independent elements affecting the appearance of colours-i.e. hue, value

³¹ Similar ground layers from gesso, glue size, and lead white priming, are reported in Michelangelo's *Entombment* (c. 1501, National Gallery, London); M. Hirst and J. Dunkerton, *Making and Meaning: The Young Michelangelo*, London, 1994, p.109. Michelangelo's application of these layers is likely to show that he coincidentally shared the similar artistic aim with Bellini, rather than as a direct contact with Bellini. The highly-polished surface effect of Michelangelo's panel works is also based on these meticulous preparations.

³² Wilde, *op. cit.*, pp. 44-46; Hall, *op. cit.*, 1993, pp.199-235. For discussion of 'tone' in Venetian painting in the sixteenth century, see M. Barasch, *Light and Color in the Italian Renaissance Theory of Art*, New York, 1978, p. 102ff.

or brightness, and saturation. When one refers to warm or cool tone, for instance, one is referring to the hue, but the word 'tone' is more correctly used to refer to the variations or correlation in the dimensions of hue and value.³³ In the case of the use of the term tonal painting in this study, it refers to the latter.³⁴ It is in this meaning of the term tonal painting that one can draw attention to Bellini's unity of value and hue in the *San Zaccaria Altarpiece*.³⁵

The question remains as to how Giovanni Bellini came to be concerned with the need for an overall unity of the tones in the first place. It has been suggested that he may have had an opportunity to learn of it from Leonardo da Vinci who briefly visited in Venice in 1500. However, it is difficult to accept this hypothesis, since Bellini's method is absolutely different from Leonardo's. As Shearman has argued, Leonardo da Vinci's pioneering method of creating tonal unity is based upon strict control of value by increased use of a dark additive and underpainting.³⁶ Bellini's priority, on the other hand, is intensity of colour, and his method of unifying different tones depends by and large on the disposition of colour and on the emphasis on a limited range of values. In fact, what was most important to Bellini's art at this stage is more likely to have been his experience in the large paintings on the textile support for the Hall of the Greater Council in the Ducal Palace of the 1490s. This theory cannot be decisively proved, since all his work in the hall was destroyed by fire. However, it is possible that Bellini continued producing the same luminous paint surfaces in the Ducal Palace in the 1490s, as are found in the *Barbarigo Canvas* (dated 1488, Murano). His glazing method and emphasis on individual colour in the *Barbarigo Canvas* anticipate the *San Zaccaria Altarpiece*, and, presumably, he became increasingly aware of the relation between colours of different values when working with painting in large dimensions.

The method found in the *San Zaccaria Altarpiece* distinguishes Giovanni Bellini's art at the turn of the century, that is to say, the time when the supremacy of Bellini among

³³ Osborne, *op. cit.*, p. 258.

³⁴ I have preferred the word tone-value to specify this meaning.

³⁵ One should be cautious about this word because it is not only employed to indicate the predominance of colour, the chromatic brilliancy of picture surface, and the use of colour as an important element of composition, but also to define the broken colour and individual brushstroke found in the paintings of the later generation.

Venetian painters was firmly established.³⁷ When Lorenzo da Pavia commented on Bellini's mastery over colouring in 1504 and when Albrecht Dürer visited Venice and wrote from there to his German patron that Giovanni Bellini was old, but still the best painter in 1506, it seems that they both had in mind the type of technical qualities found in the *San Zaccaria Altarpiece*.³⁸

³⁶ J. Shearman, 'Leonardo's Color and Chiaroscuro', *Zeitschrift für Kunstgeschichte*, (25), 1962, pp. 13-47.

³⁷ As argued in Chapter 5, the earlier reputation of Gentile Bellini was largely due to his seniority and as the heir of Jacopo Bellini. For Bellini's supreme position in Venetian art in this period, see also P. Humprey, *op. cit.*, 1986, pp. 244-245.

³⁸ 'Er jst ser alt vnd jst noch der pest jm gemoll'; A. Dürer, *Schriftlicher Nachlass*, ed. by H. Rupprich, Berlin, 1956, pp.43-44. When Albrecht Dürer visited Venice in 1506, he may have seen the *San Zaccaria Altarpiece*, as Giles Robertson argued; G. Robertson, *op. cit.*, 1968, p.1. The scholarship of the present century has put more emphasis on his new younger opponents like Giorgione and Titian, who were eventually to overshadow Bellini's later career, claiming that in 1505 when Albrecht Dürer visited Venice, Bellini's status was already undergoing a growing, dynamic challenge from. However, it seems more likely that Dürer literally used 'still' as a contrast to 'old', not to the 'best', as if Sanudo later said that although Bellini was old, he painted with excellence; '...et cussi vechio come l'era, dipenzeva per excellentia'; M. Sanudo, *I Diarii*, ed. by R. Fulin et al., vol. xxiii, Venice, 1879-1903, p.256. It should be emphasized that Giorgione had not yet established his independent artistic achievement in 1505, and, that, even after that, his clientele remained largely private, and possibly different from that of Giovanni Bellini. Although Charles Hope reconstructed the early career of Titian before 1510 (C. Hope, *Titian*, London, 1980), there is no evidence that Titian had secured his own career as early as 1505. As a rule, Dürer's assessment is not his own prejudice, but seems to correctly reflect the view of Venetian artists and patrons in this period.

Chapter 7

Bellini's Workshop and Drawing Practice

The aim of the present chapter is to investigate Giovanni Bellini's workshop practice, as can be gauged from technical and statistical examination of paintings produced under his name. So far, this study has focused upon his major large-scale works, but it is now necessary to turn to his more modest sized works in order to address questions such as when his workshop started to produce small devotional paintings with some regularity and how his workshop operated to meet the very considerable demand from his private clientele.¹ His drawing and underdrawing method and their functions within his workshop will also be discussed later in this chapter in an attempt to show how differently his workshop production functioned in comparison with that of his other major works.²

7.1 Devotional Painting for Domestic Settings and the Manufacture of Panel Painting

While demand from the private market for devotional images, especially the half-length Madonna and Child increased during the fifteenth century, many mature prestigious masters with established reputations tended to confine their interest to long-term and large-scale projects, and thus the production of such images was frequently undertaken by young or minor artists.³ Yet, Bellini produced a large quantity of relatively small size religious pictures throughout his long career. According to Pignatti's corpus of Bellini's painting, more than one third of his 218 surviving works consist of paintings of the half-length Madonna and Child.⁴ In addition, there are thirteen paintings of the *Pietà* and *Dead*

¹ The term 'workshop' can be referred to as a team working for the master on a large 'autograph' work, but it is mainly meant in this chapter as that which produces the work the master presides over, but does not necessarily execute.

² The discussion of the practice of using workshop members at the painting stage is not made in the present study. The possible application of the modern methods of conservation laboratory to the investigation of the division of labour between the master and his/her assistants has been suggested by researchers in this area; H. van Os et al., *The Early Venetian Paintings in Holland*, Maarssen, 1978, pp.9-10; for a recent attempt, see R. North, 'A technical examination of the Holy Trinity with Saints John the Baptist, Mary Magdalen, Tobias and Raphael', *The 14th Gerry Hedley Student Symposium* (unpublished), Courtauld Institute, London, 1996. Yet, in the case of Bellini, it is less likely that conservators have carried out examinations with awareness of workshop participation.

³ The exceptions, i.e. mature production of the Virgin and Child paintings, are Filippo Lippi and Botticelli.

⁴ T. Pignatti, *Opera Completa di Giovanni Bellini*, Milan, 1969.

Christ, seven *Crucifixions*, and four of *St Jerome in a Landscape*.⁵ Each of these type of work shares identifiable compositions and details, but vary in quality. Bellini can have been able to produce such a large corpus of domestic religious images only with extensive assistance from his workshop and, in fact, the majority of these works have been considered to be workshop products.⁶ The large output of such pictures in Bellini's workshop, nevertheless, suggest that unlike any fifteenth-century Italian painter of his status, Bellini realized the importance of the growing art market constituted by lay customers and founded his economic basis in this market by organising his workshop team into an efficient production line.

Commerce

Little is known about Bellini's overall income from the sale of workshop paintings, but considering the fact that a local painter Lazzaro Bastiani was paid six ducats for a painting of Christ the size of half a small sheet of paper in 1474, Bellini's similar production may have cost the same or rather more.⁷ Bellini's prestige was generally been recognized by his clients, but his workshop production was unlikely to have estimated as highly as his own works. In 1501, Isabella d'Este promised to pay Bellini 100 ducats on completion of an *istoria* by his own hand for her Studiolo in the early sixteenth century.⁸ By contrast, the *Priuli Triptych* that consists of one 1.29x0.64 metre panel and two 1.29x0.53 metre

⁵ Devotional in subject and modest in dimension, most of these types of works seems to have been destined for domestic home as a practical aid for private devotion. For detailed discussion of private devotional painting in this period, see S. Ringbom, *Icon to Narrative: The Rise of the Dramatic Close-up in Fifteenth-Century Devotional Painting*, Abo, 1965. Gibbons reported seventeen Presentation, nineteen Circumcision, fourteen Christ carrying Cross, and twenty-nine Christ Blessing paintings; F. Gibbons, 'Practices in Giovanni Bellini's Workshop', *Pantheon*, (23), 1965, pp.146-154.

⁶ The extensive workshop involvement may have not bothered most of clients, since the authorship was less strictly required in the private religious images; J. Dunkerton et al., *Giotto to Dürer*, New Haven and London, 1991, p.69.

⁷ However it may be dangerous to generalise from this one example. See pp.213-5 in this chapter, for Bastiani's document and further discussion.

⁸ C.M. Brown, *Isabella d'Este and Lorenzo da Pavia: Documents for the History of Art and Culture in Renaissance Mantua*, Geneva, 1982, doc.30; J. Fletcher, 'Isabella d'Este and Giovanni Bellini's "Presepio"', *Burlington Magazine*, (113), 1971, pp. 703-12. Considering the other companion paintings in the Studiolo, such as Mantegna's *Parnassus* and *Pallas expelling the Vices from the Garden of Virtue* (Louvre, Paris), this picture must have been required to be painted on a canvas about 1.5x1.9 metres, and to have a number of figures. Bellini was paid a quarter sum in advance, but failed to deliver the painting. He later offered to paint the Nativity or Madonna. Isabella preferred the Nativity for her bed room. Since the price was reduced from 100 to 50 ducats, the size and the number of figures seems to be smaller than expected for the *Istoria*; J. Fletcher, *ibid.*, p.711. The 50 ducats he received for the relatively small Nativity painting is significant considering that Bastiani received 30 ducats for the lost polyptych for San Samuele and Cima's *Capodistra polyptych*, which consists of one 1.55x0.72 metre panel, four 1.1x0.36 panels, four 0.18x0.13 metre panels and one 0.47x0.7 metre panel was only 70 ducats. For discussion of the trade in Venetian altarpieces at the time of Bellini, see P. Humfrey, *The Altarpiece in Renaissance Venice*, New Haven and London, 1993, pp. 151-7.

panels with predellas (Kunstmuseum, Düsseldorf) cost only 100 ducats in 1507, which presumably reflects the fact that it was mostly executed by the workshop.⁹ Thus, the six ducats that Bastiani was paid for a Madonna seems to hint at the value of Bellini's small workshop painting. These few ducats look modest in comparison to the hundreds of ducats he received for large-scale works. Yet, the continuous market demand for small domestic pictures provided him with a satisfactory and more stable income.¹⁰

The demand for devotional images increased during the fifteenth century, but the number of local painters specializing in its production grew accordingly.¹¹ The market was competitive and Bellini attempted to find a means of distinguishing his workshop output. One such distinguishing feature which appears in most of his workshop products, is a marble ledge with a paper label appearing near the bottom of the composition, as in the *Virgin and Child* in Civico Museo Malaspina in Pavia and the *Pietà* in Accademia Carrara in Bergamo, for example. For additional effect, his signature, a careful Latin inscription of his name, IOVANNES BELLINUS, was often inscribed on his works, but the signature is generally regarded as a guarantee that the master considered the picture a valid product of his workshop.¹² Bellini seems to have known how to please his lay customers and developed this format of devotional painting as one that could be identified by anyone as a Bellini product.

Manufacture of Panel Painting

Two of the most typical aspects of Bellini's domestic devotional paintings in terms of material are their support and size. None of the Bellinesque Madonna paintings were painted on textile supports; instead, the surviving examples are all on wooden panels,

⁹ V. Meneghin, *San Michele in Isola di Venezia*, Venice, 1962, vol. 1, p.322; P. Humfrey, *ibid.*, pp.105-6.

¹⁰ Having been commissioned by various groups of clients, Bellini earned a substantial amount of money from the beginning of his career. From 1479, when he was officially appointed to decorate the Hall of the Great Council, he received 80 ducats a year from the state in addition to expenses for colours and other materials. This is a considerable sum, since a skilled workman in the Arsenal in Venice earned about 50 ducats a year; C. Hope, *Titian*, London, 1980, p.120. Presumably, together with small domestic paintings, this could provide him with enough financial stability until his death, as the project was to continue several decades. For Venetian workers' wages, see F. Lane, *Venetian Ships and Shipbuilders of the Renaissance*, Baltimore, 1934, pp.162-163.

¹¹ A number of half-length Madonna paintings were produced in the workshop of Cima; P. Humfrey, *Cima da Conegliano*, Cambridge, 1983. Some of Bellini's workshop members founded their independent careers as painters specializing in the production of Madonna paintings; F. Gibbons, 'Giovanni Bellini and Rocco Marconi', *Art Bulletin*, (44), 1962, pp.127-131; F. Gibbons, 'The Bellinesque painter Marco Bello', *Arte Veneta*, (16), 1962, pp. 42-8.

measuring approximately 60cm to 80cm by 40cm to 60cm.¹³ Bellini's preference for panel contrasts with Andrea Mantegna, who produced a number of devotional images on canvas.¹⁴ It can be said that Mantegna, as a court painter, tried to satisfy his highly critical and sophisticated clients by depicting such popular images on an unconventional support, whereas Bellini's choice aimed to appeal to customers who may have had more conservative taste.

In the Bellini workshop, it seems that wooden panels were not only prepared in stock sizes but their sizes were rather strictly controlled. In a letter dated April 1473, Antonio dei Choradi asked Nicolo Gruatto to employ Lazzaro Bastiani to paint 'uno quadroto grande come mezo foio de charta di pizoli con la figura di misser, Jesù Cristo', adding that if Bastiani was unavailable to do so he should instead go to 'Ziane Belino'.¹⁵ The exact dimensions are unclear from the document, but *mezo foio de carta di pizoli* may signify *carta mezzana*, one of the officially regulated paper sizes produced in the Bologna mills in the late fourteenth century, which now measures 51.5x34.5cm in horizontal rectangular or 34.5x51.5cm in vertical rectangular.¹⁶ This is the dimension which is often found in Bellini's works. Allowing a few centimetres in either margin, the dimensions of Bellini's *Dead Christ* (c.1460s, 38x48cm, Museo Poldi Pezzoli, Milan), the *Blood of the Redeemer* (c.1465, 37x47cm, National Gallery London), and the *St Jerome in the Landscape* (c.1470s, 34x47cm, National Gallery, London) fall into this category. It seems reasonable that a jeweller like Choradi specified the size of the picture, borrowing the term from paper, which was traded in more standardised measurements.

¹² H. Tietze, 'Master and Workshop in the Venetian Renaissance', *Parnassus*, (11), 1939, p.35.

¹³ One possible exception is the *Virgin and Child* (Private collection) which was examined at the UCL Painting Analysis Unit in 1997. This work is painted on canvas, but its originality is doubtful. This work which will be discussed at the end of this chapter. For the discussion of the wood used in Bellini's panel paintings see following p.226.

¹⁴ See pp.118-120 in Chapter 2 for discussion of Mantegna's painting method on canvas.

¹⁵ P. Paoletti, *Raccolta documenti inediti per servire alla storia della pittura veneziana nei secoli XV e XVI*, vol.1, Padua, 1894, p. 15.

¹⁶ D. Landau and P. Parshall, *The Renaissance Print: 1470-1550*, New Haven and London, 1994, p.16; G. Piccard, 'Carta bombycina, carta pypyri, pergamena graeca', *Archivalische Zeitschrift*, (61), 1965, pp. 56-58.

Apart from *carta mezzana*, three more sizes were produced by the Bologna mills: *carta imperiale* (50x74cm); *carta reale* (44.5x61.5cm); and *carta recute* (31.5x45cm).¹⁷ The dimension of *carta recute*, the smallest of the four sizes, appears rarely and is limited to Bellini's early paintings. However, together with *carta mezzana*, the other two sizes are common in his wood panel works throughout his life. The dimensions of the *Davis Madonna* (c.1455, 72.3x46.3cm, Metropolitan Museum, New York), the *Dead Christ with two Angels* (c.1460, 74x50cm, Museo Correr, Venice), the *Virgin and Child* (c.1475, 75x50cm, Santa Maria dell'Orto, Venice), and the *Portrait of Doge Leonardo Loredan* (c.1505, 75x55cm, National Gallery, London) are close to *carta imperiale*, whereas the dimensions of the *Virgin and Child* (c.1455, 48 by 68 cm, Rijksmuseum, Amsterdam) and the *Virgin and Child* (c.1475, 60x45cm, Collezione senatore V. Cini, Venezia) approximate *carta reale*.

Although there are variations in margin sizes, many of Bellini's popular devotional images were of a size consistent with the dimensions of paper sheets.¹⁸ It seems highly probable, therefore, that panels were ordered in stock sizes from carpenters in batches.¹⁹ This practice, furthermore, implies that the study of the dimensions of Bellinesque paintings could produce positive results in the understanding of Bellini's workshop productions.²⁰

¹⁷ D. Landau and P. Parshall, *ibid.*, p.16; G. Piccard, *ibid.*, pp. 56-58. It seems that Bolognese regulation on paper size was generally found in Venetian examples; C. Eisler, *Genius of Jacopo Bellini*, New York, 1989. The paper in Jacopo Bellini's British Museum drawing album measures 41.5x33.6cm. This means that the dimensions of the basic sheets were about 41.5x 67.2cm, approximately the standard size of the *Carte Reale*, 44.5x61.5cm; A. Elen, 'A Codicological analysis and Reconstruction of Jacopo Bellini's Drawing Books', in C. Eisler, *ibid.*, p.457. In the pre-modern period, the size of paper was generally dictated by the size of mould, which could be held by two hands; see D. Hunter, *Paper Making*, New York, 1978, pp. 77-138.

¹⁸ The rectangular panel with 100x60 to 70cms, is one of the favourite dimension of Bellini's Madonna in the 1470s and 80s. The panels 30x20cm were often used for portraits.

¹⁹ J. Fletcher and D. Skipsey, 'Death in Venice: Giovanni Bellini and "The Assassination of Saint Peter Martyr"', *Apollo*, (133), 1991, pp.4-9.

²⁰ The size of the work of art seems to have been one of the major elements in evaluating the price of the picture in Renaissance Italy; M. O'Malley, *The Business of Art: Contracts and Payment Documents for Fourteenth- and Fifteenth-Century Italian Altarpieces and Frescoes*, Ph.D. Diss., Warburg Institute, London, 1994, pp.100-105. Francesco del Cossa, for instance, was paid by the square foot of the commissioned painting. In a letter to his patron, the Duke of Ferrara, 25 March 1470, Cossa claimed a better payment as the more outstanding artist: '...illustrious lord, if your lordship wished give me no more than ten pennies per foot...'; C. Gilbert, *Italian Art 1400-1500: Sources and Documents*, New Jersey, 1980, pp. 9-10. Due to the lack of written evidence, it remains difficult to uncover for certain the correlation between size and commercial value in Venice in the fifteenth century. However, it emerges from the correspondences between Isabella d'Este and Giovanni Bellini that the size of the painting was an important fact in valuing the commission together with the number of depicted figures. See above footnote 8 in p.211.

To analyze the developments and changes in Bellini's workshop output, this study offers seven diagrams, each of which shows the distribution of each size of Bellinesque painting every ten years from the 1450s until the 1520s [Table 8].

Table 8(a) illustrates that the sizes of Bellinesque paintings dated to the 1450s are mainly confined to within 80cm in height and 60cm in length, but they are distributed sporadically over the decade; no two are of exactly the same size. One has the impression that at this stage workshop activity was not standardised.²¹

The present analysis suggests that as early as the 1460s Bellini introduced a more mechanical procedure of painting execution to cope with increasing commissions to the workshop. Although a large number of Bellinesque panels from the 1460s [Table 8(b)] measure 20cm to 80cm as in the 1450s, the degree of distribution appears more regular than in the previous decade and, significantly, there is some emphasis on the sizes of 30cm by 20cm, 60cm by 40cm, and 80cm by 60cm, which will also be well represented in the 1470s [Table 8(c)]. To some extent, Table 8(c), the 1470s, is quite closely comparable with Table 8(b), the 1460s. At the same time, quite large size productions are commissioned more often in this period than in previous decades.

Discussing the scientific data obtained by the modern conservation of the *Assassination of St Peter Martyr* (c.1510, 63.8cmx100.4cm, Courtauld Institute, London), Jennifer Fletcher writes that '... comparison with other Bellini compositions of the same period indicates that panels of the same height and constructions were often used by the workshop...'. If the vertical rectangular panel of about 60cm by 100cm, is readily convertible to a horizontal rectangular 100cm by 60cm, one can suppose that this size of panel was the standard size used in Giovanni Bellini's workshop in the 1480s [Table

²¹ Little is known about Bellini's workshop in his early years. From the regulation of the Venetian painters' guild, the *Arte dei Dipentori*, it may be assumed that he is likely to have had two apprentices and employed assistants for extra help. Robertson puts forward the idea that Lauro Padovano worked in his workshop as an assistant and was responsible for the *St Vincent Ferrer Altarpiece*; G. Robertson, *Giovanni Bellini*, Oxford, 1968, pp.47-52. However, his argument is based only on his own formal analysis, and has now been refuted by recent scholarship; M. Lucco, 'Venezia 1450-1500', *La Pittura nel Veneto: Il quattrocento*, Milan, 1990, p. 410; P. Humfrey, 1993, *op. cit.*, p.342; N. Huse and W. Wolters, *Venedig: Die Kunst der Renaissance-Architektur, Skulptur, Malerei 1460-1590*, München, 1986, pp.215-20.

8(d)]. More than three fifths of Bellinesque paintings dated to the 1480s are reported to measure 60-100cm height and 50-70cm length.

It comes as no surprise that the systematic operation of production in Bellini's workshop seems to reach its peak in this decade. It was only in 1483, that is one year after he was appointed as an official painter to the state, *pictor nostri Dominij*, that Giovanni Bellini was exempted from all the obligations to the *Arte dei Depentori*,²² and was thus able to extend the size of his workshop and to conduct a more institutional establishment by taking on a greater number of pupils and assistants than was normally permitted.²³

The three Tables [Tables 8(e), 8(f), and 8(g)] for the later decades show different characteristics from the earlier ones, particularly for the 1480s [Table 8(d)]. Any conformity found in Tables 8(a), 8(b), 8(c), and 8(d), does not apply to the later examples. In addition, it seems that the emphasis in production shifted to a greater extent from small devotional paintings to single large altarpieces and mural paintings on textile support.²⁴

²² G. Lorenzi, *Monumenti per servire alla storia del Palazzo Ducale di Venezia*, Venice, 1868, doc.197, pp. 92. The *figureri* painters belonged to the painters' artists guild, the *Arte dei Depentori*, equally with other painting craftsmen such as leather and cloth painter. The Venetian painters' guild, which was set up in the thirteenth century, and is regarded as one of the oldest painters' guilds in Italy. It seems to have been a humiliation to the Venetian painters to be equated with other crafts belonging to the guild, as they became increasingly aware of their new sense of calling at the turn of the century; Huse and Wolters, *ibid.*, p.177. In 1511, Venetian figure painters attempted to extend their influence in the painter's guild, but the Venetian Government rejected their petition on the basis of ancient custom and order, '*modo et ordine antiquo*'. It is unlikely that Giovanni Bellini listed his name in the 1511 petition, headed by Cima da Conegliano, as he had been exempted from guild regulations.

²³ In 1492, as leader of the project to decorate the Hall of the Greater Council in the Ducal Palace, on which he had worked since the 1470s, Bellini recruited five assistants, Cristoforo Caselli, Lattanzio da Rimini, Marco Marziale, Vincezo dalle Destre, and Francesco Bissolo, and two unnamed apprentices, *fante*; F. Gibbons, *op. cit.*, 1965, p.147. It is from this time on that Bellini can be seen as a teacher of the next generation of Venetian artist. Towards the end of the fifteenth century, Vincenzo Catena, Giorgione, Palma Vecchio, Lorenzo Lotto, all born in the late 1470s, all belonged to his workshop, and Titian may have joined a little later; J. Wilde, *Venetian Art From Bellini to Titian*, Oxford, 1974, p.59. At the end of his life, three assistants were still active in his workshop, namely Vittore Belliniano, Girolamo da Santa Croce, and Rocco Marconi.

7.2 Drawing

Drawing was a basic artistic tool that contributed to the organisation of the various members of Bellini's workshop into an unified production line.²⁵ In order to understand the operation of Bellini's workshop, therefore, his drawing practice should be examined.

Mantegnesque Pen-and-ink Drawing

The definition of Bellini's drawing practice has been obscured by the lack of confidence in the authorship of his drawings.²⁶ The long controversy over attribution is highlighted in the drawing, *St James Led to Execution* (British Museum, London) [Plate 22]. Whereas scholars admit a relationship with the fresco of the Ovetari Chapel, they are largely divided into two categories as to the author of the drawing: seen either as Mantegna's preparatory work or, else, Bellini's copy of an original study by Mantegna.²⁷

The most astonishing technical aspect of the British Museum drawing, *St James Led to Execution* [Plate 22], done with pen and ink, is its variety of hatching, which can be divided into at least four different types in terms of direction; (a) vertical hatching; (b) diagonal hatching, top left to bottom right; (c) diagonal, top right to bottom left; (d) horizontal hatching [Plate 23]. The question arises as to why the artist of this drawing employed such different hatchings, since one or two types of hatching would suffice if he wished simply to examine modelling. In the *St James Led to Execution*, in effect, the artist of the drawing was not only aware of the creation of formal unity by the management of hatching, but also attempted to distinguish each main figure by the use of different hatchings; vertical hatching, for St James, far left; mainly type (a), (b) and (c) for the kneeling figure; and then again type (a) for the soldier in the middle; type (c) for the nude soldier in the foreground; finally type (d) for the far right figure [Plate 22]. In addition, the hatching may function as a pointer for the movement of figures' body and drapery. To

²⁴ See Conclusion, for the increasing emphasis of canvas painting in Bellini's late activity.

²⁵ For the discussion of Venetian drawing, see H. Tietze and E. Tietze-Conrat, *The Drawing of the Venetian Painters in the 15th and 16th Century*, New York, 1944, p. 5.

²⁶ A majority of the drawings formerly believed to be drawn by Bellini have been recently attributed to Mantegna; *Andrea Mantegna*, Exh. Cat., London, 1991. It is incomprehensible that Bellini should have worked without drawing. Most of the biographies of Venetian painters start with the statement that they copied drawings; H. Tietze and E. Tietze-Conrat, *ibid.*, pp.1-28.

²⁷ For recent bibliographical survey, see *Andrea Mantegna*, Exh. Cat., London, 1991, p.135.

clarify the gesture of the kneeling figure, type (a), (b), and (c) were used systematically from the head downward. In contrast, vertical hatching, type (a), is employed for the two standing figures in the left foreground. The direction of the action of the soldier, pushing back the spectators in the foreground, is intensified by the diagonal hatching, type (c). As to the far right figure, being pushed back by the soldier, the horizontal hatching of type (d) is employed. Therefore, it seems more plausible to say that these various types of pen hatching were employed to work out the painter's intention, not to copy somebody else's composition. As the drawing is very probably a preparatory work for the Ovetari Chapel, its authorship should be given to Andrea Mantegna.

Another drawing process found in the *St James Led to Execution* that further supports its attribution to Mantegna is that some of the figures in the drawing are depicted as if they had first been nudes, but afterwards clothed. The body of St James, and of a soldier standing in the middle, can be discussed through the draperies, whereas the group of people on the left even remain naked. This technical procedure is in exact agreement with Leon Battista Alberti's recommendation in his treatise on painting, published in about 1435; 'Before dressing a man we first draw him nude, then enfold him in draperies'.²⁸ While Alberti's book was also available to Giovanni Bellini, historical evidence indicates that the Paduan painter Mantegna was in much closer contact with Alberti, and was more profoundly influenced by his theories than was Bellini.²⁹

As the *St James Led to the Execution* can be more securely attributed to Mantegna, the drawings which have most in common with this in terms of the experimental use of hatching by pen and ink, such as the *Entombment* (Pinacoteca Tosio-Martinengo, Brescia), the *Dead Christ* and *Mourning Women* (British Museum, London), should also be linked to Mantegna, rather than to Bellini. The hatching types, observed in the St James drawing, again appear in a study for the *Entombment* (the Pinacoteca Tosio-

²⁸ '...sed veluti in vestiendo prius nudum subsignare oportet quem postea vestibus obambiando involuamus, sic in nudo pingendo prius ossa et muscoli disponendi sunt, quos moderatis carnibus et cute ita operias, ut quo sint loco muscoli non difficile intelligatur.'; L. B. Alberti, *Della Pittura*, ed. by C. Grayson, London, 1991, pp. 74-75.

²⁹ Moreover, this drawing practice is also seen in other Paduan drawings. In a drawing of the *Legend of St Christopher*, assigned to Nicolo Pizzolo, another main assistant in Squarcione's workshop, some of main figures were firstly depicted in the nude. For a reproduction of the drawing, see H. Tietze, 'Mantegna and his companions in Squarcione's Workshop', *Art in America*, (30), 1942, pp. 54-60.

Martinengo, Brescia) [Plate 23]. Although the handling of line is more thin and broken, probably due to the use of a sharply-pointed pen, the variety of hatching is comparable with the *St James Led to Execution* [Plate 22]. In the body of Christ in the *Dead Christ* and the *Mourning Women* (British Museum, London), the verso of this drawing, similar hatching has been employed, although the use of the cross-hatching and the retracing of some outlines by a broad-ended pen are more pronounced.³⁰

Apart from the above group of drawings which we have seen as examples of Mantegna's drawing, there are several others, which have also often been attributed variously to Mantegna or Bellini. The authorship of the *Pietà* (Accademia, Venice) [Plate 24], for instance, remains a key issue. This *Pietà* shares a linear geometric quality with the other Mantegnesque drawings, but it shows different drawing methods from those I have designated as characteristic of Mantegnesque drawings. The hatching employed in this drawing, mainly devoted to indicating shade and the tonal gradation, does not reinforce any movement made by the figures. This kind of hatching is also found in the *Paris Pietà* (Louvre, Paris) [Plate 25] and the *Nativity* (Courtauld Galleries, London) [Plate 26]. In the case of the *Nativity*, Wilde rightly noticed that 'the use of the constantly broken vibrating lines' or hatching aimed to increase the effect of light and even colour.³¹

The hatching used in these three drawings are all used to create the effect of light and colour, rather than movement. It is tempting then to assign these drawings to Bellini, who was strongly influenced by Mantegna in his formative years, but who gradually evolved his own artistic language with its emphasis on light and colouristic effect, as discussed in Chapter 3.³² The attribution of these drawings to Bellini can be further supported by the recent findings of underdrawing in the early Bellinesque paintings in the Museo Civico Correr, Venice. Detailed and precise preparatory underdrawing was found by infra-red on

³⁰ One may still question the authorship of these preparatory drawings, since the stylistic range of Mantegna's finished paintings and drawings is otherwise so limited throughout his long career, but an examination of infra-red reflectography reveals an interesting aspect of Mantegna's working practice. Mantegna's underdrawing confirms his varied approaches to drawing technique, even in a single painting: from fine and meticulous line, possibly with assistance of transfer technique, i.e. cartoon, to line drawn very freely; this is well illustrated in Keith Christiansen's essay in the Royal Academy Exhibition in 1991; K. Christiansen, 'Some Observations on Mantegna's Painting Technique', *Mantegna*, Exh. Cat., London, 1991, pp.71-75.

³¹ Wilde, *op. cit.*, pp.26-28.

³² See pp.126-32 in Chapter 3.

three of the four examined Bellinesque panels, dated to the 1450s and 60s: the *Transfiguration*, the *Dead Christ with two Angels*, and the *Madonna and Child* (Museo Civico Correr, Venice)[Plate 27].³³ Drawn with a brush, they share similar features in method and purpose to the underdrawing of the *Blood of the Redeemer* discussed earlier, but hatching is more widely employed. Although the underdrawing cannot be attributed to the same hand due to the difference of the brush strokes in each of the paintings, the consistent hatched lines from top right to bottom left are heavily applied in accordance with the change of tonal degree, as seen in the above three drawings. This underdrawing method suggests that this hatching technique was widely practised in Bellini's workshop.

An attribution of the two *Pietà* drawings and the *Nativity* to Bellini must still remain speculative, since the difference of pen strokes between these three drawings indicate that they, too, were drawn by various hands.³⁴ All one can say with certainty about Bellini's early drawing practice for the present moment is that he was familiar with Mantegna's drawing from his formative years and that the hatching apparent in the *Nativity* and the two *Pietà* can be closely associated to Bellini in terms of their drawing technique.

Black Chalk Drawing

It is difficult to examine Bellini's drawing method in depth, since there is no securely autograph drawing which could serve as a touchstone for his initial drawing practice. One can, however, understand some characteristics of drawing practice in Bellini's workshop by looking into circumstantial examples from the back of his panels. In 1932, Fogolari reported several drawings executed on the backs of Bellinesque panels with chalk which are dated to the 1460s.³⁵ Similar examples are reported by Urbani who examined the back

³³ A. Dorigato (ed.), *Carpaccio, Bellini, Tura, Antonello e altri restauri quattrocenteschi della Pinacoteca del Museo Correr*, Milan, 1993.

³⁴ R. Goffen, 'Bellini disegnatore e la sua attività giovanile', *Carpaccio, Bellini, Tura, Antonello e altri restauri quattrocenteschi della Pinacoteca del Museo Correr*, A. Dorigato (ed.), Milan, 1993, pp.17-24.

³⁵ G. Fogolari, 'Disegni per gioco e incunabili del Giambellino', *Dedalo*, (12), 1932, pp.360-90. The presence of drawings on the back of Bellinesque panels was also reported by Frizzoni; G. Frizzoni, 'Opere di pittura veneta lungo la costa meridionale dell'Adriatico', *Bolletino dell'Arte*, (8), 1914, pp.23-40. Since the presence of these drawing was reported, *A male nude with horse and dog* on the back of the St Peter Martyr (Museo Provinciale, Bari) has been attributed to Bellini [Plate 28(a)]. Here, Bellini's interest in classical antiquity seems to reach maturity. For the pose of the figure, a classical contrapposto was adapted more fluently. The details of anatomy must derive from antique sculpture, such as a Roman copy of the 'Spear-bearer'. The head of the Virgin, drawn near to the male nude, reflects his contemporary *Virgin and Child* type. It immediately recalls the head of the Virgin in the *Madonna and Child*, dated 1475-1480 (Accademia, Venice). On the other hand, the treatment of detail is quite comparable with his

of Bellini's panel of *St Peter Martyr*, dated to 1484 (Pinacoteca Provinciale, Bari) [Plate 28].³⁶

This type of drawing support, the wooden panel, may confuse scholars who are accustomed to paper and parchment as drawing materials. However, one should bear in mind that drawing on a wooden block was normal in a period when paper was not manufactured in sufficient quantities for painters to use it as a matter of course.³⁷

Due to their inconsistent quality, Robertson ascribed the sketches on the back of his panels to Bellini's pupils.³⁸ Although Bellini's participation in these drawings is open to question, their wide range of subject matter, from female nude to caricature-like head study, some remarkable draughtsmanship, and their spontaneous approach to the objects of study, have drawn academic curiosity.³⁹

What is of particular interest in the context of the present research, is the material that was employed in Bellini's workshop. The black chalk in these drawings suggests that this was already an important material in the Bellini workshop as early as the 1460s when the medium was still new. Black chalk, in fact, only came to be generally popular in the last quarter of the fifteenth century.⁴⁰ Only a painter completely confident in the use of oil-glazes for describing tonal gradation, could have been capable of similarly subtle

underdrawings for the Virgin's head, revealed by reflectographs. Brief lines used for eye and mouth are found in both the drawing and the underdrawings for the Virgin's head in the *Pesaro* and *San Zaccaria Altarpieces*.

³⁶ The scribbles of Bellini's workshop are found on the back of his panels, *St Peter Martyr*, dated to 1484 (Pinacoteca Provinciale, Bari); G. Urbani, 'Alcuni Disegni di Giovanni Bellini', *Arte Veneta*, (3), 1949, pp.87-89. The drawings on the back were scanned by infra-red when the painting was restored in the Istituto Centrale del Restauro in Rome.

³⁷ C. Cennini, *Il Libro dell'Arte*, Vicenza, 1971, Chapter 122.

³⁸ G. Robertson, *op. cit.*, 1968, pp. 42-43.

³⁹ Female nudes were found on the back of the *St Sebastian* panel and the centre panel of the *St Vincent Ferrer* altarpiece (San Giovanni e Paolo, Venice). At least five studies of a man's head were founded on the backs of the panels from the *Carità* and *St Vincent Ferrer* panels. Some may be from life, while others look more like pictorial jokes, i.e. caricatures [Plate 27]. Many of them were drawn in profile. There is an argument that this kind of study was reflected in his actual painting; a resemblance of this type of head to the head of St John in Bellini's *Agony in the Garden* (National Gallery, London) has been suggested. In addition, these studies of contemporary figures show strong links to Carpaccio's drawings, some of which were mounted by Vasari for his 'Libro di Disegni', with attribution to Giovanni Bellini; F. Ames-Lewis and J. Wright, *Drawing in the Italian Renaissance Workshop*, London, 1983, pp.172-175, cat. 34. There are also studies of a head of a baby apparently a study for a Virgin and Child and a roughly drawn foot of a lion, which reminds us of the studies of lions in Jacopo Bellini's drawing books. Although some of them have been assigned to Bellini himself by Heinemann, his active participation still remains open to question; F. Heinemann, *Bellini e i Belliniani*, Venice, 1962, plate 157, cat. 349.

⁴⁰ F. Ames-Lewis and J. Wright, *ibid.*, pp. 172-175.

gradations in black chalk.⁴¹ A yardstick for this subtlety is the delicate tonal change by chalk drawing, in the nude on the back of the *St Peter Martyr* panel [Plate 28].

Given this ability, Giovanni Bellini is the most likely author of the *Portrait of a Man* in black chalk on paper at Christ Church, Oxford [Plate 30]. Attribution of this drawing has oscillated between Andrea Mantegna and Giovanni Bellini, but considering its soft modelling and the effects of delicate light gradation, largely created by using chalk, it should be ascribed to Bellini. The modelling method used in this drawing and in the painting of *Doge Leonardo Loredan* (National Gallery, London) is remarkably similar, in spite of their difference in material [Plate 40].⁴²

Underdrawing in Workshop Paintings

Apart from the drawings which have been discussed so far, there are a number of highly finished workshop drawings which can be associated with Bellinesque paintings. It appears that these drawings were made by his assistants as a record of workshop production and then preserved for use in fulfilling future commissions. In practice, the motifs found in Bellinesque drawings often reappear in his later works. The drawing *Reclining Child* of the Ashmolean Museum, Oxford, for instance, is found in a Madonna painting in the Fogg Museum, Cambridge, Massachusetts.⁴³ Not only the figures and heads but also landscape was preserved in an institutionalized way. An example of a Bellinesque *simile* drawing of a landscape exists in the Ambrosiana, Milan and corresponds with the background of the *Resurrection* (Staatliche Museen, Berlin), attributed to Bellini with the help of an assistant. It is significant that the same landscape was reused in several workshop pieces some 25 years later.⁴⁴ The repetition of details and compositions was inevitable in the workshop's attempt to cope with the swelling number of commissions, and the repetition of successful motifs was sound practice.⁴⁵

⁴¹ F. Ames-Lewis and J. Wright, *ibid.*, p. 302; Dunkerton et al., *op. cit.*, 1991, pp.147-48.

⁴² The National Gallery catalogue, *Giotto to Dürer*, rightly attributes this drawing to Giovanni Bellini, pointing out the technical similarity, particularly in the soft modelling, between this drawing and the *Doge Leonardo Loredan* (National Gallery, London); Dunkerton et al., *ibid.*, p.147.

⁴³ Gibbons, *op. cit.*, 1965, p.151.

⁴⁴ *Ibid.*

To transmit designs to the actual painting, cartoons were certainly used in Bellini's workshop, and *spolveri* are found in some parts of the large-scale works, such as the *Pesaro Altarpiece* and the *Barbarigo Canvas*. It is, however, in small-scale Madonna paintings that cartoons were most frequently employed on a production-line basis. Infra-red photographs reveal *spolvero* dots on underdrawings, for example, of the *Madonna and Child* in the Rijksmuseum, Amsterdam, and the *Hague Madonna*, suggesting the use of a punched cartoon whose traces were then reinforced with the brush.⁴⁶ In the *Virgin and Child* (Rijksmuseum, Amsterdam), executed between 1465 and 1470, infra-red photographs have revealed underdrawing which reinforces tonal modelling beneath the face and hands of the child [Plate 31].⁴⁷ The underdrawing consists chiefly of contour lines, but in the faces a few lines were added to define facial details.⁴⁸ The larger dots along the legs have been reported to be 'reinforced dots of a first tracing' after the use of a cut-out stencil, or to be 'due to the use of a very crude punched cartoon'.⁴⁹

In another *Madonna and Child* in the Rijksmuseum, Amsterdam, dated 1475-80, the underdrawn contour of the child's right hand is visible through the paint layer [Plate 32], and infra-red photography reveals that both the Madonna and the Child are underdrawn.⁵⁰ The shadows and drapery are drawn 'with regular, closely-spaced oblique hatchings'.⁵¹ The dots found in the hand of the Virgin and the Child suggest the employment of a partial cartoon.⁵²

Besides apparently extensive use of cartoons, Bellini's workshop productions can be further distinguished from those of the master by detailed underdrawing.⁵³ When not

⁴⁵ This was also fairly common in fifteenth-century Italian painting. For example, figural motifs are repeated and adopted frequently by the Pollaiuolo.

⁴⁶ van Os et al., *op. cit.*, pp. 29-51.

⁴⁷ *Ibid.*, pp.29-33.

⁴⁸ Some outlines in the hands have also been tentatively redrawn, but hatching is not found; *Ibid.*

⁴⁹ *Ibid.* The application of stencil for underdrawing was a fairly rare technique.

⁵⁰ *Ibid.*, pp. 34-38.

⁵¹ Although some of the dots appear to be terminating hatching strokes, others are unrelated to such shading and seem to be due to the use of a punched cartoon; *ibid.*, p.38.

⁵² The scientific examination has reported that 'the lower hand in this painting appears to be the mirror image of the comparable hand' in the *Virgin and Child in Venice*; *ibid.*, p.38. For a reproduction of the Venice panel, see T. Pignatti, *L'opera completa di Giovanni Bellini*, Milan, 1969, no.89. The possibility of the application of a reversed cartoon has been proposed; H. van Os et al., *op. cit.*, p.38.

⁵³ I cannot give enough examples of the evidence of extensive cartoons in the Madonnas issuing from Bellini's workshop, as infra-red study has not been fully employed to examine a vast number of the surviving Bellinesque

using cartoons, his workshop team was able to apply underdrawing design to the panel with the aid of a painted prototype or perhaps the drawing used for an earlier composition. In these cases, the underdrawing often follows contours precisely as for example in the *Virgin and Child* of c.1510 in the Accademia, Venice. The contour of the figure in the *Greek Madonna* (c.1475, Brera, Milan) was drawn using charcoal and was later strengthened with colour for the modelling.⁵⁴ An infra red photograph of Giovanni Bellini's *Virgin and Child* dated to the 1480s, in the Harewood Collection, Yorkshire, also illustrates that the underdrawing defined the forms neatly by means of elaborate hatching.⁵⁵

The application of cartoon and precise underdrawing are the standard methods of Bellini's workshop production, but that is not to say that those works without detailed underdrawing are necessarily the work of the master. Members of his workshop could also paint without underdrawing directly on the panel when the composition existed in the form of drawings. For instance, the poses of St Peter and his assailant in the *Assassination of Saint Peter Martyr* (Courtauld Institute, London) appear to be modifications of those in the National Gallery version (National Gallery, London). This suggests that Bellini made a drawing for the original painting which could be reused in later paintings.⁵⁶

Equally, none of Bellini's major works, which have been examined by infra-red, showed any detailed drawing after the 1470s. Brief, free-hand drawing seems to be Bellini's standard underdrawing method from the 1470s onward, when he shifted emphasis from graphic quality to the creation of 3-dimensional volumetric form. Yet, his workshop members remained faithful to the practice of detailed underdrawing, often executed with the aid of cartoons, as an indispensable guideline to the master's original compositions.

Madonna paintings. Yet, it seems plausible that the use of cartoons in the workshop was probably more widespread than present evidence suggests; for the development of the punched cartoon in Italy and its phenomenon, see C. Bambach Cappel, *The Tradition of Pouncing Drawings in the Italian Renaissance Workshop; innovation and derivation*, Ph.D. diss., Yale University, 1991.

⁵⁴ R. Tardito (ed.), *Giovanni Bellini a Milan*, Milan, 1987, pp.10-13.

⁵⁵ R. Goffen, *op. cit.*, 1993, p.20. This drawing was shown by Ms Caroline Villers in a lecture on oil painting technique at the Courtauld Institute. I thank Ms. Villers for her kind letter informing of the details. The underdrawing in the face of the Virgin Mary in the *Madonna degli alberetti* (inscribed 1487, Accademia, Venice) has been partly revealed by overcleaning earlier in this century, and is visible to the naked eye.

⁵⁶ Dunkerton et al., *op. cit.*, 1991, p.148.

The most exceptional of Bellini's underdrawing methods seems to have been found in his canvas paintings in his late years and this will be dealt with in the final chapter.

7.3 The Making of Madonna and Child compositions

Giovanni Bellini's workshop was kept consistently busy meeting orders flooding in from Venice and the surrounding area. His workshop team would have been employed to undertake mechanical tasks such as the preparation of pigments, wooden panel work, and preparing ground and underdrawing even in important commissions requiring his authorship. The role of his workshop was certainly more extensive in the case of relatively modest-size devotional panels such as Madonna and Child compositions. To examine the practice of Bellini's workshop, therefore, this study will look into the painting techniques employed to produce modest size devotional works. In an initial effort to understand the crucial issues involved in Bellini's workshop production such as differences in terms of painting methods compared with authentic works and how the technical elements may indicate the way in which the master and his assistants communicated, I will look specifically at two late Madonna and Child compositions, attributed to Bellini's workshop; the *Virgin and Child with a Donor*, c.1490, (83.2x67.5cm) [Plate 33] and the *Virgin and Child* on canvas, c.1480, (transferred originally from panel?, 55x44cm)[Plate 34]. Both works are in private collections and scientifically examined at the UCL Painting Analysis Unit. For brevity, the former is to be referred to as Madonna (A) and the latter as Madonna (B).⁵⁷

⁵⁷ The Madonna (A) was examined by UCL Painting Analysis Unit, before the auction scheduled in Christie's in London on 13th December, 1996. This work is generally accepted as Bellini's workshop production; B. Berenson, *Italian Pictures of the Renaissance; Venetian School*, vol.1, New York, 1957, p.32.

The authenticity of Madonna (B) is unclear. It has no provenance and is not mentioned in the literature. According to the conservators, Henry Gentile, it was brought from America recently by a British owner. It seems that in spite of heavy repaint in the figurative areas and the loss of paint, this piece of work is closely related to Bellini's Madonna and Child composition of the 1470s and 80s such as the *Contarini Madonna* (1470s, Accademia, Venice) and *Madonna degli alberetti* (1488, Accademia, Venice) in terms of style. The linear underdrawing and the original composition seen from the back of canvas make its attribution more plausible. UCL technical reports reached the same conclusion on the basis of technical studies; [C. 1183]. The author has had opportunity to examine these two works at first hand. See Cat. 11 and 12 in Appendix 3.

Support

Madonna (A) was painted on a wood panel which consists of two parts joined vertically, but surprisingly, the support of Madonna (B) is linen. The latter looked like a copy or transfer at first, since none of Bellini's Madonna and Child compositions have ever been reported as being on textile supports. Closer stylistic and technical examination confirmed its traditional attribution to Bellini's workshop, but still left uncertain the original nature of its support. The method was generally identical with his panel works, but the transfer of painting support at some stage from panel to canvas might have caused more extensive loss of paint film than is evident in the painting's present condition. If its support is confirmed by further examination as original, this would make it a unique example of its kind. The author leaves this question in the balance for the moment.

The wood used in the Madonna (A) appears to be poplar on the basis of visual analysis. Poplar is known to have been the painting support most frequently used in Italy, but cannot be easily attributed in a Venetian example. Scientific analysis has detected that wood panels of fifteenth-century Venetian paintings were varied, including fir and oak.⁵⁸ Amongst the fifteen Venetian panel works from the Museo Correr, Venice, ten were on poplar, but three panels were painted on fir and two on oak. In the Core Works surveyed in this study, none of the central Italian works were reported to be painted on either fir or oak. There is however given lack of data, a risk in drawing a firm line between Central Italian and Venetian works in their uses of wood, but it does seem to reflect certain events in Venetian history; that is to say, timber shortages in the Venetian Isles. Although poplar was widely grown on the Italian peninsula, it seems not to have been readily available in Venice. In fact, all timber required in Venice was imported from outside and strictly controlled by the Venetian Government.⁵⁹ Thus, the scientific analysis of wooden panels employed in Venetian paintings imply that their local painters had to improvise for their

⁵⁸ The panel of Gentile Bellini's *Portrait of Doge Giovanni Mocenigo* (62x45) and Carpaccio's *Two Women* (95x65cm) were identified as fir; Marco Marziale's *Crucifixion* and *the Portrait of a young man* attributed to anonymous Venetian painter were executed on oak; A. Dorigato (ed.), *Carpaccio, Bellini, Tura, Antonello e altri restauri quattrocenteschi della Pinacoteca del Museo Correr*, Milan, 1993. All these works are in Museo Correr, Venice.

⁵⁹ F. Lane, *Venetian Ships and Shipbuilders of the Renaissance*, Baltimore, 1934; Huse and Wolters, *op. cit.*. I am sceptical as to whether the timber shortage ever provoked the use of canvas in Venice. It was the function of fresco that textile support first replaced.

supports using various types of wood such as fir and oak which were imported from Northern Italy and the Adriatic coast to Venice as architectural and shipbuilding materials.

Preparation

Gesso ground was found in both Madonnas. Lead white imprimatura which was frequently employed over gesso ground in Bellini's works was not detected in the Madonna (B), but was found in the Madonna (A) with traces of black. This grey imprimatura is unusual and its role is not clear. A possible explanation is the link with incised lines used later at the underdrawing stage. The white gesso showing through this pale grey layer when incised would have provided an easier guide for the painter working on it.

The gesso ground layer of these two Madonnas are simple and consistent, but evidence from Bellini's other Madonna and Child compositions suggests some confusion between the master and his assistants. The preparation consisting of multiple gesso layers is one of the characteristics of Bellini's works⁶⁰, but this may have been confusing to the novice, who may have begun training in the preparation of gesso for small and modestly sized panels. An odd feature in the gesso ground of the *Madonna of the Meadow* (c.1505, National Gallery, London) where gesso grosso and gesso sottile are applied in the wrong order, is probably due to a mistake on the part of an inexperienced apprentice.⁶¹

Underdrawing⁶²

A continuous dark line, seemingly drawn with a fluid medium, is found in the flesh area in Madonna (B) and its application is more evident, when seen from the back of the canvas against a strong light [Plate 34 (a)]. The black substance of the drawing was identified as plant black, which means that the drawing medium is more likely to be paint than ink. Probably the drawing was done with a fine sable brush and paint, indicating a varying range of tools employed underdrawing in Bellini's workshop.

⁶⁰ For discussion of Bellini's method of careful preparation as evidence of his fine craftsmanship, see Chapter 6.

⁶¹ The fine pure white gesso sottile is at the bottom, near the panel, whereas a coarse brownish gesso grosso is the nearest to the paint layer, J. Plesters, 'Cross section and Chemical Analysis of Paint Samples', *Studies in Conservation*, (3), 1955, pp. 183-93.

The Madonna (A) shows a more complicated process of underdrawing consisting of two forms of drawing. Incision using metal-point preliminarily outlined the composition and then further positioned facial details and occasional indications of shadings.⁶³ Its use was limited and suggestive, whereas black chalk drawing, employed after the incising, was more carefully handled to define the outlines of the main features of the figures and areas of shadow [Plate 33(a)]. The incised lines can now be seen on the surface when it is lit from the side. They show a series of free-hand lines etched into the pale grey imprimatura [Plate33(b)]. Sharp and ruled incised lines were used to draw the architectural structure and detail in Bellini's works from his early working years and are also used here on the parapet, but its extensive use in figurative areas was not found in his works discussed above. Black chalk was adopted in the 1470s as Bellini's main drawing material with his increasing emphasis on an oil medium. Its presence in the Madonna (A) is most clear in the places where the painter has changed his mind and shifted the outlines. Parallel hatching strokes using black chalk are found on the right-hand side of the donor's neck.

The underdrawing of Madonna (A) can shed some light on the drawing practice of Bellini's workshop. The incised marks in this work resemble brief annotations, rather than the careful outlines normally associated with incised line drawing, for instance Sassetta's St Francis cycle (1460s, National Gallery, London).⁶⁴ These free-hand incised lines and subsequent application of more accurately handled black chalk drawing imply the two different stages of underdrawing executed by painters of different status in the workshop. It can be hypothesized that a quick preliminary drawing was first made on the prepared panel perhaps by the master himself and then a more exact outline in black was made by another artist in the workshop. This is purely speculative, but such a division of labour was normal in Renaissance workshop practice.

⁶² The Madonnas [A] and [B] were not examined by microphotographic analysis such as X-ray and infra-red photographs. The discussion of their underdrawing method are based on visual analysis.

⁶³ Before employing metal point, there might be a certain proto-type in forms of drawing or finished work, which Bellini or his assistants consulted. Freer use of metal points ruled out the use of cartoon.

⁶⁴ J. Plesters, 'A Technical Examination of Some Panels from Sassetta's Sansepolcro Altarpiece', NGTB, (1), 1977, pp.3-17.

Paintwork

The pigments used in both works generally conform to the range of colours found in Bellini's authentic works and their meaning has been discussed in Chapter 1.⁶⁵ This section is mainly concerned with the method of their application

With the assistance of underdrawing, paint was applied in one area after another. In the case of Madonna (B), the cross-section obtained from the border between the green landscape and sky background, to the left of the Virgin, shows the white of the sky underneath the green paint and similarly the dark blue of the Madonna's cloak at the right hand side has traces of malachite green from the background in the lower layers, showing that the green landscape was painted before the cloak[Plate 34(b)]. These strata of paint layers indicate the order of execution in Madonna (B); the sky background first, green landscape, and then the drapery and flesh. This conventional technique was generally practised in the Bellini workshop, particularly for the execution of his modest-scale workshop productions in which the paintwork was more faithful to the guideline given by underdrawing.

In such a schematic order of painting, various workshop members could join the picture-making at any stage of the painting process. The presence of different hands is evident in Madonna (A), which is more complicated in terms of composition. In the porcelain smoothness of the flesh on both mother and child, the paint is thin and individual brushstrokes are not found, whereas the flesh paint of the donor has been laid on quite thickly using bold strokes. Such a difference points to another hand at work within the workshop to paint the donor's profile.⁶⁶

Simple paint layers kept to a minimum in both Madonnas distinguish Bellini's workshop production from what is thought to be Bellini's autograph work. As he exploited the painting techniques associated with the oil medium, the number of paint layers found in his major works generally tend to increase from the 1470s, and the intense chromatic effects created by the interplay between underlayers and top glazing layers culminated in

⁶⁵ See pp.69-72 in Chapter 1. For the range of colour used in the works, Cat. 11 and 12 in Appendix 3.

the *San Zaccaria Altarpiece*. The Madonna (A) is dated to the 1490s, but the cross-sections taken from it show only two layers of paint at most, but generally only one [Plate 33 (d), (e)]; similar structures are found in Madonna (B), dated to c.1480 [Plate 34 (b), (c)]. These examples are, in fact, even simpler, compared with those of the *Pesaro Altarpiece*. The most plausible explanation for this phenomenon is the effort to reduce the time required for production. It appears that Bellini succeeded in this goal without compromising the chromatic effect too much as his contemporaries valued this as a speciality of Bellini's work.⁶⁷ In the case of Madonna (A), the pale grey imprimatura not only provides an extra smooth ground, but also plays the part of a middle tone immediately underneath the paint film and thus unifies the chromatic composition.

The effort to save production time is suggested by Madonna (A), in which an extraordinarily elaborate system of decoration was begun but not completed. On the lower right hand side of the head-dress, where it disappears behind the baby's hand, the warm yellow of the leaf decoration has been covered with a minute series of small white dots [Plate (c)]. This decoration continues upwards, until about the level of the Virgin's chin, where it fades out. A relatively simple painted pattern replaces these dots. The UCL Painting Analysis Unit Report raised questions about this change; 'it could be that the painter had intended to decorate the whole of the head-dress in the same meticulous fashion. Did he run out of patience?', or 'was it the patron who ran out of patience, and the painter of time?' We do not know the exact reason for this change; this could be the result of a simple change of mind. What can be assumed from this kind of technical feature are the working conditions of Bellini's workshop where several versions of Madonna and Child compositions were continuously being executed with cooperation between the workshop members.

Conclusion

The workshop that Bellini maintained from the beginning of his independent career seems to have played an important part in his prolific activities, undertaking mechanical tasks in

⁶⁶ This is the observation made by L. Sheldon and C. Hassell; UCL Painting Analysis Unit, C.1094.

⁶⁷ For discussion of Bellini's colouring method at the turn of the century, see Chapter 6.

prestigious commissions and taking more prominent role in the manufacture of relatively small-size devotional panels. This chapter has argued that it was in this latter field of production that systematic manufacturing methods were employed. The sizes of wooden panels were standardised and precise underdrawing, often drawn with assistance of a cartoon, was used to approximate the master's technique.

The meticulous picture-making techniques found in Bellini's workshop production seem to contradict his overall approach to painting, particularly on canvas supports, which became more spontaneous and direct towards his last years. In fact, although the painting technique of Bellini's studio production reflects his own development of painting methods, it seems to have been more conservative. It should, therefore, not be confused with his own methods and should be considered independently. The next chapter will focus on Bellini's late painting techniques based on canvas as a conclusive statement of his innovative application of painting materials and methods.

Chapter 8

Canvas; Bellini's Last Years

The present study has made it clear that textile support was used by Giovanni Bellini in his formative years and was increasingly adopted to decorate the walls of important meeting rooms in the 1470s and 80s.¹ Bellini continued to produce his works using canvas in his late years and the majority of these canvases served as mural paintings. His priority in his last period was still given to the completion of the mural canvas cycles in the Great Council Hall, which he was in charge of since 1479.² The *Baltimore Canvas; the Virgin and Child with Saints and Donors* (Walters Art Gallery, Baltimore) dated to c. 1505, was initially displayed in the *procuratia* in the Ducal Palace.³ The *Martyrdom of St Mark* (c.1515-26, Scuola Grande di San Marco, Venice) is a mural canvas, which is still in its original position on the entrance wall of the former albergo of the Scuola di San Marco, now the library of the Ospedale Civile.⁴ A companion piece, the *St Mark Preaching in Alexandria* (c. 1504-7), now in the Brera, Milan, decorated the facing wall.⁵

¹ Bellini's earlier documented commissions for canvases were, then, produced to cover the walls of important meeting places: the Scuola di San Girolamo (c.1464); the Scuola Grande di San Marco (c.1466); For a survey of the documents, see P.F. Brown, *Venetian Narrative Painting in the Age of Carpaccio*, New Haven and London, 1988, pp.266-277;. Bellini's earliest surviving canvas, the *Barbarigo Canvas*, was executed as a mural decoration, as discussed in Chapter 5.

² For his activity in the Ducal palace in the sixteenth century, see G. Lorenzi, *Monumenti per servire alla storia del Palazzo Ducale di Venezia*, Venice, 1868, docs. 296, 347, 349, and 350.

³ Ridolfi described the *Baltimore Canvas* in 1646 as displayed in the *Procuratia* of the Ducal palace; C. Ridolfi, *Le Maraviglie dell'Arte*, Padua, 1835, pp.84-99; G. Robertson, *Giovanni Bellini*, Oxford, 1968, 123-4.

⁴ Giovanni Bellini took over his brother's job to decorate the former albergo of the Scuola di San Marco, after Gentile's death in 1507. Gentile consigned his father's 'librum designamentorum' to his younger brother Giovanni on the condition that he was to complete any unfinished studio commitments; P. Molmenti, 'I pittori Bellini: Documenti e ricerche', *Archivio veneto*, (36), 1888, pp.231-232. Giovanni Bellini later completed the *St Mark Preaching in Alexandria* (Brera, Milan). The *Martyrdom of St Mark* (c.1515-26, Scuola Grande di San Marco, Venice), left unfinished by Giovanni himself, was signed and dated by Giovanni Bellini's follower Vittore Belliniano in 1526, ten years after the master's death.

⁵ For the documents concerning the Scuola di San Marco, see Molmenti, *ibid.*, p. 233. See also P. Humfrey, 'The Bellinesque Life of St Mark Cycle for the Scuola Grande di San Marco in Venice in Its Original Arrangement', *Zeitschrift für Kunstgeschichte*, (48), 1985, pp. 225-242.

The canvases by Giovanni Bellini, mentioned above, have two defining features; they were public commissions and they were murals.⁶ However, as private individuals began to develop a greater interest in paintings on canvas since the mid-fifteenth century, a wider variety of functions were required for canvas. The support of Bellini's devotional works and portraits was predominantly wooden panel, but, among his late works, the *Dead Christ* (Scuola Grande di San Rocco, Venice) and the *Portraits of a Dominican* (inscribed 1515, National Gallery, London) were painted on textile support.⁷ The *Drunkenness of Noah* (103x157cm, Musée des Beaux-Arts, Besancon) is unlikely to have been displayed in a public space, considering its modest dimensions.⁸ The *Incident in the life of Scipio* (74.8x356.2cm, c.1507-8, National Gallery of Art, Washington) and the *Feast of the Gods* (170x188cm, c.1514, National Gallery of Art, Washington) were mural paintings, but were commissioned for the decoration of private palaces.⁹

Bellini tried to apply his experience of oil-on-panel paintings to canvas in the 1470s and 80s, but in the early sixteenth century, as major official commissions in textile support continued and a greater number of private individuals developed an interest in paintings on this type of textile support, Bellini seems to have found it necessary to modify his painting technique based on panel for the execution of his canvas works. This chapter, which focuses on Bellini's late painting practice on textile support, will reveal that Bellini changed his painting method in accordance with the demands of the different painting support towards the end of his life. It will show that Bellini adopted a freer and more varied approach to canvas painting and, in consequence, the perfectionist craftsmanship of Bellini's panel painting method was considerably relaxed in his late canvas painting.

⁶ Doge Barbarigo wanted his devotional painting on canvas and the *Baltimore Canvas* was commissioned from Bellini by three Venetian magistrates. These two commissions were made under the official approval, since they were placed in the Ducal Palace. E. Packard, 'A Bellini Painting From the Procuratia di Ultra, Venice', *the Journal of the Walters Art Gallery*, (33-34), 1970/71, pp.64-84.

⁷ Until then, it seems to have been a norm in Bellini's workshop that canvases were mainly reserved for mural decoration whereas a large number of his workshop productions remained panel support. For discussion of Bellini's panel support, see pp.212-216 in Chapter 7.

⁸ For attribution of the *Dead Christ* (Scuola Grande di San Rocco, Venice) and the *Drunkenness of Noah* (Musée des Beaux-Arts, Besancon) to Bellini, see *Le Siècle de Titien: L'âge d'or de la peinture à Venise*, Exh. Cat., Paris, 1993, cat. 3 and 4, pp. 270-272.

⁹ For the *Incident in the life of Scipio*, see F. R. Shapely, *Catalogue of the Italian Paintings*, vol. 1., National Gallery of Art, Washington, 1979, pp.52-54. For a discussion of the *Feast of the Gods*, D. Bull and J. Plesters, 'The Feast of the Gods: Conservation, Examination, and Interpretation', *Studies in the History of Art*, (40), 1990, pp. 11-17.

8.1 Working Condition

It is notable that a majority of Giovanni Bellini's canvases prior to 1500 were commissioned by the Venetian government or confraternities for the decoration of their own meeting rooms.¹⁰ Located in prestigious places of a public nature and representing important narratives for the history of Venice and its patrons, canvas ceased to be regarded as a cheap material. Canvas painting was no longer a second-rate substitute for tapestry or an alternative to frescoes.¹¹

Conditions of Production

The development of the oil painting medium and its application to textile support played a crucial role in promoting the status of canvas painting. However, it was not an easy task to produce oil-on-canvas paintings in public buildings at the time of Giovanni Bellini, partly because of their sheer scale and partly because of the experimental stage of oil as a painting medium.

Venetian canvas cycles produced during this time tend in general to be monumental in order to fit the large area of wall they covered. The dimensions of Bellini's mural canvases are no exception. The two canvases for the Scuola Grande di San Marco measure around 3.5 metres high and 7.7 metres wide; the *Martyrdom of St Mark* (c.1515-26, Scuola di San Marco, Venice) is 3.62x7.71 metres and the *St Mark preaching in the Alexandria* 3.47x7.70 metres. The exact dimensions of Bellini's canvases for the Great Council Hall are not known, but they may have been close to those of later works, approximately measuring 5 by 5 metres.¹² In commissions for such large mural canvases, Bellini may have worked in the very room where the paintings were to be mounted.¹³ In

¹⁰ C. Hope, 'Eyewitness style' (Review of P. Brown's *Venetian Narrative at the Age of Carpaccio*), *New York Review*, December, 1988, pp.42-3.

¹¹ See Chapter 2 and 5, for the purpose of canvas painting in fourteenth- and fifteenth-century Italy.

¹² Federigo Zuccari's *Barbarossa kneeling before Pope Alexander III*, completed in 1582 after the destroy of Bellini's version for the west wall of Great Council Hall, Ducal Palace, Venice measures 5.75x4.2 metres. The dimension of Francesco Bassano's *Donation of the Sword* (Ducal Palace, Venice), dated to c.1582-7, is 5.75x5.75 metres.

¹³ Perhaps, Bellini may not have enough room to work on that scale.

response to the commission of the *istoria* from Isabella d'Este in 1501, Bellini told her mediator that he had to continue working in the Ducal Palace and that he would be there all morning, but would manage to find some time every day to please Isabella, and it is thus clear that he was working on site.¹⁴ In the case of the mural paintings, therefore, it seems that the transportability of canvas support was not a major consideration.¹⁵ Artists working on the spot were not able to work simultaneously in their own workshop. The sudden drop in the number of Bellini's paintings in the 1490s may show how his commitment to the decoration of the Great Council Hall demanded an enormous amount of his time [Table. 7].¹⁶

In the early sixteenth century oil still remained a difficult material to handle and, thus, it was certainly not an easy task to work with oil paint on such large-scale canvas supports.¹⁷ Very often, in fact, Bellini had to excuse himself to his private clients, who were less familiar with the nature of the medium. A letter from Lorenzo da Pavia to Isabella d'Este in January, 1504, reads that 'Bellini needed another one and a half months because it was winter and his colours would not dry properly.'¹⁸ As stated earlier, Bellini may have made up these practical excuse to disguise his unwillingness to advance Isabella d'Este's commission, but, nevertheless, it appears that his explanation, to a large extent, did reflect the technical problems of oil painting at that time.

¹⁴ C.M. Brown, *Isabella d'Este and Lorenzo da Pavia: Documents for the History of Art and Culture in Renaissance Mantua*, Geneva, 1982, pp.157-67. J. Fletcher, 'Isabella d'Este and Giovanni Bellini's "Presepio"', *Burlington Magazine*, (113), 1971, pp. 703-12.

¹⁵ The point is not that the canvas was not transportable, but that it was easier to work on site in order to be able to spread the whole of the canvas in the case of the mural paintings; perhaps not possible in a painter's workshop and perhaps to gauge a painting's relationship to other work. As Bellini increasingly worked for patrons from outside Venice in his late years, transportability was an important factor in the choice of canvas support. It is probable that he was sent a canvas and stretcher for the purpose of the decoration of a suite of private rooms in Ferrara for Alfonso d'Este, since a letter from Tebaldi, the Duke's agent in Venice, states that Titian, who later took on this commission, took receipt of the stretcher and canvas in April 1518; Bull and Plesters, *op. cit.*, 1990, p.11. When Francesco Gonzaga, writing to Bellini on 4, October 1497, said that; '... In the past few days we have had sent to you a painting on which we wish that you paint the city of Paris', it is possible that the word the 'painting' may refer to a canvas; R. Goffen, *op. cit.*, 1989, p.265.

¹⁶ See a letter, written on 2 March 1501 by Michele Vianello to Isabella d'Este; Giovanni himself said that he was constrained by the Venetian state to continue the work begun in the Ducal Palace; C.M. Brown, *op. cit.*, 1982, pp. 157-167; Fletcher, *op. cit.*, 1971, pp. 703-12.

¹⁷ The nature of oil was unlikely to be understood clearly. See pp. 81-90 in Chapter 2, for discussion.

¹⁸ 'Cercha al quadro de Giovane Belino io de contunevo lo sollicito, ancora che me valia pocho, ma m'à promiso che in termine de uno mese e mezo che el sarà finito e dice che a l'invernada pole male colorire che non suga i colori'; C.M. Brown, *op. cit.*, 1982, doc.82, p.78; Fletcher, *op. cit.*, 1971, pp. 703-12. The medium used was not specifically

Commission

According to Vasari, Gentile Bellini himself was able to persuade his patrons that he should work on canvas as a painting support instead of conventional wall decoration in fresco;

Ora Gentile, o per avere miglior modo e più practica nel dipignere in tela che a fresco, o qualunque altra si fusse la cagione, adoperò di maniera che con facilità ottenne di fare quell'opera non in fresco ma in tela.¹⁹

However, it is difficult to imagine that Gentile Bellini should have carried out canvases for his own practical interest without previous agreement from his clients and Vasari's statement may rather reflect his own views on the artist's autonomy on these occasions. Mantegna, for instance, had to offer a technical alternative to his patron as to the choice of painting support.²⁰ In the case of Bellini's commission for Isabella d'Este's studiolo, textile support was under consideration since all the other paintings in her studiolo project were on canvas. Isabella d'Este certainly intended a canvas from the beginning and, as it was, her mediator wrote a letter to ask her whether it was to be painted on panel or canvas mentioning other studiolo pictures.²¹ Since the original destination of Bellini's painting had changed, Isabella d'Este wrote to her agent in Venice, on 22nd, November, 1502, saying that she would leave it to Bellini to decide whether it was to be painted on panel or canvas.²²

The dimensions and support of a painting were of importance when negotiations for a commission were in progress. Giovanni Bellini required information regarding the

mentioned, but from the context it is clear that Bellini was working with oil. The slow drying nature of oil paint is just the opposite of conventional aqueous media, glue or tempera. For details, see pp.81-85 in Chapter 2

¹⁹ Vasari, *le Vite...*, ed. by R. Bettarini and P. Barocchi, vol. 3, Florence, 1987, pp.427-441.

²⁰ Mantegna presents technical alternatives in a letter dated on 6 July 1477; 'Illme et Ex. S. mo, da poi la debita ricomandacione aviso la Exc. Vostra chome volendo far quei ritrati, non intendo, volendolj la S. vostra si presto in che modo nabia a fare, o solamente disegna(ti) o coloriti in tavola o in tela e de che statura. Se la S. vostra li volesse mandare lontano Se [posso] no farli avoltare suso un bastonzelo. Ancora chome sa la Excia vostra non si può far bene dal naturale chi nona comodita di vedere. Le Exc. Vostre sono fuora de la tera, mi governero chome parera a quele, aspetaro de intendere et di avere o tavolette oli telareti chio posa dare principio aditi ritratj.'; P. Kristeller, *Andrea Mantegna*, London, 1901, doc. 69, pp. 534-535.

²¹ Fletcher, *op. cit.*, 1971, p. 709; Goffen, *op. cit.*, 1989, doc. 42, p. 267.

measurements of the painting from an agent of Isabella d'Este in April 1, in 1501.²³ According to the same letter written of 22, November, 1502, Isabella was sending the required measurements.

While canvas was rapidly replacing fresco, the wooden panel remained as Bellini's preferred support for altarpiece painting. He executed a dozen altarpieces in his last twenty years, but with the exception of the one example, the *Lamentation* (Accademia, Venice), which was painted with the assistance of his workshop in his last year, none of them were painted on canvas. It seems that the application of textile support to altarpieces was not a matter of great concern in the early sixteenth century. The altarpiece was then regarded as church furniture and, as such, the customary wooden panel was adequate for its job.²⁴ However, in the course of the sixteenth century as private interest in canvas painting increased, coinciding with massive major official commissions, canvas came to replace most of the functions of panels and became a dominant support even in the making of altarpieces.

8.2 The Nature of Canvas

When choosing the type of textile for such mural painting which needed to be long-lived, strength was a key factor. Linen cloth is strong and, due to its less absorbent nature, can provide a proper surface which takes priming well.²⁵ Cotton and wool are not ideal carriers for painting, since they are highly absorbent and less durable.²⁶ Apart from linen, Cennini recommended the use of silk, but such a luxurious material was rarely used as a

²² Fletcher, *ibid.*, p. 709; Goffen, *ibid.*, p. 267.

²³ Goffen, *ibid.*, doc.31, p.266.

²⁴ It seems that altarpiece may have been thought of as a more precious object on the more solid support and more honorable to the saints.

²⁵ R. Gettens and G. Stout, *Painting Materials: A Short Encyclopaedia*, New York, 1966, pp.227-232, 239; H. Osborne (ed.), *The Oxford Companion to Art*, Oxford, 1989, p.200.

²⁶ At the end of the fourteenth century, a cotton factory had been set up near Venice, but it never prospered; C. Villers, 'Artists Canvases; a History', 6th ICOM Committee for Conservation, Ottawa, 1981, p. 6.

painting support.²⁷ Hemp cloth was also a strong material, but its rough surface seems not to have appealed to artists until the eighteenth and nineteenth centuries.²⁸

Bellini shows a consistent choice of canvas made from linen. Linen is reported to have been used for the *Barbarigo Canvas*.²⁹ The fibre of his late canvas, the *Feast of the Gods* (National Gallery of Art, Washington), has been identified as flax, a sort of linen, and others of his major canvasses seem to fall into this pattern.³⁰

The threads of Bellini's canvases vary from 12 to 13 threads per square centimetre in the *Baltimore Canvas*, to 17 to 20 threads per square centimetre in his *Barbarigo Canvas*.³¹ A rather finely woven canvas of 23 to 24 threads per square centimetre is found in the *Feast of the Gods*, the choice of canvas for which may have been made on the part of the client, Alfonso d'Este.³² Since Titian was sent a canvas and stretcher for the companion parts of the *Feast of the Gods*, which were all commissioned to decorate Alfonso d'Este's studiolo in Ferrara in 1518, it is highly probable that Bellini was commissioned on a similar basis. Indeed, the general appearance and thread count of the canvas used in the *Feast of the Gods* is identical to that of Titian's *Bacchus and Ariadne*, also for the studiolo (National Gallery, London).³³ Alfonso d'Este, deeply concerned with the consistency in the decorative scheme of his studiolo project, tried to unify the size, shape, and appearance of the canvases employed there.³⁴

An examination of Bellini's canvases shows that there is no logical consistency in the ways which they have been put together; his canvases are made up of pieces sewn

²⁷ C. Cennini, *Il Libro dell'Arte*, Vicenza, 1971, Chapter 162; D. Thompson, *The Craftsman's Handbook*, New York, 1960, pp. 103-4. Silk was used in Gentile Bellini's *Virgin and Child with Saints*, signed and dated 1491 (private collection, London). It has been extensively repainted. See J. Meyer zur Capellein, *Gentile Bellini*, Stuttgart, 1985, cat. A. 12.

²⁸ Gettens and Stout, *op. cit.*, pp.227-232, 239.

²⁹ L. Lazzarini, 'La Pala Barbarigo di Giovanni Bellini; Le analisi di laboratorio', *Quaderni ... di Venezia*, (3), 1983, p. 23.

³⁰ D. Bull and J. Plesters, 1990, *op. cit.*, p. 56.

³¹ Packard, 1970/71, *op. cit.*, pp.64-84; Lazzarini, *op. cit.*, 1983, p. 23.

³² Bull and Plesters, *op. cit.*, p. 56. In the case of the *Feast of the Gods*, it is likely that Giovanni Bellini was sent a canvas and stretcher. See the following page in this chapter.

³³ Bull and Plesters, *op. cit.*, p.57; J. Plesters, 'Titian's Bacchus and Ariadne', *NGTB*, (2), 1978, pp.37-38.

³⁴ J. Plesters, *ibid.*, 1978, pp.37-38.

together regardless of the size of canvas strip and the direction of seams. The support of the *Barbarigo Canvas* is composed of four strips of canvas, used horizontally and measuring 69, 34, 37 and 66cm respectively from the base [Plate 19(e)].³⁵ The support of the *Feast of the Gods* is made up of three vertical strips of unequal width; 77.5, 82.6, and 33 cm [Plate 43(b)].³⁶ When making up canvas for large paintings, the number of seams was generally kept to a minimum. Thus the three horizontal seams of the *Barbarigo Canvas* or the two vertical seams of the *Feast of the Gods* could have been reduced to one, had they been properly arranged, since the common size of canvas was, approximately 70cm wide in sixteenth-century Venice. The asymmetrically placed seams of the canvas strips in these two canvases may suggest that some experimenting was needed to find the right size and format.³⁷

Textile is a material lighter and easier to handle than wood. It does not involve the complicated and laborious preparation required by wood, such as seasoning and the employment of a woodworker. The difference in the general pattern of sizes between Bellini's panel and canvas paintings, seems to reflect less systematic requirements for the preparation of canvas size [Table 9]. The distribution of the sizes of his panel paintings clearly indicates regularity [Table 8]. Most Bellinesque panels measure under 80 by 80 cm, whereas all the exceptionally large panels are designed to be altarpieces. In contrast, the sizes of his canvases are diverse, generally very large, and vary according to the specific nature of the commission which would take into account the area of wall where the image was to be located. Bellini's freer and varied approach to canvas painting and the further relaxation of the meticulous craftsmanship of the medieval painter are also witnessed in his canvas painting methods, discussed below.

³⁵ L. Lazzarini, 1983, *op. cit.*, p.23.

³⁶ Bull and Plesters, *op. cit.*, p.56. Plesters has reported that the two vertical seams are very unusual in that instead of having the customary overcoated edges they have a line of stitching on either side of the join, visible on the surface of the picture; *ibid.*

³⁷ Bull and Plesters, *ibid.*, p. 91. The x-radiograph reveals that the seam of the Bellini's *Baltimore Canvas* horizontally traverses the picture in the middle [Plate 42(a)]; E. Packard, 1970/71, *op. cit.*, pp.68-69.

8.3 Preparation and Underdrawing

In terms of ground and priming, no particular difference is discernible between Bellini's wood and textile supports. Bellini employed gesso ground, and all-over glue and lead-white priming as a norm in the preparation of his panel paintings.³⁸ Gesso seems to have been invariably used in his canvas paintings and the lead-white priming is found over the gesso ground in his canvas work, the *Feast of the Gods*.³⁹

Gesso Ground

Careful preparation may play an important role in the creation of the magnificent light effect found in Bellini's canvas paintings, since smooth gesso ground and bright lead-white priming underneath transparent oil colour certainly increase their luminosity.⁴⁰ Yet towards the end of his life, Bellini seems to have abandoned his earlier careful preparation method and to have begun to be interested in the effects of thinner ground with darker underlayer. In 1515, just one year before his death, Bellini signed and dated, the *Portrait of a Dominican*, a canvas now in the National Gallery in London [Plate 39]. Scientific examination has yet to be carried out on this painting, but it has been suggested that the gesso was prepared in the same manner as for panel paintings.⁴¹ Nevertheless, its overall appearance is different from that of his panel paintings. The surface has a dark green tone, but lacks the bright and smooth effect found in his panel paintings.⁴² Moreover, paint was applied so thinly that the texture of the fabric is exploited to diffuse lines and contours in the picture. The quite different surface effect of this work from his panel paintings is apparent if one compares this portrait with his *Portrait of Doge Leonardo Loredan*, on which the precisely contoured form was executed on a panel ground of velvet-like

³⁸ The *Blood of the Redeemer* and the *Pesaro Altarpiece*, for instance. See pp.133-36 in Chapter 3, for a discussion of Bellini's preparation method.

³⁹ A glue layer is not found in the preparatory layers in the *Feast of the Gods*. It is difficult to identify original glue layer due to the later linings, but almost certainly, Bellini's canvases were sized before preparation. One of the points of similarity in the methods described by Cennini in Italy and Le Begue of the Netherlands is that the canvas of the fourteenth and fifteenth centuries was invariably sized; D. Wolfthal, *The Beginnings of Netherlandish Canvas Painting: 1400-1530*, Cambridge, 1989, p.24. Cennini advises to 'take gesso sottile and a little starch or a little sugar'; C. Cennini, *op. cit.*, Chapter 162; D. Thompson, *The Craftsman's Handbook*, New York, 1966, p.103.

⁴⁰ See pp.188-89 in Chapter 5, for a detailed discussion. Similar reasons are given for Titian's application of gesso ground in the *Bachus and Ariadne* (National Gallery, London); Plesters, *op. cit.*, 1978, pp.37-38.

⁴¹ I am grateful to Dr. J. Kirby of the National Gallery, London for providing me with this information.

⁴² M. Davies, *National Gallery Catalogue: The Earlier Italian School*, London, 1961, pp. 61-64.

smoothness [Plate 40]. The thinly-applied paint with an overall shadowy effect in Bellini's *Portrait of a Dominican* suggests that although gesso ground may have been applied to prepare his fabric to receive paint, it is unlikely to have been employed to the same extent as for his panel paintings.

The *Portrait of a Dominican* is not a unique example. Bellini's other relatively small canvas paintings, such as the *Dead Christ* (Scuola Grande di San Rocco, Venice) and the *Drunkenness of Noah* (103 by 157 cm, Musée des Beaux-Arts, Besançon), all share a similar surface effect to the *Portrait of a Dominican* [Plate 40 and 41] Bellini may have found that the thicker gesso ground and lead white priming, designed to create luminosity in his huge canvas works, was not necessary in these works, which served a quite different function and whose rich surface qualities could be enjoyed from close up.

Colour Underpaint and Mantegna's Preparation Method

In Bellini's modest-size canvas works, forms are basically defined by applying light and opaque colour over a darker toned underlayer. The question of how far Bellini extended the dark-tone underlayer over the painting surface remains unanswered. The use of coloured priming can be speculated, but scientific examinations of sixteenth-century Venetian paintings show that dark coloured priming was not the standard method in the early decades of the sixteenth century and became widely practised by Venetian painters only after the mid-sixteenth century, which makes it more likely that Bellini's method was to use a localized underpainting rather than a continuous film of coloured priming.⁴³

It has been proposed that this light-over-dark painting method should be associated with Giorgione, and that Bellini may have been influenced by his younger contemporaries.⁴⁴

⁴³ None of Titian's works in the National Gallery in London has a coloured ground; Plesters, *op. cit.*, 1978, p.38. For Titian's continuous use of gesso ground, see also J. Dunkerton, 'Developments in colour and texture in Venetian painting of the early 16th century', *New Interpretations of Venetian Renaissance Painting*, ed. by F. Ames-Lewis, London, 1994, pp. 70-71. No coloured or dark ground has been found in any of Giorgione's and Titian's paintings that have been examined in the National Gallery of Art, Washington. D. Bull, Chairman of Painting Conservation, in the National Gallery of Art, kindly provided this information.

⁴⁴ The employment of the dark underlayer has been ascribed as an invention of Giorgione; D. Rosand, *Painting in Cinquecento Venice: Titian, Veronese, Tintoretto*, New Haven and London, 1982, pp.19-20; M.Hall, *Colour and Meaning: Practice and Theory in Renaissance Painting*, Cambridge, pp.199-231.

The 'canvasness' of Giorgione's portraits on textile supports such as the *Portrait of David* (c.1510, canvas, Herzog Anton Ulrich Museum, Brunswick) and *La Vecchia* (1510, canvas, Accademia, Venice) and his competent use of such an allusive surface effect in the creation of unprecedented mythological subjects found in the *Tempest* (c.1507, canvas, Accademia, Venice) and the *Fête Champêtre* (c.1510-11, canvas, Louvre, Paris) may have inspired Bellini to exploit his early experiment in canvas painting. However, it seems more plausible that Mantegnesque small devotional images on canvas exercised the primary influence on Bellini's experimental approach to gesso ground and coloured underpainting on textile support.

Mantegna produced a number of canvas paintings with the consistent choice of conventional media. In terms of preparation, however, Mantegna's method is more diverse. A recent study by Andrea Rothe has shown that Mantegna used five types of ground preparation; [1] simple sized canvas having no gesso; [2] a thin gesso ground; [3] a thick gesso ground; [4] gesso and lead-white priming; [5] finally, a red-brown priming with or without gesso ground.⁴⁵ About ten canvases by Mantegna seem to have been executed without gesso preparation, perhaps to avoid cracking during transportation.⁴⁶ In many cases, a layer of gesso has been reported in his canvases; Mantegna used most frequently a thin gesso ground, whereas he needed thicker gesso when he worked on canvas paintings for mural decoration such as the nine canvases of the *Triumph of Caesar*. The lead-white priming Mantegna used in his panel works is reported in the canvas work *Mucius Scaevola* (Staatliche Graphische Sammlung, Munich).⁴⁷

⁴⁵ A. Rothe, 'Mantegna's Painting in Distemper', *Andrea Mantegna*, Exh.Cat., London, 1992, pp.82-87.

⁴⁶ No gesso ground is reported in *St Euphemia* and the *Infant Redeemer* (the National Gallery, Washington). In particular, the x-radiograph of the *Infant Redeemer* shows that the painting may have been rolled up just as Mantegna later suggests to his patron in the document of 1477; Kristeller, *op. cit.*, p.534-35. Vasari writes, 'In order to be able to convey pictures from one place to another men have intended the convenient method of painting on canvas, which is little weight, and when rolled up is easy to transport'. And then, Vasari clearly advised that 'unless these canvases intended for oil painting are to remain stationary, they are not covered with gesso, which would interfere with their flexibility, seeing that the gesso would crack if they were rolled up'; Maclehorse, *Vasari on Technique*, New York, 1960, p.237. with the one exception of the *St Euphemia* (171 by 78cm), the majority of Mantegna's canvas paintings, without gesso preparation, measure 40-50cm wide and 40-50cm high. On the other hand, it is unlikely that his large canvases with a gesso ground were definitely intended for transport. It is evident that the *Holy Family with St Elizabeth and Infant St John* (Kimbell Art Museum, Fort Worth), with a thin gesso layer, has been thrice-folded and, in consequence, the paint film has been damaged; Rothe, 1992, *ibid.*, p.84.

What is most interesting in the discussion of Mantegna's preparation method is his use of red-brown priming, or as Andrea Rothe calls it 'red imprimatura'. In fact, Rothe's argument that Mantegna used red-coloured priming remains open to question. Since this so-called 'red colour priming' is found mostly in his grisaille paintings, it may only be related to Mantegna's technical treatment of the reddish marble background for painting in monochrome.⁴⁸ Rothe reports that the *Virgin and Child* (Gemäldegalerie, Berlin) also has red colour priming, but there is no indication of a source for his assertion. Unless backed up by scientific analysis, it is difficult to tell the difference between localized underpainting and a continuous film of colour priming. Therefore, it is difficult to accept Rothe's view on the use of red imprimatura in Mantegna's canvases at face value.

Nevertheless, it is interesting to note that, grisaille paintings aside, in the group of Mantegna's canvas works which Andrea Rothe suggests have red priming, the number of hues is strictly reduced, producing a monochrome effect. A sense of broken light is created by the thin application of lead-white over the textile support, which has been covered with a dark underlayer. A similar approach to colour and light is found in Bellini's modest size canvas works, such as the *Dead Christ* (Scuola Grande di San Rocco, Venice), the *Drunkenness of Noah* (Musée des Beaux-Arts, Besancon), and the *Portrait of a Dominican* (National Gallery, London). The number of major hues is considerably reduced in these canvas works in comparison to that of his contemporary panel paintings. Moreover, highlights emerge from a dark ground in the Christ in the *Dead Christ*, in the heads and drapery of the three sons and the vineyard in the background of the *Drunkenness of Noah*, and in the sitter's face in the *Portrait of a Dominican*.⁴⁹

Bellini certainly knew Mantegna's canvas works and probably had an opportunity to examine the latter's monochrome grisaille work in the early sixteenth century. It is highly probable that the grisaille painting of the *Incident in the Life of Scipio* was commissioned

⁴⁷ Rothe, *ibid.*, p.86.

⁴⁸ *Ibid.*, pp.82-87.

from Bellini after the death of Mantegna to complete the latter's order from Francesco Cornaro in Venice. Working on a new type of painting, unprecedented in his work, Bellini may have found that he could work out his composition using a minimum application of colour hue on the darker underpaint and thus achieve a textural effect.

Underdrawing

It is in the field of underdrawing that the extent of experimentation in Giovanni Bellini's use of canvas painting seems most apparent. Those canvases by Bellini which have been examined by infra red reveal less detailed underdrawing in comparison with his works on panel.⁵⁰ He generally used careful underdrawing for his panel works as well as a metal stylus for the geometric design of the floor, architectural setting and for the construction of an accurate perspective exemplified by the *Pesaro Altarpiece*.⁵¹ While without full scientific reports on the underdrawing, it still remains hypothetical whether Bellini changed his underdrawing techniques in accordance with the painting support used, it must also be borne in mind that coarse canvas, unlike the smooth surface of panel, does not in practice easily permit underdrawing using charcoal, ink, and black chalk or metal point. Joyce Plesters' put forward the idea that infra-red scans are less successful with textile support and that Bellini may have used bare outlines with charcoal which he brushed off during the painting.⁵² There is good reason to argue that he used oil paint and not carbon-based materials for underdrawing, as the painters of a later generation generally did. Alternatively, he may have used some organic or earth colouring matter, probably applied with a brush as opposed to hand tools, a sensible option on canvas surfaces. In addition, one of the most useful attributes of oil medium, i.e. that of allowing the painter to change his original intention easily during the execution, may have diminished the emphasis on preparatory drawing.

⁴⁹ It is of importance to note that Bellini's methods here intensifies the subject matters of the canvases, especially the *Dead Christ* and the *Drunkness of Noah*; one a sombre Passion subject, the other an antetype of the Passion.

⁵⁰ The initial examination of the *Feast of the Gods* indicated that no underdrawing could be seen; Bull and Plesters, *op. cit.*, pp.58-59. However, a later examination using a new Infra red camera showed that some underdrawing did exist. It is sketchy and rather brief, indicating placement of feet and so on. Similar underdrawing method is seen in the *Incident from the Life of Scipio* canvas. I am grateful to Mr. D. Bull for providing me with this information.

⁵¹ The lines of the architectural design are very precisely incised with a metal stylus. See pp. 152-156 in Chapter 4.

8.4 Colour Modelling

As a general premise, it is likely that Giovanni Bellini employed different methods of preparation and underdrawing in accordance with the painting support towards his late years. This theory finds further confirmations in his method of applying paint.

The consistency of painting method which defines Bellini's technique at the turn of the century, is found again in one of his last panel works, the *Diletti Altarpiece*; St Jerome with St Christopher and St Louis (1513, San Giovanni Crisostomo, Venice) [Plate 36].⁵³ The cross-sections from this work show not only that a careful preparation of gesso ground, and glue and lead white priming was employed, but that paint layers were generally built from light to half light to shadow as in the *San Zaccaria Altarpiece*, although the number of paint layers was increased in the later painting due to the *pentimenti*. In contrast, the cross-sections from his contemporaneous work on canvas, the *Feast of the Gods*, presents a completely different picture in the structure of paint layers. Unlike his medium-size late canvas works, gesso ground and lead white priming were employed in this picture, probably for the creation of a luminous effect, suitable for its mural function. But, the number of superimposed paint layers varied from a single layer to nearly ten. While the terrain in front of the figures is very thin, and a cross-section from this area shows that much of it is created using a single layer of paint, the paint structure in the drapery is far more complicated. Such a different approach to paint surface is again found in the contrast between the head of Sylvanus and the *lira da braccio* held by Apollo; the paint was loosely applied in Sylvanus's head, whereas the paint in the *lira da braccio* is thicker than that surrounding it.⁵⁴ This diversified approach to paint surface suggests that Bellini modified his panel-based painting technique in the execution of canvas works towards the end of his life, probably realizing that his perfectionist craftsmanship in panel painting was not so appreciable in canvas painting, which responds flexibly to the brush stroke and has its texture already supplied by the canvas surface.

⁵² Bull and Plesters, *op. cit.*, pp. 39-40.

⁵³ L. Lazzarini, 'Il colore nei pittori veneziani tra il 1480 e il 1580', *Bolletino d'Arte, Supplemento 5*, 1983, pp. 135-44.

⁵⁴ Bull and Plesters, *op. cit.*, pp. 35-36.

Taking advantage of these characteristics of textile support, Bellini seems to have tried to take a freer approach to canvas painting. The handling of the brushwork in the *Feast of the Gods* is more open and dynamic. Accordingly, the paint layers found in the cross-sections from this work are no longer thin and flat, in the same way as those of his panel paintings.⁵⁵

It should be emphasized that this canvas-based method is less inevitably articulated in Bellini's panel paintings, where he is more concerned with brilliant colour and clear form. Details of his panel the *Diletti Altarpiece*, particularly in the drapery of St Louis, show how differently he worked on the smooth panel ground. The comparison can also be drawn between the two contemporary paintings on different supports, the *Drunkenness of Noah* on canvas (Musée des Beaux-Arts, Besancon) and the *Naked Woman in front of the Mirror* on panel (Kunsthistorisches Museum, Vienna) [Plate 37 and 38]. These two paintings have much in common with each other in terms of style; the elaborate red drapery, for instance, is found in both paintings. However, the well-finished, precise form which Bellini was most concerned with in the *Naked Woman in front of the Mirror* is missing in his canvas painting, the *Drunkenness of Noah*. Bellini's handling of the details is quite different. Here he adopted freer brushwork over a darker underlayer and the distribution of highlights is immediate and spontaneous in the canvas works. This freer approach to picture-making was remarked upon by R. Longhi in 1956, when he praised this work as 'the earliest work of the modern paintings'.⁵⁶ Longhi's words are not merely an exaggeration, though his definition of modern might not be accepted today. The employment of thinner ground and darker underpaint with emphasis on texture, the lack of precise underdrawing, and freer application of brushwork in Bellini's late canvas works prove that Bellini brought oil paint on canvas one step closer to the realisation of oil painting in its classic form.

⁵⁵ See particularly the cross section was taken from the blue drapery of the nymph with jar on her head; Bull and Plesters, *ibid.*, pp.61-90.

⁵⁶ R. Longhi, 'I Primitivi italiani all'Orangerie', *Il Giorno*, 26 May, 1956.

Conclusion

It is a difficult task to draw a single conclusion from this study of Bellini's painting technique; partly because of Bellini's remarkably long career and prolific activity, and partly because of his continuous experiments with materials and the adaptability of his painting methods according to the nature of particular commissions. However, if we take a broader view and look at his painting technique in the context of the later development of painting method in Venice, it becomes clear that it is Bellini's techniques based on oil medium and canvas support and the resultant qualities which emerge with the use of these new materials -such as chromatic brilliancy, that could be maximised in the harmonious arrangement of colour, and rich texture, which are of the greatest importance in sixteenth-century Venetian painting.

The Venetian painters of the succeeding generation worked with oil and canvas as a matter of course, and colour and texture remained their central interest. Indeed, walking through the corridor which links the fifteenth century galleries of the Sainsbury wing with the main building of the National Gallery in London, and entering the Wohl room, which houses the sixteenth-century Venetian paintings, one is aware of what seems to be a total change of aesthetic, analogous to switching from a mini television to a wide screen experience. Almost all of the works in the Wohl room are painted on textile support, are generally much larger, with freer brush work together with brilliant colour and texture. Bellini's increasing use of canvas and the corresponding methods which he developed on this very different type of support exerted a strong influence on the younger generation of Venetian painters and, to a large extent, can be said to have changed the general concept of painting material by the first two decades of the sixteenth century.

This study indicated that the transition of painting materials was a prolonged and complicated process, which involved diverse approaches. The Venetian initiative in the development of oil medium and canvas support in Italy has been explained partly in relation to its maritime culture. The ruling elite of Venetian society consisted of travelling merchants

with cosmopolitan and sophisticated tastes, and their access to the Netherlandish paintings stimulated a more positive response to oil and canvas from Venetian painters. As Venice dominated the colour trade in this period, local painters enjoyed a practical advantage in the application of exotic Eastern colours and high quality Western colours because of their accessibility and cost. This study proposed that the Venetian patrons' eye for colour was sharpened by a close involvement with the international trade in colour materials. It has been argued that the characteristics of Venetian Renaissance painting (so-called 'Venetian colourism'), such as its intense chromatic beauty and visual virtuosity in the handling of paint, need to be understood in relation to the socio-economic milieu of Venice.

Formal aesthetic criteria are crucial in the interpretation of individual pictures from the technical point of view, but this study has also underlined that the methods and materials employed in the image were further related to their subject-matter and function. Light and colour were distinctive elements in Bellini's works, and this study has shown that the meaning of his works can be clarified by carefully examining their use in the composition. As such, the enigmatic use of light in his early work the *Agony in the Garden* and the complicated distribution of colours in the late *San Zaccaria Altarpiece* were understood as responsive to their particular subject-matter. In this respect, the looser, more allusive qualities of painting surface found in Bellini's late canvas works such as the *Drunkenness of Noah* and the *Portrait of a Dominican* should be viewed as his effort to approximate the new type of private compositions characterised by poetical atmosphere and mythical subjects which developed in Venice in the early sixteenth century. Choice of materials was also affected by the designated function of pictures and this study has maintained that canvas painting developed in Venice in close association with secular and semi-secular mural schemes.

The data resulting from the modern scientific analysis of painting have greatly increased our understanding of painting materials and methods, and this study has made an effort to bring together recent scientific findings to build a wider and more accurate picture of the development of specific techniques in Italy. The present research also has maintained that

our knowledge of the dramatic transition of picture-making in fifteenth-century Italy can be enhanced by reading commercial documents which have been regarded as peripheral to this area of study and by re-reading artists' contracts and other familiar art-historical sources with the awareness of recent scientific findings.

Further aided by the author's visual analysis, this study has identified that different media and different supports were requested to fulfil specific aesthetic qualities and functions, as the diversity of painting material grew in Italy in the second half of the fifteenth century, and that a certain practice developed in the combination of them such as 'glue on canvas' and 'oil on canvas'. Oil medium, for instance, began to be seriously practised initially to appeal to the tastes of the ruling elite in Renaissance courts and was later more widely appreciated as a vehicle to represent naturalistic form and space. Therefore, this research argued that its predominance at the turn of the century should be viewed as an indicator of the change of aesthetic in favour of a more naturalistic painting. Textile support was not neglected in Italy in the Middle Ages, but the increasing popularity of Netherlandish glue-on-canvas painting in the mid-fifteenth century and particularly its recognisable quality 'its canvasness' seems to have influenced Italian painters' approach to textile support. Oil-on-canvas painting was developed out of this complex situation and was particularly adopted in Venice. Here it was primarily associated with mural decorations where the practicality of textile and the intense colour of oil paint were particularly appreciated. In the sixteenth century, oil and canvas became dominant painting materials throughout Italy and increasingly matched together. Many of the functions formerly associated with panel and fresco, then, were increasingly replaced by them.

* * *

Once the new format of painting was established, little changed for several centuries. In the technical development of painting, oil and canvas remain an important vehicle of artistic expression even in the art of our time, and the choice of material is still central to a sector of the contemporary art world. Although writing in a totally transformed artistic and historical

context and with a special agenda, the American critic, Clement Greenberg, defended the Abstract Expressionist movement as a modern experiment within the tradition of the medium of oil and canvas painting. Responding to an unconvinced onlooker who said that his child could paint better than an Abstract-Expressionist, Greenberg put forward his idea that it is the materials and methods of painting that would always distinguish the work of the two. He maintained that;

the exact choices of colour, medium, size, shape, proportion - including the size and shape of the support- are what alone determine the quality of the result, and *these choices depend solely on inspiration or conception* [author's italics].¹

His argument seems to be based upon American artists' experimental, rather sensational, approach to the application of paint media on gigantic canvases after the Second World War. The present study indicates that this modernist assertion of the formal aesthetic value of painting technique can be attested as a legacy of the experimentation, engendered by artists of a specific place and time, namely by Giovanni Bellini and his contemporaries in late fifteenth-century and early sixteenth-century Venice.

¹ C. Greenberg, 'After Abstract Expressionism', *Art in America*, (6), 1962; C. Harrison and P. Wood (ed.), *Art in Theory; 1900-1990*, Oxford, 1993, pp.766-769.

Appendices

Appendix 1

Modern Methods of Identifying Paint Media

The range of paint media employed in easel painting in Europe in the second millennium is fairly limited; mostly egg tempera and oil. Animal glue, resin, and bee's wax were also used, but are of less significance, considering that the vast majority of paintings were created in egg tempera –perhaps not in Northern Europe- up to the fifteenth century and then predominantly in oil later on. The question of identifying their paint media, however, remains difficult, even though it is usually a case of distinguishing between oil and egg tempera, or a mixture of the two. The optics and techniques associated with these two media are different, but in the case of fifteenth- and sixteenth- century Italian painting in which the two media coexist equally and often somewhat 'experimentally', their characteristics are less distinct. It is important to note that on the optical front, for example, tempera paintings can appear saturated in colour and glossy in appearance, an affect usually associated with oil painting. The identification of their media with any certainty, therefore, requires modern scientific methods.

The scientific method of the identification of paint media has gathered momentum over the past three decades with the application of gas-liquid chromatography (or GLC hereafter) to the museum object and the development of the 'staining method'. There are other methods available, such as thin paper-chromatography, but this account restricted itself to the gas-liquid chromatography and the staining method as they are predominantly employed in the museum laboratory.

Gas-Liquid Chromatography

The method of Gas Chromatography or GLC developed in chemistry in the 1950s and came to be applied to the analysis of paint media in the late 1960s. Its merit lies in the ability to separate various compounds of organic samples of relatively small size.¹ In the

¹ J.Mills and R. White, *The Organic Chemistry of Museum Objects*, London, 1987, pp.26-40. J. Mills, 'The Gas Chromatographic Examination of Paint Media. Part I. Fatty Acid Composition and Identification of Dried Oil Films',

museum laboratory, it is used to analyse the composition of oil or fat (egg) into broken down units, the fatty acids (R-COOH), and to measure them quantitatively.²

As this technique was originally introduced in order to examine volatile compounds, it can only separate non-volatile compounds, such as the fatty acids of oil or fat, successfully after they are converted to more volatile derivatives; conveniently their methyl esters.³

The pattern of the chromatograms of oil and egg is qualitatively similar but the low proportion of azelate(C₉) in the egg, or its low A/P ratio [azelate(C₉)/palmite(C₁₆)], is unmistakable.⁴ This result can be affected by the presence of different pigments, but more usually it is the mixture of the two media which provides real complications for it. A relative presence of azelate in the chromatograms is often interpreted as a pointer of the mixture of oil and egg tempera or of the contaminations of samples.⁵ The analytical method for the identification of mixed technique will be discussed later in this paper.

The advantage of gas chromatography is first its accuracy with only a minute sample size. In easel painting, the size of samples is normally small, and it is difficult to employ a method like thin layer chromatography which requires larger samples than usually available from pictures, although it also offers an effective analysis of paint media. In gas chromatography, about 1mm³ of paint will suffice for several runs on this test.⁶

In addition, gas chromatographic examination can determine the nature of drying oils. Historically, linseed and walnut oils have been largely used as paint media, and the quantitative measurement of p/s ratio [palmite(C₁₆)/stearate(C₁₈)] of the chromatogram

Studies in Conservation (11), 1966, pp. 92-107. J.Mills and R. White, *The Organic Chemistry of Museum Objects*, London, 1987, pp.26-40.

² Mills and White, *ibid.*, 1987, pp.14-16.

³ The satisfactory separation of these methyle esters according to molecular weight is achieved by non-polar stationary phase, hydrocarbon or silicone greases; Mills, *op. cit.*, 1966.

⁴ For example, see the gas chromatograms of oils and egg illustrated in p.142 of J.Mills and R. White's *The Organic Chemistry of Museum Objects*, London, 1987.

⁵ J. Mills and R. White, 'Analysis of Paint Media', NGTB, (4), 1980, pp. 65-66.

⁶ For the sampling of GLC, see Mills, *op. cit.*, 1966, pp.99-106 and J. Mills and R. White, 'The Gas Chromatographic Examination of Paint Media. Some Examples of Medium Identification in Paintings by Fatty Acid Analysis', *Conservation and Restoration of Pictorial Art*, (ed.) N. Brommelle and P. Smith, London, 1976, p.73.

shows about 1.4 for linseed and about 2.7 for walnut (or about 4.5 for poppy).⁷ Walnut oil has been recognised as having a less yellowing effect on the paint film with pale colours, but except for this the characteristics of these two drying oils are almost identical.⁸ Nevertheless, the identification of the drying oils is an important matter to conservators who have to choose adequate materials for restoration.

Unfortunately, only a few laboratories can afford to buy and staff the gas chromatographic equipment. The cost of this instrument is very high and requires a specialist scientist.⁹ Other institutions can obtain the GLC analysis of their data in co-operation with the laboratory owning such equipment; but the cost is still high. Therefore, a number of institutions with more limited means have had to turn to alternative methods more readily available to them.

Staining Method

The most frequently used method to differentiate between egg tempera and oil media by a 'non-specialist', in a scientific sense, is the 'staining method'.¹⁰ Since this method examines the reaction of the mounted cross-sections of paint to certain chemicals -for instance, Ponceau S as a stain for protein-based media like glue and egg, and Sudan Black B as an oil stain, it can be carried out with the basic conservation equipment for the preparation of paint cross-sections, and thus has been widely adopted. It was pioneered by the Laboratoire de Recherche des Musées de France and was known as the primary method for the identification of paint media in the restoration institutions in Italy until the

⁷ Mills, *ibid.*, 1966, pp.103-106.

⁸ Mills and White, *op.cit.*, 1987, p.143. Unlike their northern counterparts who preferred to work with linseed oil, fifteenth-century Italian painters often employed walnut oil. In the sixteenth century, however, linseed oil gradually replaced walnut oil in Italy. J. Mills and R. White, 'Analyses of Paint Media', NGTB (4), 1980, pp.65-66.

⁹ J. Mills, 'the Identification of Paint Media- An Introduction', *Conservation and Restoration of Pictorial Art*, (ed.) N. Brommelle and P. Smith, London, 1976, pp. 69-71. The Scientific Department of the National Gallery, London, is the major centre for this technique.

¹⁰ Mills, *ibid.*, 1976.

late 1980s.¹¹ The extensive results of the analysis of paint media by Johnson and Packard in the Walters Art Gallery, Baltimore, were also obtained by this technique.¹²

Analysts using the staining method, propose that this technique allows them to detect not only the paint media of oil, egg, and glue, but the artificial emulsion of oil and egg yolk or glue, and paint media with separate layers.¹³ The problems of this method, however, are prudently pointed out by Mills and White, staff of the National Gallery Scientific Department who pioneered GLC. In interpreting its results, for instance, considerable care is needed, since a number of positive chemical reactions of paint can be falsified by the absorption of some pigments and porous layers or cracks in the paint samples.¹⁴ Moreover, this method cannot distinguish between the various types of oil or types of protein. The technique of differential staining of multilayered cross-section is an appealing one, but Mills suggests 'any laboratory embarking on the method has to set its own carefully standardised conditions'.¹⁵

Conclusion: Co-operation of the two methods and the Development of New Methods

There is a danger in accepting the results from staining cross-sections at face value, but it is also not an easy task to interpret the information obtained by GLC. No matter how the test is carried out, whether by GLC or staining method, the fundamental problem of methods of the identification of paint media is the size and number of samples, mostly from damaged areas, and the interpretation of these limited number of results as representing the entire painting. Mills confessed when he introduced the GLC in 1976 that

¹¹ Recently, however, medium analysis in Italian institutes is carried out by GLC and Mass Spectrometry, L. Berti et al., 'La Nascita di Venere e L'Annunciazione del Botticelli restaurate', *Gli Uffizi; Studie Recerche* (4), 1987, p.81; S. Volfin and R. Stevanato, 'Studio dei leganti pittorici della Pala di San Giobbe di Giovanni Bellini', *Quaderni ... di Venezia* (19), 1994, p.41; F. Trevisani and E. Daffra (ed.), *Quaderni di Brera* (9), 1997.

¹² M. Johnson and E. Packard, 'Methods used for the Identification of Binding Media in Italian Painting of the Fifteenth and Sixteenth Centuries', *Studies in Conservation*, (16), 1971, pp.145-164.

¹³ Johnson and Packard, *ibid.*, pp. 145-164.

¹⁴ This problem can be found in the staining of thick sections. The sampling of thicker sections earlier carried out by Johnson and Parkard in 1971 was rejected by M. C. Gay herself, who gathered samples in thinner paint films; 'Application of the staining method to cross-sections in the study of the media of various Italian paintings of the fourteenth and fifteenth centuries', *Conservation and Restoration of Pictorial Art*, (ed.) N. Brommelle and P. Smith, London, 1976, p.79. Staining method was later refined by E. Martin; 'some improvement in the techniques of analysis of paint media', *Studies in Conservation* (22), 1977, pp.63-7. Yet, there is still doubt on the reliability of its results. For details of the difficulty of interpreting staining methods, see Mill and White, *op. cit.*, 1987, p. 148.

'The number of samples taken from any one picture was usually not more than two or three and perhaps only one. The object of taking more than one was more that of obtaining thereby an average result of greater statistical significance, than stemming from the thought that different media might be employed in different areas. This latter possibility and that of mixed media were added complications which we were perhaps unwilling to dwell upon overmuch since they seemed just too demanding of the methods...'¹⁶

There is no such a problem, if a picture is painted with single paint medium in homogenous way. However, the wide use of the mixed technique of oil and egg tempera - either mixed or as constituents of separate layers- in Italian Renaissance paintings has been suggested by conservators who examined them by staining method.¹⁷ The unreliability of this test has often been put forward, and Mills and White further said that '*the possibility of the use of different media in the different layers of the painting's structure, could also hardly be coped with in the absence of supplementary techniques*'.¹⁸ However, the concept of mixed techniques as well as entire findings by staining technique seems not to have been discarded, as some of them are now confirmed by the recent innovations of GLC itself.¹⁹

A very interesting study of media, using both by GLC and staining methods was carried out on Crivelli's *The Vision of the Blessed Gabriele* (dated to 1489/90, National Gallery, London). Mills and White reported that all four samples obtained from this painting had azelate peaks at about half the level of the palmitate peaks, suggesting the presence of both egg and oil. They later carried out staining methods which indicated that this

¹⁵ Mills, *op. cit.*, 1976, p. 70.

¹⁶ J. Mills and R. White, 'The Gas Chromatographic Examination of Paint Media. Some Examples of Medium Identification in Paintings by Fatty Acid Analysis', *Conservation and Restoration of Pictorial Art*, (ed.) N. Brommelle and P. Smith, London, 1976, p.72.

¹⁷ Johnson and Packard, *op. cit.*, pp.145-64.

¹⁸ Mills and White, *op. cit.*, 1976, p.72.

¹⁹ By producing spectra specific to different media, Mass Spectrometry analyzes the chemical structure of their molecular components and identifies them. It also allows the analysis of lake colours; J. Kirby, 'A Spectrometric method for the identification of lake pigments dyestuffs', NGTB, (1), 1977, pp.34-45. Infrared spectrometry is another spectrometric method and detects specific infrared radiation from objects. This method has been increasingly used thanks to the development of infrared Fourier transform spectroscopy (FTIR). FTIR can identify the spectra of paint media such as linseed oil, egg yolk, and albumin, and further used to identify lake pigments such as madder and indigo. For the recent refinements of GLC by the application of Mass Spectrometry and FTIR, see J. Mill and R. White, 'Organic mass-spectrometry of art materials; work in progress', NGTB (6), 1982, pp.3-18; M. Low and L. Baer, 'Application of Infrared Fourier Transform Spectroscopy to Problems in Conservation', *Studies in Conservation*, (22), 1977, pp.116-128.

generally resulted from the use of a mixed media (Four samples were stained, not all from the same areas as those used for GLC).²⁰ In Caravaggio's *Boy bitten by a Lizard* egg tempera and oil emulsion was reported in 1993, but in this case the GLC of the National Gallery is not complemented with staining method, but by new methods like Mass Spectrometry and FTIR-microscopy. The refined method combining GLC with MS and FTIR-microscopy again reveals a mixed technique, or the co-presence of oil and egg tempera in 15th and 16th as well as further 17th century paintings: Solari's *A Man with a Pink*; Annibale Carracci's *Silemus gathering Grapes*; Guercino's *Incredulity of Saint Thomas*.

Although GLC does provide the more accurate information about the paint media, compared to the staining method, it is still difficult to gauge the 'overall' medium of a picture on the basis of this analysis; samples taken from only a few, disparate areas, which could not be entirely selected for art-historical reasons, can give a misleading impression of the media as a whole. In 1976, Mills said that chromatographic analysis is '*still to be concerned more with methods (of paint analysis) than the application of standardised procedures to the study of artists' technique*'.²¹ Does this question, then, addressed by Mills about GLC twenty five years ago, still remains valid? Since then, a great deal of media analyses based on GLC have been carried out with the development of other complementary methods. The materials and methods of painters have been the subject of museum exhibitions and publications, making them a matter of public interest. The National Gallery's 'Art in the Making' series and 'Meaning and Method' series represent a changing tendency, and a critical account of Renaissance painting techniques was compiled by the National Gallery of London in its recent catalogue, *Giotto to Dürer*. The development of media analysis is an important catalyst for this change. In conclusion, it is

²⁰ Mills and White further express their concern of staining methods; 'Our general feeling is, however, that the method really should be used in conjunction with chromatographic techniques since it can give results which will otherwise be wrongly interpreted.'; *op. cit.*, NGTB (2), 1978, p.73. The GLC and Staining method are complemented together in the medium identification of Filippino Lippi's paintings, and show the presence of egg-tempera undermodelling; *ibid*, p.75.

²¹ Mills, *op. cit.*, 1973.

important to note that the National Gallery now generally accepts the mixed technique as a norm of fifteenth and sixteenth century Italian painting technique.²²

In the increasing specialisation of this field, little seems left for the non-scientist. Nevertheless, the effort to bridge the gap between the scientific data by all the participants in this discipline should not be given up, as long as the proclamation by the late Joyce Plesters is shared by art historians, scientists, and conservators; *'In the interpretation of analytical data there is no substitute for looking long and hard at the picture itself'*.²³

²² See R. White's technical reports on the media analysis of Italian Renaissance paintings, for crucial data of mixed technique; NGTB (17) and (19), 1996 and 1998. See also J. Dunkerton, 'Modifications of traditional egg tempera techniques in Italy', *Early Italian Paintings Techniques and Analysis*, 1997, pp.29-34.

²³ J. Plesters, 'Painting Methods and Materials: A Brief Survey of Published Work from 1961 to 1972', *Conservation and Restoration of Pictorial Art*, (ed.) N. Brommelle and P. Smith, 1977, p.5.

Appendix 2

Cross-section Study

The aim of this paper is to assess the limitations of the cross-section analysis of paint samples. The idea that the examination of cross-sectioned paint samples under the optic microscope could provide invaluable information on the construction of paint film and the identification of materials was firstly conceived by Laurie around 1914.¹ This method has been subsequently developed especially as a scientific tool for the conservation and restoration of museum objects, but because of its power to reconstruct the order of picture-making, it has increasingly become a popular element of art historical discussions and drawn public interest in art exhibitions exemplified by *Making and Meaning* in the National Gallery, London.² This new form of painting analysis was comprehensively examined by Joyce Plesters four decades ago and her explanations remain legitimate.³ However, it is of importance to underline its limitations as one element of the study of painting methods, since it has remained a fundamental tool in this research.

Sampling

The scientific methods which have been used for the analysis of painting can be categorised into destructive and non-destructive by their resultant effects upon examined images. Whereas cross-sections and chemical analyses are known to be the former, photographic examinations such as microphotography, x-ray and infrareds belong to the latter. To examine a painting using a cross-section of paint under the microscope, samples must be removed from the paint film and mounted on a transparent medium, usually artificial resin. This technique is workable with minute samples, a square millimetre or even smaller; therefore using a smaller than that required for chemical analysis like GLC. It can be argued that the appearance of painting remains virtually unchanged by sampling, but no matter how

¹ A. Laurie, *The Pigments and mediums of the Oil Masters*, London, 1914.

² M. Hirst and J. Dunkerton, *Making and Meaning: The Young Michelangelo*, London, 1994.

³ J. Plesters, 'Cross section and Chemical Analysis of Paint Samples', *Studies in Conservation*, (3), 1955, pp. 183-93.

negligible it is, the method does cause damages on paintings, which is obviously a more critical issue when dealing with so-called 'masterpieces'. In general this means that the number of samples taken from a painting is very limited and samples are mostly taken from damaged areas; the more damaged the examined painting is, the more chances to obtain samples. Ideally, to obtain the relevant information for art historical research, samples must be taken from what could be termed the historically sensitive area, but in practice it is often difficult to do that since taking samples from undamaged areas is undesirable.

As the number of samples that can be taken for cross-section study is limited, there occurs what might be called a statistical hazard. This simply means that it cannot be absolutely guaranteed that a square millimetre or less of a painting is representative of the area under study.⁴

There are further aspects of the cross-section study that are peripheral to art historical study, but which seem to derive from the nature of conservators' research itself. At the moment, laboratory examinations are not arranged primarily to answer academic questions, but for practical reasons such as the preliminary assessment of damage, conservation treatment, preparing for sale, or for exhibition. Thus, the technological methods including cross-sections have been first adapted to assist such practical purposes and thus such scientific data has been viewed as a by-product.

Microscopic Examinations

Some technical problems arise during the microscopic examination of cross-sectioned paint samples. These are less critical, compared with those from the sampling, but it is of importance to be aware of them in the assessment of cross-section study, particularly when analyzing a conservator's report.

⁴ *Ibid.*

After it has been taken from the picture, the sample is mounted in a block of cold-setting resin. This resin block is polished to reveal the edge of the sample for examination. The polishing is carried out carefully and monitored step by step with the aid of low and high magnification microscope, not only because the mounted sample can be easily polished away, but because the shape and layer structure of cross-section can be, to a great extent, affected by this process.

To demonstrate the changes of the shape of sample, depending on the progress during polishing, I have taken a sample from near the gold lining of the Virgin Mary in a 14th century triptych (private collection) which was under technical examination and cross-sectioned it gradually [Fig. 1, 2].⁵ Fig. 3, 4, 5, and 6 are the photographs of this paint sample, each of which represents the different stages during the polishing of the cross-sections.

Fig.3 shows the cross-sectioned paint sample after its initial polishing; blue, light brown, gold leaf, brown layer in order. One might suspect that this is the wrong way around, regarding the brown layer as ground and the light-brown layer as an underpainting for blue. Since the sample was obtained from the border of gold background and blue drapery, this kind of layer structure, as shown in Fig.3(a), might be possible in this sample. Yet, this is not the case, since the brown layer, which later turned out to have no pigments or gesso in transmitted and fluorescent for resin under the ultra-violet light, is actually a varnish. Therefore, Fig. 3 is the right direction of the sample, showing the sequence of the painting from (1) blue, (2) light brown and (3) gold leaf to (4) varnish. No ground is found in this sample. In practice, because samples are generally obtained from the painting surface using a sharp pointed tool, they are often v-shape and, unless the tool has penetrated deep into the paint film, a ground layer or other lower layers are often missing in the samples; This is the case for the present sample.

⁵ UCL Painting Analysis Unit Report C.1201.

After examining the overall construction of the paint film, one can examine individual layers and attempt to initially identify pigments by their colour, shape, size and optical properties. The dark blue in the lower layer appears to be azurite. The greenish blue colour and the coarse, angular particles are the features of pigment from a mineral like azurite under the microscope, but it is difficult to draw a firm conclusion from these optical properties, since these characteristics of azurite are also that of ultramarine. Some deep blue particles in the bottom, in fact, look like ultramarine. Other scientific tests such as pigment dispersions under polarised light and EDX analysis, can help to determine its precise identity. I decided to employ one of them, after examining the consistency of the structure by the further polishing of the sample.

The light brown in the second layer is the bole which serves as an underlayer for gilded gold.⁶ The bole is an earth clay containing iron oxide which gives a reddish brown colour.⁷ This bole layer is now broken into several pieces, probably because of the higher portion of finely ground pigments to medium or the movement of the panel, more likely. The gold leaf is also fragmented over the broken lines of the bole layer, indicating that the gold leaf is original. It is of interest to note that varnish has been squeezed into the bole through the gaps of gold leaf. A question arises as to whether the bole consists of two layers since the colour of its upper part appear to be darker. The difference turned out to be more distinctive in the second stage of examination.

Fig.4 is the photograph of the cross-section of the sample taken after further polishing. The overall layer structure and features of Fig.4 are generally consistent with Fig.1, except the horizontal crack in the bole layer which suggests that the bole consisted of two separate layers.⁸

⁶ D. Bomford et al., *Art in the Making; Italian Painting before 1400*, London, 1989, pp.21-24.

⁷ The colour of the present underlayer is lighter, suggesting the lower presence of iron-oxide substances.

⁸ This sophisticated method seems to reflect the artist's meticulous craftsmanship.

Since the blue layer remains consistent, a complementary microscopic examination, called the pigment dispersion, was employed to identify the pigment precisely. Under a low power microscope, it was possible to extract a small fragment of paint from the blue layer. The predominately large particles of greenish blue were examined by polarising light microscopy [fig 4(a)], and from its appearance could be identified definitely as azurite. It had a lighter refractive index than the mounting medium, whereas ultramarine would have been lower; and it showed strong colours in crossed polarised light, whereas ultramarine particles would have disappeared.⁹

The layer structure of the initial cross-section study is found again in the third stage of polishing [Fig. 5], but the horizontal crack in the bole layer gets wider and the angular shape of the coarse azurite particles appears more distinctive.

The right hand side of the cross-section is disrupted by the broken layers. This disruption became severe in the next polishing stage [Fig.6]. The gold leaf was scattered into several dots with its bole underlayer and blue particles, leaving the unpigmented varnish layer dominant in the sample. The analysis concluded here as all parts of the sample has been examined.

Conclusion

The changes of the layer structure and shape of the sample from the first examination to the final are significant and, in a sense, spectacular, considering its minute size; after all these

⁹ This identity can be confirmed by supplementary analysis. Azurite will show the high proportion of copper in energy-dispersive X-ray analysis (EDX). EDX is an elemental analysis by using Scanning Electron Microscopy (SEM) and is now used to supplement the results obtained by optical microscopy of the cross-section. By scanning a beam of electrons, SEM reveals the details of objects at magnification up to 100,000x. It can analyze very minute areas of a sample, for instance a single pigment particle or a single paint layer. In SEM, EDX further measures x-ray characteristic in the elements of a sample and shows the proportion of elements such as copper, lead, tin, etc which the sample contains. Similar information can be provided by Laser Microspectral Analysis (LMA), which also measures the spectrum typical to the object. Other spectrometric methods such as infrared spectrometry, ultraviolet and visible spectrometry, florescence spectrometry, and mass spectrometry can be used in the identification of a certain type of pigments; see fn. 19 in Appendix 1. For discussion of spectrometric analysis, see J. Mills and R. White, *The Organic Chemistry of Museum Objects*, London, 1987, pp. 17-23. In the case of pure samples of crystalline pigments such as gesso, lead white and vermilion, X-ray diffraction analysis (XRD) can be used to confirm the results from the optical microscopy of cross-section. High Performance Liquid Chromatography (HPLC) is used to identify some organic pigments such as types of red lake.

changes happen in a paint sample measuring approximately 0.3mm^3 . The sample came from a border area in which complications of the paint layers are to be expected, and this may explain these changes. At any rate, together with the difficulty of obtaining samples from museum objects, the understanding of the procedure of cross-sectioning paint samples is important in the assessment of the examination of a painting by this method. The results of scientific analysis such as cross-section, for instance, reaches the general public in forms of photography in publications and exhibitions. Although the level of information varies within the layer structure which may change during the progress of microscopic examination, it is a norm to reproduce only one or two examples in the technical report. In the case of the above-mentioned sample, Fig.4 may be chosen to represent the overall findings from the sample; particularly it highlights the layer structure of the bole layer. Yet, Fig.3 which shows well the optical properties of azurite and the clear separation of the two bole layers is an equally good choice. When the emphasis shift from blue and bole to varnish, Fig.6 can be adopted, whereas Fig.3 is a good picture of the overall layer structure. In fact, it can be said that the publication of the photo images of cross-sections, to some extent, depends on researchers' interest. Therefore, when considering the reported photographed images of cross-sections, one should bear in mind the selective nature of the choice of photographic images.

The present study is, to a great extent, indebted to the published materials; Plate 18, 33 and 34 are the data examined or re-examined by the author under the microscope, whereas the cross-sections of Plate 7, 10,11, 19, 21, and 36 are from published technical reports. The latter are the results examined by experts who are well aware of the limitations of cross-section study, and the confirmation of identity of materials, in many cases, was obtained by several different techniques. Little room is left for arguing their findings, but some questions can still arise, since they have not always been fully brought together with reference to art historical discussions. If questions arose from the published technical reports, I have tried to communicate with restorers and scientists who were in a position to answer such problems.

Appendix 3

Core Works

Note

- Core works consist of Venetian and other Italian paintings dating from 1300 to 1550, though the majority are fifteenth century.
- The technical information gathered here is intended to indicate the general pattern of painting materials used in the period concerned. These works have all received modern scientific examination, but the level of analysis they received are varied, depending on the purpose of the laboratory analysis, the condition of works, and the availability of scientific tools. For a discussion of difficulties arising from these varied approaches, see Appendices 1 and 2.
- The method of paint media analysis, if employed, is listed. It is difficult, however, for the author to list the identifying methods for individual pigments since they are not always clearly mentioned in technical reports. Microscopic examination of cross-section and of pigments in dispersion under polarising light are the most important method used in the identification of pigments for this period, but it is often supplemented by other analytic methods such as EDX, LMA and XRD. The methods noted in the reports are listed at the end of each table with references.

Abbreviation

Preparation

gesso; gesso and glue ground	u.draw: underdrawing	u.paint: underpainting
LdW priming: Lead white priming	ch.coal: charcoal	
Oil l.: Linseed oil	Oil w.; Walnut oil	

Colours

Ul: Ultramarine Blue	Az: Azurite	In: Indigo	Sm: Smalt
Vm: Vermilion	RdL: Red lake	Mn: Minium or Red Lead	
LtY: Lead-tin Yellow	Or: Orpiment	Rg: Realgar	
YeE: Yellow Earth	GnE: Green Earth	RdE: Red Earth	
Vd: Verdigris	CoR: Copper Resinate	Ma: Malachite	Vt: Verditer
LdW: Lead white	Bk: Black		

Methods of scientific analysis

EDX: Energy-Dispersive X-ray microanalysis
 FTIR: Infrared Fourier Transform Spectroscopy
 FS: Fluorescence Spectrometry
 GLC: Gas Liquid Chromatography
 HPLC: High-Performance Liquid Chromatography
 IR: Infrared Photography or reflectography
 LMA: Laser Microspectral Analysis
 Micr.; Microscopic Examination of Cross section
 MS: Mass Spectrometry
 PLM: Polarising Light Microscopy
 Staining Methods
 UVS: Ultraviolet and Visible Spectrometry
 XRD: X-ray Diffraction Analysis

Venice

1. Jacopo Bellini

The Crucifixion

c.1450, Museo Correr, Venice

Panel (poplar), 29.7x57cm, Egg tempera [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -priming -u.draw. (IR)	U1 Az	Vm RL	LtY YeE All yellows are in YeE or GnE LtY for green with Vd.	Vd GnE Green; LtY and Vd	-Gold gilding and shell gold -Flesh; LdW+GE.

Dorigato, 1993, pp.108-111; Micr. FS

2. Jacopo Bellini and his sons

Canvases from the Scuola Grande di San Giovanni Evangelista

c. 1460, Private Collection, England.

Canvas, 110x150cm, Egg and some oils [micro. and visual analysis]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw	Az Az (drapery and sky); single blue	RdL Vm Mn Vm(lower quality)	LtY	Vt CoR	-gold and silver gilding -gesso ground varied between the canvases.

UCL Painting Analysis Report C.1212; Micro. PLM

3. Giovanni Bellini

The Crucifixion

Late 1450s, Museo Correr, Venice

Panel, 54.5x30cm, Egg tempera (GLC)

Preparation	Blue	Red	Yellow	Green	Note
-gesso -LdW priming -u.draw. (IR)	U1 Az -Az; underpaint for U1 in cherubime	RdL Vm Mn Vm; not for red colour, but for mixture of brown and flesh	LtY LtY; green mixture	Vd	Shell gold -RdL and violate lake for St John's costume -Flesh=Vm+LtY +LdW

Dorigato, 1993, pp.122-5; Micro FS.

4. Giovanni Bellini

The Transfiguration

Late 1450s, Museo Correr, Venice

Panel (Poplar), 134x68cm, Oil [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -LdW priming (oil) -u.draw. by brush (IR)	U1 Az -Az; sky and u.paint for U1	Vm RdL Vm and RdL: costume	LtY YeE LtY glaze in St Peter's costume	GnE Ma -Ma + GE: grass	-Shell gold -extensive used of LdW for highlight and half tone. -Vm and LtY for flesh tones

Dorigato, 1993, pp.126-129; Micro. FS

5. Giovanni Bellini*The Blood of the Redeemer*

c.1465, National Gallery, London

Panel (poplar), 67.5x101cm, egg tempera [GLC]; two samples - blue sky and white floor tiles.

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -LdW priming -U.draw (bone black; brush?) -metal point	Ul (sky) Az (landscape)	Vm	?	Vt (landscape and dark tiles); no XRD test.	*Shell gold *Coloured marble =Vm+Bk+little LdW

NGTB(2), pp.22-24; Micr. PLM

6. Giovanni Bellini*Pietà*

Late 1460s, Museo Correr, Venice

Panel, Oil l. [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -LdW Priming -u.draw (brush) -metal point	Ul (sky)	Vm	LtY	GnE	Vm+LtY +LdW for brown colour and Angel's flesh.

Dorigato, 1993, p.130-33; Micro FS.

7. Giovanni Bellini*Virgin and Child*

c.1460, Museo Correr, Venice

Panel, Egg (GLC)

Preparation	Blue	Red	Yellow	Green	Note
-gesso -LdW priming -u.draw.	Ul? Az	Vm RL RdO	LtY	Vd	Gold leaf

Dorigato, 1993; Micro FS.

8. Giovanni Bellini*Virgin and Child*

Late 1460s, Museo Correr, Venice

Panel (transferred to canvas) Egg tempera with some oils [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -oleaginous layer? -LdW priming -u.drawing (brush)	Ul Az Ul+Az; sky	Vm RdL	LtY	Vd	Flesh=Vm+LdW RdL+VdLtY; Virgin's costume Gold gilding

Dorigato, 1993, pp.118-121; Micro FS.

9. Giovanni Bellini*The Pesaro Altarpiece*

c.1473-6, Musei Civici, Pesaro

Panel (poplar), 262x240cm (main panel), Oil [GLC]; three samples

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue priming -LdW priming -u.draw (cartoon) -metal point	Ul (costume; sky) Az (frame; U.paint sky in predella) Sm (U.paint of Ul; costume; sky)	Vm RL RdO (?)	Or LtY(tiles) YeO(?)	CoR (landscape) Ma (Costume) Green costume in St Paul=Az+YeL+RdL+little Ma	Brown Ochre Flesh=Or+LdW+little Vm

Valazzi, 1988; Micr. PLM EDX XRD.

10. Giovanni Bellini*San Giobbe Altarpiece*

c.1478, Accademia, Venice

Panel, 471x258cm, Oil and Egg tempera with some emulsion [GLC/staining methods]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -LdW priming (egg emulsion)	UI	Vm RdL	Or	Ma	Gold gilding

Quaderni (17); Micr. PLM EDX XRD.

11. Giovanni Bellini*Madonna and Child*

1480s, Private Collection, England

Canvas (transferred?), 44x55cm, Oil [visual and Micr.]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw.(brush)	UI	Vm RdL	LtY	Ma	

UCL Painting Analysis C.1183; Micr. PLM

12. Workshop of Giovanni Bellini*Madonna and Child with a Donor*

1490s, Private Collection, South America

Panel, 83.2x67.5cm, Oil [visual and Micr.]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw; black chalk or ch.coal with incised lines	UI	Vm RdL	LtY YeE YeE (Virgin's robe)	Ma Vd CoR	

UCL Painting Analysis Report C.1094; Micr. PLM

13. Giovanni Bellini*Barbarigo Canvas*

c.1488, San Pietro Matire, Murano

Canvas, 200x300cm, Oil ('Olio Magro') [Staining Method]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -u.drawing (ch.coal)[IR] -metal point	UI	Vm RdL	LtY	Vd	

Quaderni (3), 1983; Micr. PLM EDX XRD

14. Giovanni Bellini*San Zaccaria Altarpiece*

1505, San Zaccharia, Venice.

Panel, 500x235cm, Oil(?)

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw [IR]	UI	Vm RdL	Or Rg	Vd CoR	

La Pala di Castelfranco, 1978/Lazzarini, 1988; Micr. PLM EDX XRD

15. Giovanni Bellini*San Giovanni Crisostomo Altarpiece*

1513, San Giovanni Crisostomo, Venice

Panel, 300x185cm, Oil(?)

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue priming -LdW priming	Az	Vm RdL Mn	LtY Or Rg	Vd CoR	

Lazzarini, 1988; Micr. PLM EDX XRD

16. Giovanni Bellini*Madonna and Child with Saints and Donors*

1505, Walters Art Gallery, Baltimore.

Canvas, Egg tempera and some oil [staining method]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw.?	Ul	RdL Vm	?	CoR	

Packard, 1971; Micr.

17. Giovanni Bellini and Titian*The Feast of the Gods,*

c.1515, National Gallery of Art, Washington

Canvas, 170x188cm, Oil with trace of egg tempera [GLC/MS]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -LdW priming (oil) -u.draw (very brief)	Ul Az	Vm RdL RdO	LtY (type I) Or Rg YeL YeE Silenus's robe= Or+Rg=orange	Vd CoR Ma Ma (only traces)	-LdW in priming is grey carbonate, not lead carbonate.

Bull and Plesters, 1990; Micr. XRD

18. Giovanni Bellini*The Assassination of St Peter Martyr*

c.1510, Courtauld Gallery, London

Panel, Oil with some egg [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -LdW priming -No underdrawing by IR; metal point?	Az (Sky)	Vm RL *Red costume= RL glazing over Vm	LtY (dress, tree)	Ma (costume) Vd (landscape) -Treetrunk=Vm+ Ldw+Bk	*Little use of earth colour *Brown; black glazing over red

Fletcher and Skipsey, 1993; Micr.

19. Gentile and Giovanni Bellini*St Mark preaching in Alexandria*

c.1510-16, Brera, Milan

canvas, 347x770cm, Oil (?)

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw -metal point	Ul Az	Vm RdL RdO	YeE LtY	Vd	Brown=RdO+Bk+ Yellows (sometimes Vm)

Tardito, 1988.

20. Antonello da Messina*Pietà (Unfinished)*

c.1475, Museo Correr, Venice

Panel, Oil L. [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw (ch.coal) -metal point; free incised lines	Az	Vm RL	LtY Or Giallorino?	Ma GnE Landscape=Ma+Lt Y	Christ Body= Giallorino+GnE+L dW

Dorigato, 1993, pp.162-172; Micr. FS

21. Bartolomeo VivariniTwo panels; *St Cosmas and St Damian*

c.1475, Gouda, Stedelijk Museum Het Catharina Gasthuis

Panel, 49x33.3cm and 43.5x30cm

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw.	Ul Az	Vm RL		Vt with whole egg	Violet= RL+Az+ Little Ul.

van Os, 1978, pp.157-160.

22. Alvise Vivarini*Virgin and Child*

c.1480-2, Ca d'Oro, Venice

Panel

Preparation	Blue	Red	Yellow	Green	Note
-gesso	Ul	Vm ReL	LtY	Vd CoR	

Lazzarini, 1988; Micr. PLM EDX XRD

23. Carpaccio*Arrival of Ambassadors*

c.1496/7, Accademia, Venice

Canvas, 275x589cm

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -trace of u.painting	Az	Vm RdL	LtY	Vd CoR	

Lazzarini, 1988; Micr. PLM EDX XRD

24. Carpaccio*Presentation in the Temple*

1510, Accademia, Venice

Panel, 130x137cm

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -U.painting	Ul Az	Vm RdL	Or Rg	Vd CoR	

La Pala di Castelfranco, 1978/Lazzarini, 1988; Micr. PLM EDX XRD.

25. Carpaccio*Meeting of Joachim and Anna*

1515, Accademia, Venice

Panel, 185x171cm

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue	Ul	RdL Vm	LtY Or Rg	Vd CoR	

Lazzarini, 1988; Micr. PLM EDX XRD

26. Carpaccio*Venetian Women* (Museo Correr)*Hunting in the Lagoon* (Getty Museum)

c.1500, Panel, Egg tempera and Oil [GLC, FTIR]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw. (cartoon) [IR] -metal point	Ul Az Ul in sky and green mixture with CoR Az for water and details of dress	RdL Vm	Or LtY		-gesso ground; calcium sulphate

Dorigato, 1993/ Szafran, 1995, pp.148-159.

27. Cima*Madonna of the Orange*

1496, Accademia, Venice

Panel

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue	Ul	Vm RdL	LtY Or Rg	Vd CoR	

Lazzarini, 1988; Micr. PLM EDX XRD

28. Pasqualino Veneziano (Bellini School)*Virgin & Child*

c.1490s, Bonnefantenmuseum, Maastricht.

Panel, 79.5x62.3cm, Egg and Oil [staining method]

Preparation	Blue	Red	Yellow	Green	Note
U.draw. (cartoon)	Ul Madonna's Robe and sky	Vm RL		CR Vd	-U.draw. by brush

H. van Os, 1978, pp.123-127. Micr.

29. Cima*Incredulity of St Thomas*

1505, National Gallery, London

Panel, Oil [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso (unburnt) -glue -priming in parts -u.draw. (brush- iron gall ink and charcoal) [IR] -metal point	Ul Az Ul (costume) Az (ceiling and u.paint for Ul; sky, costume) *Ul and Az in medium grades.	Vm RdL ReE RdL(lac) *Haematite u.paint for RdL (costume) *RdL glaze over green costume	LtY YeO YeL Or Rg	Ma Vd CoR Green costume= Ma+Vd+LdW (+LtY)	-Soft wood tar (Brown) -Red brown glaze=Rg+ little red earth and umber.

NGTB (10), 1986, pp. 4-27. Micr. PLM EDX XRD HPLC

30. Cima*Lamentation* (c.1490, Pinacoteca, Modena)*Virgin and Child with Saints* (c.1490, Brera, Milan)*The Chirring of St Peter* (1516, Brera, Milan)

Panel, Oil & some egg and oil emulsion

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -partly LdW priming (emuls.)	Ul Az Az used for strictly U.paint of Ul.	Vm RL	YO YL LY	Vd CR GE Green drapery= Vd+LtY/ LW	Green folige in 'Lamen-tation' = GE+ LtY+LdW

Rossi-Minaresi and Tucci, 1998. Micr. EDX

31. Cima

Tobias and the Angel
c.1510, Accademia, Venice
Panel

Preparation	Blue	Red	Yellow	Green	Note
-gesso(calcite) -u.draw.	UI	RdL	LtY	Ma CoR	

Lazzarini, 1988; Micr. PLM EDX XRD

32. Giorgione

Castelfranco Altarpiece
c. 1505(?), Duomo, Castelfranco.
Panel, 200x152cm, Egg Tempera [Staining method]

Preparation	Blue	Red	Yellow	Green	Note
Gesso	UI Az	Vm RdL Mn	LtY	Vd CoR	

La Pala di Castelfranco, 1978/Lazzarini, 1988. Micr. PLM EDX XRD

33. Giorgione

La Tempesta
c. 1505-6, Accademia, Venice
Canvas, 68x59cm, Oil l. [GLC]

Preparation	Blue	Red	Yellow	Green	Note
Gesso	Az	RdL	LtY	Vd	

La Pala di Castelfranco, 1978/Lazzarini, 1988. Micr. PLM EDX XRD

34. Giorgione

La Vecchia
c.1510, Accademia, Venice
Canvas, Oil l. [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso		RdL		CoR	

La Pala di Castelfranco, 1978/Lazzarini, 1988. Micr. PLM EDX XRD

35. Palma Vecchio

The Assumption
c.1510, Accademia, Venice
Panel

Preparation	Blue	Red	Yellow	Green	Note
-glue -gesso +calcite -glue	UI Az	Vm RdL Mn	Or Rg Lt	Vd CoR	

Lazzarini, 1988; Micr. PLM EDX XRD

36. Sebastiano del Piombo

Sacra Conversazione
1506, Accademia, Venice
Panel, Oil w.

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue	UI	RdL	LtY	Vd CoR	

La Pala di Castelfranco, 1978/ Lazzarini, 1988; Micr. PLM EDX XRD

37. Sebastiano del Piombo
Judgement of King Solomon(Unfinished)
 Kingston Lacy
 Canvas, 208.3x315cm, Oil

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw (ch.coal)	UI -UI (single blue)	RdL Vm	LtY	CoR	-gesso; calcium sulphate dihydrate -gold leaf

Hamilton Kerr Institute (1); Micr. XRD

38. Sebastiano del Piombo
St Louis of Toulouse
 1507/8, Accademia, Venice
 Canvas, Oil w. [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso	UI	Vm RdL Mn	LtY	Ma CoR	

Lazarini, 1988; Micr. PLM EDX XRD

39. Sebastiano del Piombo
San Giovanni Crisostomo Altarpiece
 1509/10, S. Giovanni Crisostomo, Venice
 Canvas

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue	UI	Vm RdL	Or Rg LtY	Ma Vd CoR	

La Pala di Castelfranco, 1978/ Lazarini, 1988; Micr. PLM EDX XRD

40. Lotto
St. Christina Altarpiece
 c.1507, S. Cristina al Tivarone
 Panel

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -gesso	UI	Vm RdL	Or Rg	Vd CoR	

Lazarini, 1988; Micr. PLM EDX XRD

41. Lotto
Portrait of a Gentleman
 c.1526, Accademia, Venice
 Canvas

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue	Az	Vm RdL	LtY	Vd CoR	

Lazarini, 1988; Micr. PLM EDX XRD

42. Lotto
St Nicholas in Glory
 c.1529, Accademia, Venice
 Canvas

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -Grey priming	UI Az	Vm RdL	Or Rg LtY	Ma Vd CoR	

Lazarini, 1988; Micr. PLM EDX XRD

43. Lotto*The Holy Family*

National Gallery, London, 1522?

Canvas, 89.5x74.3cm

Preparation	Blue	Red	Yellow	Green	Note
-gesso -priming; LdW+LiY -u.draw; linear	Az Az glaze over purple u.painting by RdL+Az+ LdW	RdL Vm RdL=Madder and lac	?	?	-thin Gesso ground

NGTB (19), 1998, pp.52-63; Micr. HPLC

45. Lotto*The Holy Family*

Museum of Fine Art, Boston, 1522?,

Canvas (not original), 94.6x77.8cm.

Preparation	Blue	Red	Yellow	Green	Note
-gesso -LdW priming -u.draw; free+ extensive	Ul Az Ul glaze over purple u.painting by RdL+Az+ LdW	RdL Vm RdL=Madder and lac	?	?	-Ul was identified by FTIR

NGTB (19), 1998, pp.52-63; Micr.

46. Lotto*A Lady with a Drawing of Lucretia*

1530-3, National Gallery, London,

Canvas, 95.9x110.5cm

Preparation	Blue	Red	Yellow	Green	Note
-gesso -Grey priming; LdW+little carbon black	Az	Vm RdL	Rg Pure Rg for highlight of Lady's dress	Vd	-blue background strip; Az -pink strip;RdL+Vm +LdW

NGTB (19), 1998, pp. 52-63; Micr.

47. Giovanni Mansueti*St Jerome & Discovery of flour in St Benedict's Monastery*

c.1510, Groningen, Bruges

Canvas, 96.6x136.4cm, Oil? [Staining method]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -LdW priming	Ul	Vm RL -Black added to RL glaze		Vd -Green marble= Az+LW+ Vd	-Thin ground -Green background=Ul+so me yellow

H. van Os, 1978, pp.106-109.

48. M. Basaiti*St George and the Princess*

1520, Accademia, Venice

Canvas

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -grey imprimatura	Ul Az	Vm RdL		Vd CoR	

Lazzarini, 1988; Micr. PLM EDX XRD.

49. M. Basaiti*St Peter enthroned with Saints*

1520, San Pietro di Castello, Venice

Canvas

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue	Ul	RdL	Or Rg	Vd CoR	

Lazzarini, 1988; Micr. PLM EDX XRD.

50. Titian*St Mark enthroned with Saints*

1510, San Maria della Salute, Venice

Panel, 230x149cm, Oil l. [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -trace of U.draw	Ul	Vm RdL	?	CoR Vd	-Bitumen

Lazzarini, 1988; Micr. PLM EDX XRD.

51. Titian*Assunta*

1518, Frari, Venice.

Panel

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -trace of U.drawing	Ul In	Vm RdL		CoR Vd	-Bitumen

Lazzarini, 1988; Micr. PLM EDX XRD

52. Titian*Ca'Pesaro Altapiece*

1519/26, Frari, Venice

Canvas, 278x268cm, Oil

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -grey priming	Ul Az Sm In	Vm RdL	LtY Lt(?)	Vd CoR	

Quarderni (8), 1979, pp.68-71; Micr. PLM EDX XRD.

53. Titian*Bacchus and Ariadne*

1515, National Gallery, London,

Canvas, Oil l. [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso; very thin	Ul Az	RdL Vm Vm; only in the Ariadne's sash.	LtY(type I) Or Rg	Ma Vd Ma=very coarsly ground; foliage in the back	Lavish display of Ul=sky, landscape, drapery, some in flesh

NGTB (2), 1978, pp.37-45; Micr. XRD

54. Titian*Martyrdom of St Lawrence*

1548-57, Church of Gesuiti, Venice

Canvas

Preparation	Blue	Red	Yellow	Green	Note
-Priming; brown colour; burnt ochre + carbon black		Vm RdL	LtY	Ma	-Bitumen

Lazzarini, 1988; Micr. PLM EDX XRD

55. Titian*Doge Grimani Kneeling before Faith*

1555-76, Ducal Palace, Venice

Canvas

Preparation	Blue	Red	Yellow	Green	Note
-gesso+calcite	Ul Az Sm	Vm RdL	?	CoR Ma	-Litharge

Lazzarini, 1988; Micr. PLM EDX XRD

56. Pordenone*Madonna and Child with Saints*

1511, Accademia, Venice

Panel

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -trace of u.drawing	Az	Vm RdL	Or Rg Lt	Vd CoR	

Lazzarini, 1988; Micr..PLM EDX XRD

57. Pordenone*St Catherine, Sebastian, and Roch*

1535, San Giovanni, Venice

Canvas

Preparation	Blue	Red	Yellow	Green	Note
-gesso -LdW priming	Ul	Vm RdL	Or Rg LtY	Vd CoR	

Lazzarini, 1988; Micr. PLM EDX XRD

58. Veronese*The Holy Family with Saints*

c.1551-5, Church of San Giovanni, Venice.

Canvas

Preparation	Blue	Red	Yellow	Green	Note
-gesso	Ul Az	RdL Vm	LtY Rg Or	Vd CoR	

Lazzarini, 1988; Micr. PLM EDX XRD

59. Veronese*The Banquet in the House of Levi*

1573, Accademia, Venice

Canvas

Preparation	Blue	Red	Yellow	Green	Note
-gesso	Az	Vm RdL	Rg Or LtY	Ma Vd CoR	-Litharge

Lazzarini, 1988; Micr. PLM EDX XRD

60. Veronese*Allegory of Love (Four Canvases)*

1570s, National Gallery, London.

Canvas, c.189x189cm., Oil 1. [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -grey priming; LdW+ black+umber	Az Sm Sky; Sm+LdW	RdL Vm Mn RdL; New World cochineal	LtY (type I and II) Or Rg	GnE CoR Vd	-no trace of Ul blue. -haematite (flesh)

NGTB (17),pp.33-55; Micr. EDX XRD HPLC FTIR

61. Veronese*The Adoration of the Kings*

National Gallery, London, 1573

Canvas, 355.6x320cm, Oil

Preparation	Blue	Red	Yellow	Green	Note
-chalk -u.draw; dry black material	Az Az; single blue in sky and drapery	RdL Vm RdL; polish cochineal	LtY (type II) Rg	Ma Vd Ma underlayer for Vd glaze	-chalk ground; calcium carbonate (XRD)

NGTB (17), pp.33-55; Micr. EDX XRD HPLC FTIR

62. Tintoretto*St George and the Dragon*

1560s, National Gallery, London

Canvas, 157.5x100.3cm, Oil [Staining method]

Preparation	Blue	Red	Yellow	Green	Note
-gesso (thin) -trace of u.draw.	Ul Az Ul; drapery and sky Az; u.paint for sky, landscape and sea	RdL Vm RdL; drapery Vm; minor details	LtY	Ma Vd CoR Landscape; CoR glaze over Ma	

NGTB (3), 1979, pp.32-36; Micr.

63. Tintoretto*The Appartition of the Cross to St Peter*

1555, Scuola di San Rocco, Venice

Canvas, Oil

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw.	Az Sm	RdL Vm Mn	Or Rg LtY	CoR	-gesso (anhydrite) -yellow light on the drapery of angel; RdL+Or

Plesters and Lazzarini, 1996/ Lazzarini, 1988; Micr. PLM EDX XRD

64. Tintoretto*The Crucifixion*

1565, Scuola di San Rocco, Venice

Canvas, Oil

Preparation	Blue	Red	Yellow	Green	Note
-gesso	Ul Az In Sm	RdL Vm Mn	Or Rg LtY	Vd CoR	-gesso (anhydrite) -bitumen

Plesters and Lazzarini, 1996/ Lazzarini, 1988; Micr. PLM EDX XRD

65. Tintoretto*The Miraculous Pool*

1565, Scuola di San Rocco, Venice

Canvas, Oil

Preparation	Blue	Red	Yellow	Green	Note
-gesso+Carbon Black	Ul Az	RdL Vm Mn	LtY	Ma	

Plesters and Lazzarini, 1996/ Lazzarini, 1988; Micr. PLM EDX XRD

66. Tintoretto*The Origin of the Milky Way*

c.1578, National Gallery, London

Canvas, 148x165cm, Oil l. [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-No gesso ground -single coloured ground by brownish ochre, black, RdL, Ul, Az and Ma. (oil) -LdW u.drawing using brush	Ul Az In Ul; drapery and sky	Vm RdL	LtY Or Rg	Ma CoR	- Az: bluish drapery with Ma and minor details such as the wings of the putti -In: final glaze for the breast of the peacock

NGTB (3), 1979, pp.32-36; Micr.

Northern Italy**67. Francesco Squarcione (?)***Virgin and Child*

c.1440, Groningen, Bruges

Panel, 59.5x45.5cm

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw. (cartoon) [IR]	Az In Madonna's robe= Az+In+black	?	Or	Vt (Madonna's inner dress)	Green tree=Or+Black

H. van Os, 1978, pp.131-135. Micr.

68. Schiavone*Virgin and Child*

c.1456-60, Amsterdam

Panel, 102x103.5cm

Preparation	Blue	Red	Yellow	Green	Note
-gesso -No trace of u.draw [IR]	Az In Blue background= Az+In+White	?	Or	Vt. (Madonna's inner dress)	Green tree=Or+Black

H. van Os, 1978, pp.128-131; Micr.

69. Andrea Mantegna*St Luke Polyptych*

c.1450, Brera, Milan

Panels (poplar), Tempera with some oil

Preparation	Blue	Red	Yellow	Green	Note
-gesso -LdW priming in parts -u.draw. (IR)	Ul Az -Ul & Az in oils for St Luke's mantle -Aze+YeE=blue mantle	Vm (banner) RdL RdO	LtY	CoR(major green with traces of Vd) Ma (St Guilano panel) CoR in oils Ma in egg	*Brown=Vm+Bk+ little RdL *Flesh=LdW+ little Vm *Gold gilding *Colour varnishing

Il Polittico di San Luca, 1988.

70. School of Andrea Mantegna (16th Century copy?)*Madonna & Child*

Private collection

Canvas

Preparation	Blue	Red	Yellow	Green	Note
No gesso	Az(drapery)	Vm RdO *Drapery; Vm over RdO	YeO	Vd	*flesh=pink modelling over verdaccio

UCL Painting Analysis Unit, Report no. C.1160; Micr. PLM

71. Francesco del Cossa*St Vincent Ferrer Altarpiece*

c.1473, National Gallery, London,

Panel(poplar), 153x60cm, Egg tempera [GLC/Staining]

Preparation	Blue	Red	Yellow	Green	Note
-gesso	Ul In Indigo used for u.paint for Ul.	Vm RL	LtY 'Mosaic gold'	Vt Vd	-gesso (dihydrate form) -'mosaic gold' in the horizontal rail.

NGTB (5.), 1981, pp.45-57. Micr. XRD LMA

72. Cosimo Tura*Allegorical Figure*

c.1460, National Gallery, London

Panel, 116x71cm, Oil over initial tempera painting [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw. [IR] -metal point	Ul Az In Drapery; Ul SkyIn; 2 to 4 layer of In, rarely with Az	Vm Mn RdL Red drapery; Vm over Mn RdL;lac	LtY (type I)	Ma Vd CoR	-gesso (dihydrate form)

NGTB (11), 1987, pp.19-35; Micr. XRD HPLC LMA

73. Bramantino*Adoration of the Kings*

c.1505, National Gallery, London

Panel (Poplar), 56.8x55cm, Oil w. [GLC/FTIR]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw. -metal point	Ul Az	Vm RdE Drapery in Vm shaded by black	LtY	Vd CoR	

NGTB (14),1993, pp.43-61; Micr. EDX

74. Giampietrino*Christ Carrying the Cross*

c.1510-30, National Gallery, London

Panel (poplar), 59.7x47cm, Oil w.

Preparation	Blue	Red	Yellow	Green	Note
-gesso -grey priming containing carbon Bk		RdL Vm RdE RdL glaze over Red-brown u.layer =Vm+RdE+Bk	?	?	-Flesh modelling; Dark translucent glazes over grey priming

NGTB (17), 1996, pp.5-19.

75. Boltraffio*Virgin and Child*

1493-9, National Gallery, London

Panel (walnut), 92.7x67.3cm, Oil and Egg [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -blackish brown underlayer	?	?	?	Vd CoR Green hanging; Vd+Bk over dark underlayer	-extensive drying faults

NGTB (17), 1996, pp.5-19.

Central Italy**76. Master of St Francis***Crucifixion*Late 13th century, National Gallery, London

Panel, 92.1x71cm, Egg tempera with some oil

Preparation	Blue	Red	Yellow	Green	Note
-gesso	UI	RdL Vm RdL glaze over LdW+RdL+UI= Loin cloth		Vd CoR GnE -CoR glaze over Vd+LdW=Christ's feet	-gilding -Vegetable Bk

Art in the Making, 1989, pp.54-63; Micr. PLM EDX LMA XRD

77. Giotto*The Pentecost*

1305-17, National Gallery, London

Panel, 45.5x44cm, Egg tempera

Preparation	Blue	Red	Yellow	Green	Note
-gesso	UI Az	RdL Vm RdE	LtY (type II)	GnE	-gilding -red resm

Art in the Making, 1989, pp.64-71; Micr. PLM EDX LMA XRD

78. Duccio*Three Panels from the Maestà*

1311, National Gallery, London,

Panel, c.45x45cm, Egg tempera

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw. (IR; quill and brush) -metal point	UI Az Brown-mauve; Az+RdL	RdL Vm	YeE	GnE	-gold gilding

Art in the Making, 1989, pp.72-89; Micr. PLM EDX LMA XRD

79. Ugolino di Nerio*Santa Croce Altarpiece*

1324-5, National Gallery, London

Panel, Egg with some oil [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw.	Az	RdL Vm	YeL -no LtY	GnE Green drapery; Az+little LdW over GnE	-u.draw; very brief -gold gilding

Art in the Making, 1989, pp.99-123; Micr. PLM EDX LMA XRD.

80. Nardo di Cione*St John the Baptist with St John the Evangelist and St James*

c.1365, National gallery, London

Panel, 159.5x148cm, egg

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw (IR; lamp Bk; quill)	UI	Vm Mn RdE Vm: darkened Mn; sgraffito	LtY YeE	-Green mixture; UI+LtY -GnE?; no sample from the flesh	-u.draw; detailed -gilding

Art in the Making, 1989, pp.156-189; Micr. PLM EDX LMA XRD.

81. Jacopo di Cione*San Pier Maggiore*

1370-1, National Gallery, London

Panel, Egg with a little oil [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw.(IR)	UI Az	RdL Vm Mn RdE RdL; brazilwood?	YeE YeL LtY(type II)	Ma GnE -Major green; Az+LtW -Ma; sgraffito	-gilding -lower grade of UI for lilac and purple mixture

Art in the Making, 1989, pp.156-189; Micr. PLM EDX LMA XRD

82. Paolo Uccello*Hunt in the Forest*

Late 1460s, Ashmolean, Oxford

Panel, 65x165cm, Egg tempera with some oil

Preparation	Blue	Red	Yellow	Green	Note
-gesso -dark U.painting containing black	UI Az UI in sky and crimson colour mixed with RdL Az=costume	RdL Vm RdO -black particles in RdL glaze	YeE	Ma Vt -Cracking has developed in some of the top layer in green foreground (Ma) due to the slower drying rate of thicker underlying layer.	-Extensive use of black particles as an additive to RdL glaze or brown mixture.

Hamilton Kerr institute (1); Micr. XRD

83. Paolo Uccello*St George and Dragon*

Early 1470s, National Gallery, London,

Canvas, 56.5x74cm, Oil w. [GLC-MS, FTIR; heated oil]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -orange-red priming;RdO+ LdW (oil) -black partial priming (from unkown composition) -LdW priming -u.draw (IR; linear)	Az	Vm RdE	LtY	Ma and Copper- contain green	

NGTB (19), 1998, pp.26-30.

84. SassettaPanels from *the Sansepolcro Altarpiece*

c.1444, National Gallery London

Panel

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw -metal point	Ut Ul; drapery, sky, and architecture	Vm RdL(Kermes)	LtY YeL	Ma Vd Vt Ma (main green) Vd&Vt (landscape)	

NGTB (1), 1977, pp.3-17; Micr. XRD

85. Piero della Francesca*Brera Altarpiece*

c.1472, Brera, Milan

Panel, Oil and tempera with emulsion [UVF]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw (cartoon) -metal point	Ul Az Sm	RdL Vm	LtY	CoR	LdW + little Sm glaze over pavement (egg)

Quaderni di Brera (9); Micr UVF

86. Perugino*Certosa di Pavia Altarpiece*

c.1500-5, National Gallery, London

Panel, Oil w. with some egg [GC/Staining Method]

Preparation	Blue	Red	Yellow	Green	Note
-gesso	Ul Az Az; u.paint for Ul or green mixture	Vm RdL RdL; madder	YeO		-gesso; anhydrite

NGTB(4), 1980, pp.3-31; Micr. LMA UVF

87. BotticelliFour Scenes from the *Early Life of Saint Zenobius* and *Three Miracles of Saint Zenobius*

c.1500, National Gallery, London

Egg tempera and some oils [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw (IR; vegetable Bk) -metal point	Ul Az Costume=Az+little Ul=Ul+RdL+LdW Sky=Az+LdW	Vm RL	LtY YeE	Vt	Brown=Vm+Bk +LdW Flesh=YeE+LdW+ Vegetable Bk on LdW underpaint Shell gold

NGTB (17), 1996, pp.20-32.

88. Botticelli*The Birth of Venus*

1480s, Uffizi, Florence

Canvas, Egg [GLC; one sample from green foliage]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw (IR); (1) outline by small brush ink (2) largebrush monochrome u.draw with aqueous media	Ul Az Sea; Az+Vd+LdW	Vm RdL	LtY YeE	Vd CoR Ma	-gesso; gesso sottile with little glue. -gold gilding -flesh; CoR glaze

Gli Uffizi (4), 1987, pp.75-83.

89. Botticelli*La Primavera*

1480s, Uffizi, Florence

Panel, Egg-oil emulsion (tempera grassa)

Preparation	Blue	Red	Yellow	Green	Note
-gesso(heated) -LdW priming -u.draw (IR)	Az	RdL Mn	LtY YeE	Ma CoR	

Baldini, 1986.

90. Filippino Lippi*The Virgin and Child with Saint John*

Late 1470s, National Gallery, London,

Panel (Poplar), 59.1x43.8cm, Egg tempera and Oil (walnut and linseed) [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw. (brush) -metal point	U1 Az Costume=U1 glazes in oil/U1+LdW /LdW Sky=Az+LdW	RdL RdL; lac in oil w.	LtY	Vt CpR Vt in egg CpR in oil l. Foliage=Vt on Bk Grass=Az on Vt+LtY	Mauve=Az+RdL+ LdW Flesh=LdW+Vm on YeE+LeW+Bk vegetable; green underpaint

NGTB (17), 1986, pp.20-32; Micr. EDX FTIR

91. Imitator of Fra Filippo Lippi*Virgin and Child with an Angel*

c.1480, National Gallery, London

Panel (poplar), 69.9x48.3cm, Egg tempera and Oil [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -underdrawing in Vegetable Bk (IR, brush) -metal point	U1 Costume=U1+LdW	Vm RdL RdE Costume=RdL in egg on LdW	LtY YeE	Vt CoR Lining=Vt and CoR in oils for shade Grass in front= Vt+LtY+LdW Grass in distant=Vt	Puple Grey=Az+ RdL+LdW Distant mountain= VgB+Vm and/or RdE+LdW Flesh=LdW+Vm with little Bk over verdaccio (YeE+ LdW+VgB)

NGTB (17), 1996, pp.20-32; Micr. EDX FTIR.

92. Domenico Ghirlandaio*Virgin and Child*

c.1480, National Gallery, London

Panel (poplar), 92.3x58cm, Egg tempera and Oil [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso	U1 Az Costume=Az in oil w. Sky=U1+LdW	Vm RdL RdE Costume=RdL(lac with little kermes) +Ld W Costume=RdL in oil on RdL in egg over Vm	LtY YeE	Ma Vt CoR Lining=Vt and CoR in oils for shade Grass=Vt+Ma+Az with CoR glazes	Purple grey =Az+Bk+RdL (glaze) over lamp black +RdL+LdW Flesh=LdW+Vm Gilding

NGTB (17), 1996, pp.20-32; Micr. EDX FTIR.

93. David Ghirlandaio*Virgin and Child*

c.1480, National Gallery London

poplar, 78.8x46.5cm, Egg tempera and Oil [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw. in Vg Bk (brush) -metal point	Ul Costume and Sky=Ul+LdW	Vm RdL RdL(kermes and little lac) Red Carpet= RdL(lac) in oil over Vm in egg	LtY YeE	Ma Vt CoR GnE Linging=Ma Grass=Vt+LtY+ YeE on Ma+Vt Tree=Vt+Ul with CoR glazes in oil	Purple grey=Ul+LdW+Rd W over Ul+LdW+VgBk Flesh=LdW+Vm/ GnE underpaint Gilding

NGTB (17), 1996, pp.20-32.; Micr. EDX FTIR

94. Michelangelo*Virgin and Child with Saint John the Baptist and Angels*

c.1497, National Gallery, London

Panel (poplar), 104.5x77cm, Egg tempera with some oil [GLC]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -underdrawing; Vg Bk (brush)	Az Sky=Az+LdW in egg	Vm RL Costume=RdL(lac with little kermes) in egg and some Oil w.	LtY YeE	Ma GnE Lining=Ma Grass in front=Ma+LtY in egg with some oil	Purple=Bk+LdW+ RdL Flesh=brown glazes on LdW+little Vm+RdE over green earth underpaint

NGTB (17), 1996, pp.20-32; Micr. EDX FTIR.

95. Michelangelo*Entombment*

c.1500, National Gallery, London

Panel (poplar), Oil l. and Egg [GLC-MS]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue priming -LdW priming (egg) -u.draw [IR]	Az Ul to be painted for the Virgin Mary?	RdL Vm RdE Mn RdL: lac lake	LtY YeE	CoR	

Making and Meaning; Micr. EDX HPLC FTIR

96. Michelangelo*Holy Family (Doni Tondo)*

c.1500, Uffizi, Florence

Panel, Oleo-resinous media

Preparation	Blue	Red	Yellow	Green	Note
-gesso -LdW priming -no u.draw by IR	Ul Az In(?) Virgin's manto & sky;CoR+Ul+LdW Joseph's blue garment; In(?) over Az+LdW	Vm RdL Mn	LtY Joseph's drapery; LtY over Mn+Vm	CoR	-ochre in flesh -brown lake for the Child's flesh

Gli Uffizi (2), 1985, pp.57-85; Micr., XRD, X-ray and UV spec.

97. Raphael*Crucified Christ with Virgin Mary and Saints and Angels.*

c.1503, National Gallery, London

Panel, 280x165cm, Oil [GLC; Linseed oil in 2 samples, walnut oil in a sample from blue area]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw.	Ul Az -Ul is limited to the bluest parts of the distant landscape.	RdL Vm -RdL is a dominant red.	LtY	Vd	-gold and silver gilding -brown ochre -purplish shadow; LdW+RdL+Az

Plesters, 1990, pp.15-37.

98. Raphael*St John the Baptist Preaching*

1505, National Gallery, London

Panel (Poplar), 29.2x53.8cm, Egg tempera and Oil [two samples in egg; one from foliage of tree in oil w. with some resin]

Preparation	Blue	Red	Yellow	Green	Note
-gesso -u.draw.[IR]	Ul Az Az (Sky and landscape) Limited use of Ul in costume; mixed with RdL and LdW=Az in the rest of drapery	RdL(lac) Vm	LtY (type I)	Vd CoR	-A single thin gesso layer =calcium sulphate dihydrate =Venetian and Northern Italian school -gold gilding

Plesters, 1990, pp.15-37.

99. Raphael*Transfiguration*

1517, Vatican.

Panel, 410x279cm, Oil (linseed oil with some walnut oil)

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue priming -LdW priming -U.drawing? -Extensive underpainting	Ul Az	RdL Vm RdO		CoR GE Ma	-extensive u.painting; green for blue sky, for instance. See plate 169 in Mancinelli's report for schematic diagram of u.painting

Mancinelli, 1990, pp.149-160.

100. Raphael*Monteluce Altarpiece*

1516-20, Vatican

Panel, Tempera Grassa (emulsion)

Preparation	Blue	Red	Yellow	Green	Note
-gesso -glue -LdW priming (less uniform in the lower panel) -U.painting?	Az Sm (upper panel only) Greenish sky=LdW with smalt and some ochre	RdL Vm Mn RdL and Sm layer for the u.painting of RdL glaze	YO	Ma	

Mancinelli, 1990, pp.149-160.

Check List; typical preparations and colours

Methods and Colours	Table number in Appendix 3		
	Venetian Works (66) 1-66	Northern Italian Works (9) 67-75	Central Italian Works (25) 76-100
1. Lead white Priming	1 3 4 5 6 7 8 9 10 15 17 18 30 45 47 57	69	89 95 96 99 100
2. Coloured Priming	42 43 46 48 52 54 60 65 66	74 75	83
3. Indigo	51 52 64 66	71 72	96
4. Smalt	9 52 60 63 64		85 100
5. Orpiment or Realgar	9 10 14 15 17 20 24 25 26 27 29 35 39 40 42 46 53 56 57 58 60 61 63 64 66	67 68	
6. Verditer	2 5	67 68 71	82 84 90 91 92 93
7. Red Lead	2 3 35 38 60 64 65	72	81 89 95 96 100

Appendix 4

Venetian Contracts and Payment Records

Narrative Canvas Cycles

Scuola Grande di San Marco, Sala Capitolare

Six contracts for at least nine paintings, all destroyed in a fire on 31 March 1485, have survived.

1. 1466 Jul. 6

Jacopo Bellini

(Molmenti, 1892, pp.126-30)

*Jacopo will receive 375 ducats including expenses. He should use the high quality of blue (ultramarine?) and other colours; 'El qual lavor sia fato si belo e ben fato melio che mai lavor l'abia fato de bontà e de cholori perfeti de azuro e de altri cholori ubligandose de non tuor per fin el farà questi lavori altro lavor de alguna condizion soto pena de quello pareà ai ofiziali se trovera in la Schuola a sua deschrizion e consienza.'

2. 1466 Dec. 15

Gentile Bellini

(Molmenti, 1892, pp.128-9)

* Gentile is commissioned to execute two *teleri* from the life of Moses. He is to be paid 150 ducats for each work including colours and other expenses; 'e meter boni cholori azuro e horo chome achadrà a tute sue spexe in modo chel sarà a paragon con i altri.'

3. 1467 Jan. 10

Andrea da Murano and Bartolommeo Vivarini

Scuola Grande di San Marco, Sala Capitolare

(Paoletti, 1894, I, p.10)

*Andrea da Murano and Bartolommeo Vivarini are commissioned to execute a canvas from the life of Abraham(?), using good quality materials; '... e depente de bonj cholorj finj oro azuro ultramarin marizi lacha e verdi e altrj cholorj achadera ale sopra schrite istorie che tutj sia in perfezion...'. They will receive the same money given to Jacopo Bellini

4. 1469 Jan 7

Lazzaro Bastiani

(Molmenti, 1892, p.130)

*Commission at artist's own request. '...a tutte sue spexe de colori, ori, azuri et ogni altra cosa sopra dicti telleri acadese i qual colori et oro debabi esser in tutta perfection...'

5. 1470 Apr 24

Giovanni Bellini

(Molmenti, 1892, pp.129-30)

*Giovanni Bellini will paint a two-part canvas with scenes from the Life of Noah for the same rate of money given to his father. No specific comments on colours

6. 1483 Feb 23

Bartolomeo Montagna

(Paoletti, 1894, I, pp. 11-12)

*No specific comments on colours.

Great Council Hall, Ducal Palace

The commission is well documented including 7 contracts and petitions together with other payment records.

7. 1474.

Gentile Bellini

Great Council Hall, Ducal Palace

(Lorenzi, 1868, no.188.)

*Gentile Bellini is commissioned to replace the damaged fresco works by canvases and to continue the decoration of the Great Council Hall, '*principal ornamenti de questa nostra Cita*'. The cost of colour and other things is paid by the Salt Office; '*...El qual officio del Sal, per aspectar cussi a quelli, li habia a far la spexa di colori et altre cose necessarie in tal opera.*'

8. 1479.

Giovanni Bellini

Great Council Hall, Ducal Palace

(Lorenzi, 1868, nos. 192 and 195)

*Giovanni Bellini is appointed by the Great Council to take over his brother's work. Until the *sansaria* falls vacant, he is paid 80 ducat per year. This does not include his expenses for colours; '*... Vadit pars, quod auctoritate hujus Consilij, fidelis civis noster Joannes Belinus pictor egregius, deputetur ad dictum opus instaurandum, renovandumque, et teneatur id instaurare atque renovare quando et ubis fuerit opus, ac sibi mandabitur per Provisores nostros Salis: qui sibi providere debeant expensis nostris de coloribus et alijs rebus eidem operi necessarijs.*'

9. 1481

Francesco di Giorgio

(Lorenzi, 1868, no.196)

* No specific comments on colour

10. 1488

Alvise Vivarini

(Lorenzi, 1868, no.22)

*No specific comments on colour

11. 1494.

Perugino

(Lorenzi, 1868, no.237, p.111)

*With reference to colours, Perugino was instructed to make the commissioned work more lavish (*richa*), using gold, silver, ultramarine, and necessary pigments, than the other companion works in the Hall. Perugino is offered a fixed price, 400 ducats, so he agreed to use such materials at his expense. The Venetian Government will provide the canvas and the wooden support for him, together with the scaffolding and other devices; 'Devendo far ditta opera più richa dela prima a tutte soe spexe de oro arzento azuro et colori et de tute quelle cosse apertien a larte del depentor. Et li Magnifici Signori Provedadori li farano far il teller de legnami et de telle da depenzer suxo, et i soleri et altri inzegni, azo depender si possi.'

12. 1513

Titian

(Lorenzi, 1868, no.338)

*No specific comments on colours.

13. 1518

Titian

(Lorenzi, 1868, no.344)

*Titian claims that he was paid only 10ducats for colours except for 3 ounces of ultramarine provided directly by the Government and 4 ducats per month for the salary of his two workshop members.

14. 1538

Pordenone

(Lorenzi, 1868, no.471)

*Pordenone will receive 200 ducats for his work in the Great Council Hall. No specific comments on colours.

Scuola di San Marco, Albergo

15. 1492 Jul. 15

Gentile and Giovanni Bellini

Scuola di San Marco, Albergo

(Paoletti, 1894, I, p.17)

*Gentile Bellini is contracted to decorate the Albergo of the Scuola di San Marco. The Scuola bears the expense of everything that is required for the work. Gentile Bellini was to receive 50 ducats for his labour.

16. 1515.

Giovanni Bellini

Scuola di San Marco, Albergo

(Paoletti, 1894, I, p.14)

*After Gentile's death, Giovanni Bellini takes over his brother's job in the Scuola. He is told to paint a canvas work with colours in perfection. The Scuola paid for every expense and Giovanni Bellini was to be paid the same price given to his brother.

Banners

17. 1452/53

Jacopo Bellini

Scuola Grande di Santa Maria della Carità.

(Paoletti, 1894, I, 8-9)

*This contract shows that Jacopo Bellini was to be paid 140 ducats for a banner. Ultramarine and gold both in highest quality should be used; '...figuris auro fino et de lazurio ultramarino fino secundum formam et designum...'.
'

18. 1501

Alvise Vivarini

Scuola Grande di San Marco

(Paoletti and Ludwig, 1899, pp.274-5)

*Alvise Vivarini was commissioned to paint a banner for the Scuola Grande di San Marco for 100 ducats which includes his expenses for materials apart from the silk. He is instructed to use all colours fitting and necessary and principally ultramarine and gold leaf; 'In en qual penello veramente die intervegnir tuti quei colori pertinenti el nezessarj et prezipue azuro oltramarin et oro mazenado secondo lobieto et appetito nostro, et secondo che per messer lo guardian overamente compagni li sera imposto.' It is interesting that his use of colour is to be directed by the Guardian and the companions. Vivarini has provided the design, 'secondo l'ordine e forma de el desegno che per luj è stato fato', but it remains unclear whether the contract was ever executed.

Altarpieces

19. 1440

M. Giambono

San Daniele Polyptych in Friuli

(V. Joppi, 'Di alcune opere d'arte in San Daniele di Friuli', *Archivio Veneto*, (21), pp.468)

(N.Land, 'New Proposal...', *Pantheon* (39), 1981, pp.305-9)

*Polyptych with polychrome sculptures with possibility of some painted panels.

*No specific comments on colours.

20.1447

M. Giambono

Coronation of the Virgin for S. Agnese in Venice

(Paoletti, 1894, Vol.2, Padua, pp.13-15)

(N.Land, 'Michele Giambono..', Burlington Magazine (119), p.167ff)

*No specific comments on colours

21. 1470/3

Bartolomeo Vivarini

Misericordia Altarpiece; Triptych (San Maria Formosa, Venice)

(Ludwig, *Jahrbuch der Königlich preussischen Kunstsammlungen* (25), 1905, pp.15-18)

*Record of contributions and no comments on colours.

22.1484

Bartolomeo Vivarini

Death of the Virgin (Certosa, Padua)

(P. Sambin, 'Nuovi documenti...', *Bollettino del Museo Civico di Padova* (52), 1964, pp.41-42)

*50 ducat fee including frame and colour; 'magistro Baxtholomeo tam pro dicto opere fabricando lignamen picture quam coloribus et qui bus cum que alius expensis ituris in perficiendo palam ducatis quinquaginta auri...'

23. 1490

A. Vivarini

Virgin and Child with Saints

(L. Lanzi, *Storia pittorica del'Italia* (M. Capucci, 1968, II, p.13))

*comments on fee and expenses possibly based on original contract; 100 ducat fee including frame and materials

24. 1492/3

Cima

Virgin and Child with Saints (345x202cm, Conegliano, Duomo)

(Humfrey, 1983, pp.197-9)

*Contract and payments; He was paid 65 ducat which included the cost of colours. The use of high quality colour and gold was stipulated in the document; '... deauratam et pictam optimo auro et finissimis coloribus arbitrio et iudicio...'

25. 1513/15

F. Bissolo

Coronation of St Catherine of Siena (San Pietro Martire, Murano)

(Ludwig, *Archivalische Beiträge*, 1905, p.44)

*Contract and payments; 40 ducats (365x235cm); 'per duchati quaranta a tute mie spexe reservando chel diti padri loro debia meter tuto lazuro che achadera in dita pala sia fata in tela bona e sufficiente...'

26. 1513

Cima

Madonna and Child with Saints (formerly Capodistria, S. Anna)

(Humfrey, 1983, pp. 205-206)

*Contract for altarpiece and frame; 70 ducats (31 ducats for frame)

*Cima writes the agreement for painting a polyptych for the church of S. Anna in Capodistria, promising to use good quality colours at his expense. The work was removed from the high altar in 1946, and its present whereabouts is unknown.

27. 1519-26

Titian

Ca'Pesaro Altarpiece

(J. Crowe and G. Cavalcaselle, 1881, p. 441)

*Payments; no specific payment for pigments but they show that Titian was paid 6 ducats for temporary frame and for the canvas; 'per il Telaro di legno, per tela, per fatura di dito telaro Duc sie (6)'.

28. 1523

Lorenzo Lotto

Saint Lucy Altarpiece

(Annibaldi, Jr., 1980, pp.149-52)

*Lotto was stipulated to use good quality pigments and genuine gold; 'facere et pingere unam anconam in tabula cum figuris prout et sicut aparet designatum per designum per ipsum magistrum Laurentium in Cartone factum existens penes supradictos confraternales, bonorum colorum et legalis auri ita et taliter quod sit melioris conditionis et pulchritudinis tabla scole...' He was to be paid 220 ducats (ducati d'oro larghi) including colours.

29. 1523/6

Palma Vecchio

St Stephen with Saints (280x180cm, Madonna dell'Orto, Venice)

(A. Mercati, 'Studi storici dell'arte e documenti a proposito di una pala di Palma il Vecchio', Rendiconti della Pontificia Accademia di Archaeologia, 1939, pp.21-35)

*Contract and payments; 'Et die far die grandeza et largeza secundo rechiede la qualita' de la capella per del desegno fato per mo.' They do not contain specific comments on colour, but show that Palma was paid L4 s.10 for his canvas on 14 October 1523; 'Jacommo palma per tela per la pala L 4. s10...' Total fee paid to him amounts to 66 ducats.

30. 1525/6

Palma Vecchio

Adoration of the Sheperds (470x260cm, S. Elena, Venice)

(F. Stefani, Archivio Veneto, 1871, pp.166-8; Ludwig, Archivalische Beiträge, 1903, p.68)

*According to the document, Palma Vecchio was to be paid 110 ducats including the expenses. He should use high quality pigments; 'Et quam palam prefatus magister Jacobus promisti pingere bonis et optimis coloribus.'

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Table 1. Major publications of Bellini's Restored Work

1. *The Transfiguration*, Museo Civico Correr, Venice.
-c.1455
-Dorigato, A. (ed.), *Carpaccio, Bellini, Tura, Antonello e altri restauri quattrocenteschi della Pinacoteca del Museo Correr*, Milan, 1993, pp.46-7, 126-9.
2. *The Crucifixion*, Museo Civico Correr, Venice.
-c.1455
-Dorigato, A. (ed.), *Carpaccio, Bellini, Tura, Antonello e altri restauri quattrocenteschi della Pinacoteca del Museo Correr*, Milan, 1993, pp.122-5.
3. *St Jerome*, Barber Institute, Birmingham.
-c.1455
-Braham A., Wyld M., and Plesters J., 'Bellini's "The Blood of Redeemer"', *National Gallery Technical Bulletin*, (2), 1978, p.24.
4. *The Blood of the Redeemer*, National Gallery, London.
-c.1465
-Braham A., Wyld M., and Plesters J., 'Bellini's "The Blood of Redeemer"', *National Gallery Technical Bulletin*, (2), 1978, pp.11-24.
5. *The Agony in the Garden*, National Gallery, London.
-c.1465
-Dunkerton, J. et al., *Giotto to Dürer*, New Haven and London, 1991, p.294.
-Braham A., Wyld M., and Plesters J., 'Bellini's "The Blood of Redeemer"', *National Gallery Technical Bulletin*, (2), 1978, p.24.
6. *The Dead Christ with two Angels*, Museo Civico Correr, Venice.
-c.1465
-Dorigato, A. (ed.), *Carpaccio, Bellini, Tura, Antonello e altri restauri quattrocenteschi della Pinacoteca del Museo Correr*, Milan, 1993, pp.130-5.
7. *The Virgin and Child*, Museo Civico Correr, Venice.
-c.1465
-Dorigato, A. (ed.), *Carpaccio, Bellini, Tura, Antonello e altri restauri quattrocenteschi della Pinacoteca del Museo Correr*, Milan, 1993, pp.118-121.
8. *The Virgin and Child*, 66.5x49cm, Rijksmuseum, Amsterdam.
-c.1465-1470.
-Van Os, H. et al., *The Early Venetian paintings in Holland*, Maarssen, 1978, pp.32-33.
9. *The Pesaro Altarpiece*, Museo Civico, Pesaro.
-c.1473
-Valazzi, M. R. (ed), *La Pala ricostituita*, Venice, 1988.
10. *The Portrait of Jörg Fugger*, Contini collection, Florence.
-1474
-Goffen, R., *Giovanni Bellini*, New Haven and London, 1989, pp.197-200.
11. *The Greek Madonna*, Brera, Milan
-c.1475.
-Tardito, R. (ed.), *Giovanni Bellini a Milan*, Milan, 1987, pp.10-13.

12. The *Resurrection*, Gemaldegalerie der Staatliche Museen, Berlin
 -c. 1475-79
 -The infra-red reflectogram is referred to in H. van Os et al., *op. cit.*, p.38.
13. The *Virgin and Child*, 55x49cm, Rijksmuseum, Amsterdam.
 -1475-80
 -H. van Os et al., *The Early Venetian Paintings in Holland*, Maarssen, 1978, p.38.
14. *San Giobbe Altarpiece*, Accademia, Venice
 -1478
 -Quaderni ... di Venezia (19), 1994.
15. The *Barbarigo Canvas*, San Pietro Matire, Murano.
 -1488
 -Lazzarini, L., 'La Pala Barbarigo di Giovanni Bellini; Le analisi di Laboratorio', *Quaderni della Soprintendenza ai Beni Artistici e Storici di Venezia* (3), 1983.
15. The *Virgin and Child*, Harewood Collection, Yorkshire.
 -c.1490s
 -R. Goffen, *Giovanni Bellini*, New Haven and London, 1989.
16. The *Virgin and Child*, 77.2x56.7 cm, Amsterdam, Rijksmuseum
 -school of Bellini
 -1480-90
 -Van Os, H. et al., *The Early Venetian paintings in Holland*, Maarssen, 1978, pp.32-33.
17. *Vanitas*, Accademia, Venice
 -c.1490
 -*Giorgione a Venezia*, Exh. Cat., Milan, 1978, pp.34-37.
18. The *Lamentation*, Gemaldegalerie der Staatliche Museen, Berlin
 -c.1500
 -The infra-red reflectogram is referred to in H. van Os et al., 1978, *op.cit.*, p.38.
19. The *Resurrection*, Uffizi, Florence.
 -c.1500
 -The infra-red reflectogram is referred to in H. van Os et al., 1978, *op.cit.*, p.38.
20. The *Madonna of the Meadow*, National gallery, London.
 -c.1501-5
 -Dunkerton J. et al., *Giotto to Dürer*, New Haven and London, 1991, p.336.
21. The *Doge Leonardo Loredan*, National Gallery, London.
 -c.1501-5
 -Dunkerton J. et al., *Giotto to Dürer*, New Haven and London, 1991, p.364.
 -Rawlins, I. (ed), *From the National Gallery Laboratory*, London, 1940.
22. The *Pietà*, 65x90cm, Accademia, Venice
 -1505
 -*Giorgione a Venezia*, Exh. Cat., Milan, 1978, pp.93-95.
23. *San Zaccaria Altarpiece*, San Zaccaria, Venice.
 -1505
 -Lazzarini, L., 'Il colore nei pittori veneziani tra il 1480 e il 1580', *Bolletino d'Arte*, Supplemento 5, 1983, pp. 135-44.
24. The *Virgin and Child enthroned with St Peter and Paul and a Donor*, Birmingham Museum and Art Gallery, Birmingham.

- c.1505
 - Bellini workshop
 - Restored and displayed in the National Gallery, London, in 1993.
 - Cannon-Brooks, P., *The Cornbury Park Bellini*, Birmingham, 1977.

 - 25 *The Assassination of St Peter Martyr*, National Gallery, London.
 - c.1505
 - D. Bull and J. Plesters, 'The Feast of Gods', *Studies in the History of Art*, (40), 1990.

 - 26 *The Assassination of St Peter Martyr*, Courtauld Institute Galleries, London.
 - c.1510
 - Bellini Workshop
 - Fletcher, J. and Skipsey, 'Death in Venice: Giovanni Bellini and "The Assassination of Saint Peter Martyr"', *Apollo*, (133), 1991, pp.4-9.

 - 27 *The Baltimore Canvas: Virgin and Child Enthroned with Saints and Donors*, Walters Art Gallery, Baltimore.
 - c.1510
 - Packard, E., 'A Bellini Painting From the Procuratia di Ultra, Venice', *the Journal of the Walters Art Gallery*, (33-34), 1970/71.

 - 28 *The Virgin and Child*, Dienst Versreide Rijkscollecties, the Hague.
 - c.1510, school of Bellini
 - H. van Os et al., *The Early Venetian Paintings in Holland*, Maarssen, 1978, pp.45-49.

 - 29. *Sts Jerome, Christopher and Louis*, San Giovanni Crisostomo, Venice.
 - 1513
 - Lazzarini, L., 'Il colore nei pittori veneziani tra il 1480 e il 1580', *Bolletino d'Arte*, Supplemento 5, 1983, pp. 135-44.
 - Giorgione a Venezia*, Exh. Cat., Milan, 1978, pp.196-201.

 - 30. *A Dominican with the Attributes of St Peter Martyr*, National Gallery, London
 - c.1515, Bellini Workshop.
 - Davies, M., 'Un Dipino Belliniano Radiografato a Londra', *Arte Veneta*, 1950.

 - 31. *The Feasts of the Gods*, National Gallery of Art, Washington.
 - c. 1515
 - D. Bull and J. Plesters, 'The Feast of Gods', *Studies in the History of Art*, (40), 1990.

 - 32. *The Deposition*, Accademia, Venice.
 - 1515
 - Quaderni della Soprintendenza i Beni Artistici e storici di venezia*, (1), 1965, pp.13-14.

 - 33. *The Virgin and Child*, 23x20 cm, Amsterdam, Rijksmuseum
 - 1490-1520, Bellini school
 - H. van Os et al., *The Early Venetian Paintings in Holland*, Maarssen, 1978, pp.42-4.

 - 34. *The Virgin and Child*, 50x42.2cm, Maastricht, Bonnefantenmuseum
 - 1520s, Bellini school
 - H. van Os et al., *The Early Venetian Paintings in Holland*, Maarssen, 1978, pp.50-51.

 - 35. *St Mark Preaching in Alexandria*, Brera, Milan.
 - c.1515-26
 - Tardito, R., 'Milano: Pinacoteca di Brera. Il restauro della <<predica di San Marco in Alessandria d'Egitto>> e Gentile e Giovanni Bellini', *Arte Veneta*, (42), 1988, pp.258-265.
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Table 8(a) Distribution of the size of Bellinesque Works in the 1450s

The dimensions of Bellinesque works in Table 8 are based on the catalogue of Bellinesque works given by T. Pignatti, *L'Opera Completa di Giovanni Bellini*, Milan, 1969.

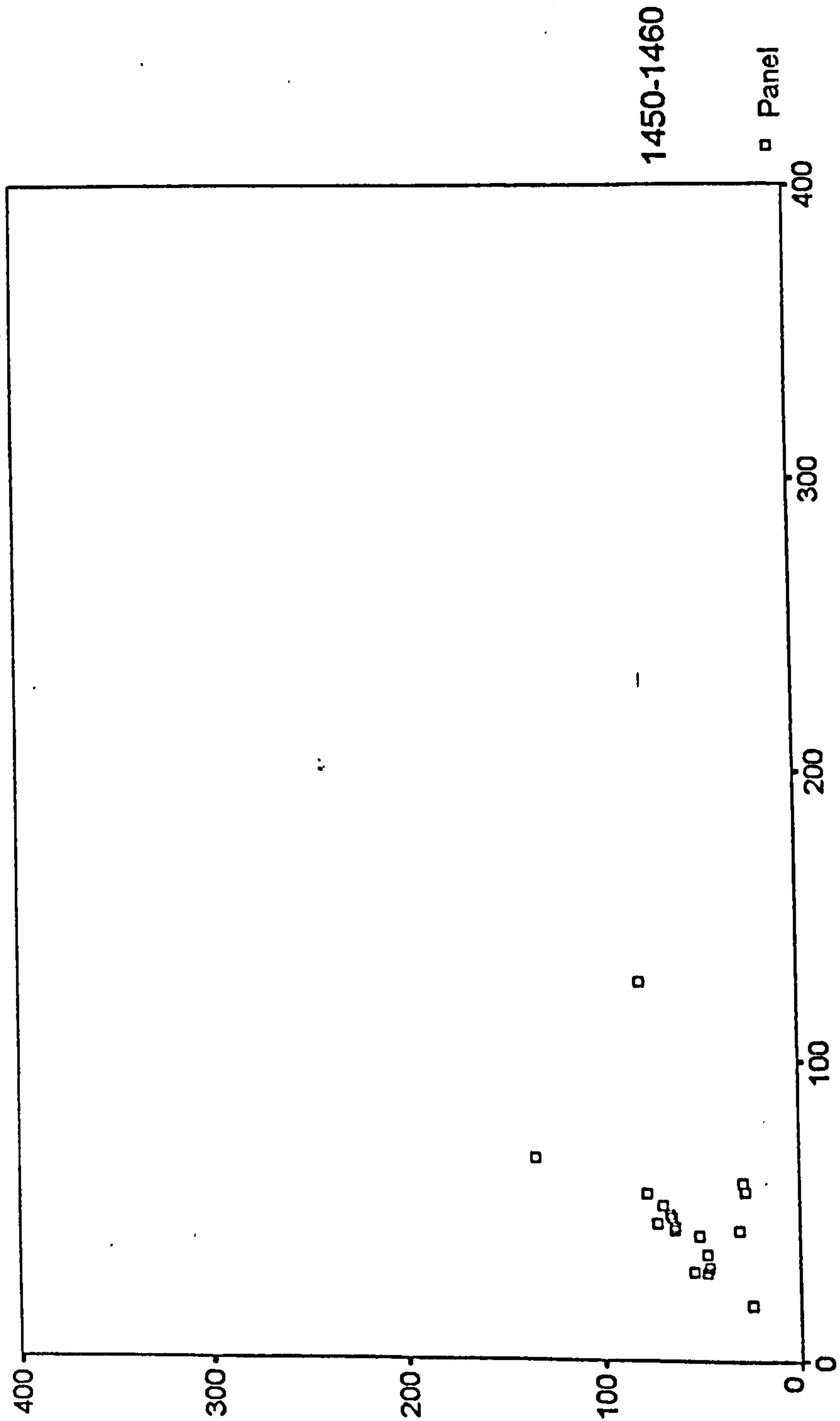


Table 8(b) Distribution of the size of Bellinesque Works in the 1460s

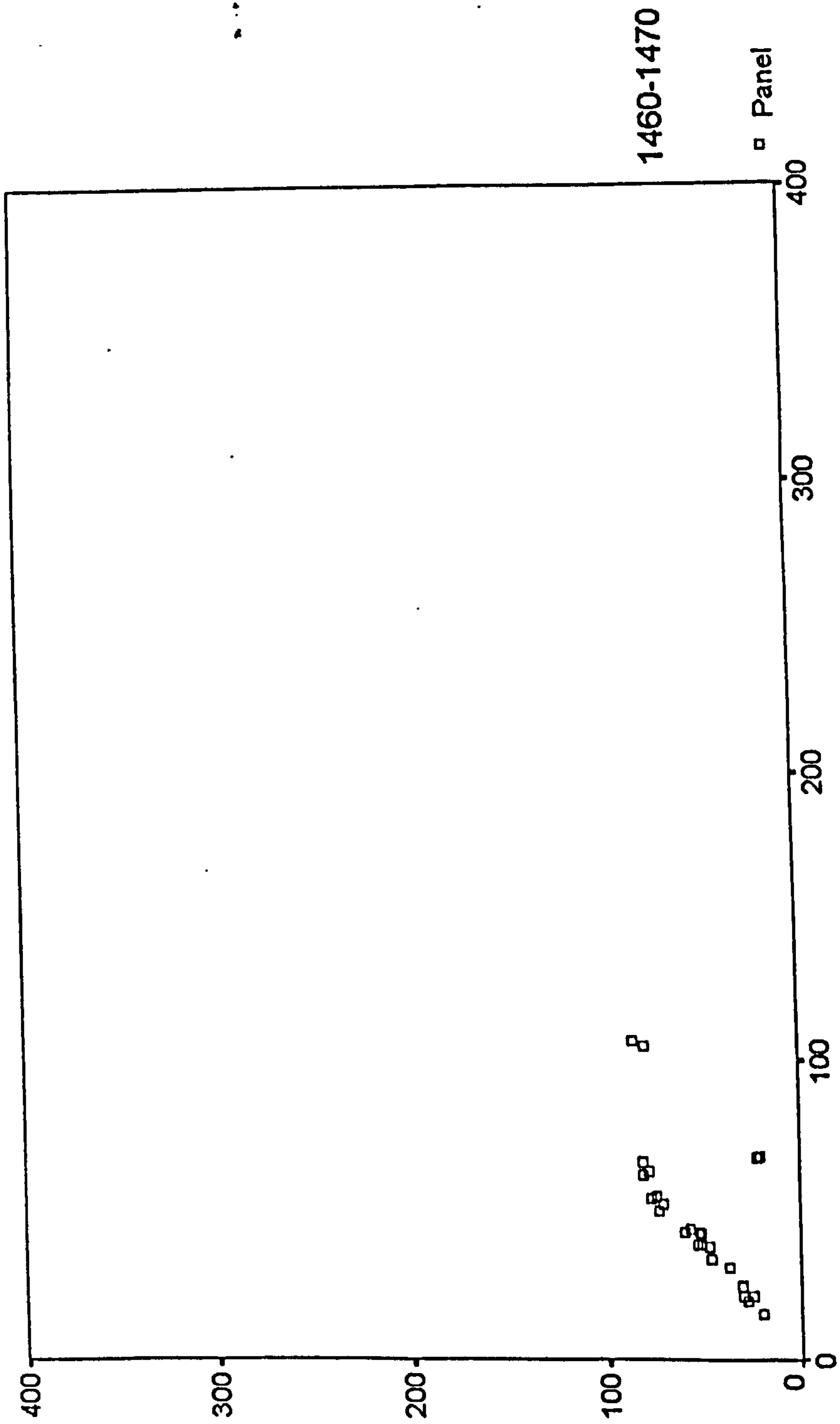


Table 8(c) Distribution of the size of Bellinesque Works in the 1470s

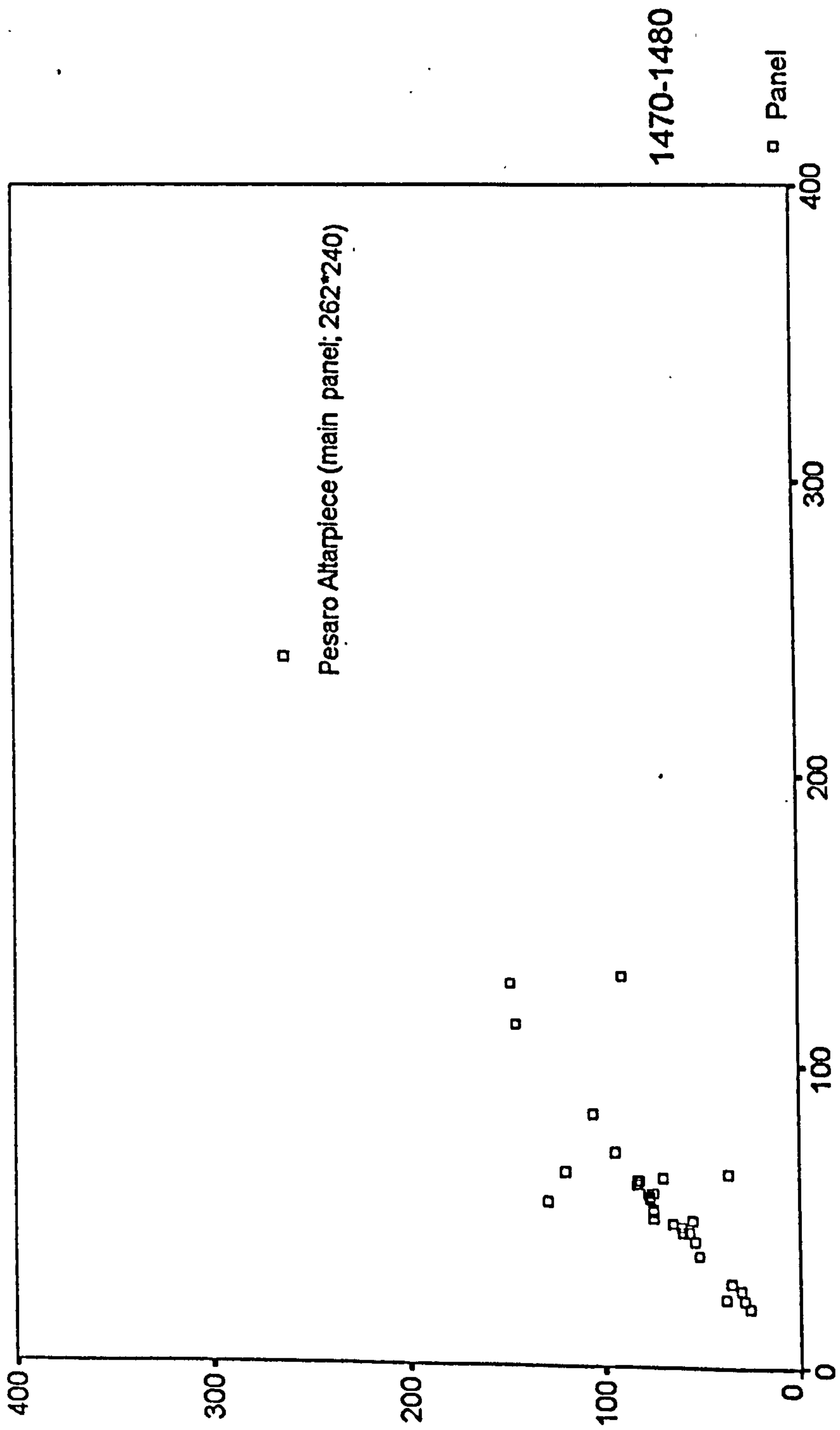


Table 8(d) Distribution of the size of Bellinesque Works in the 1480s

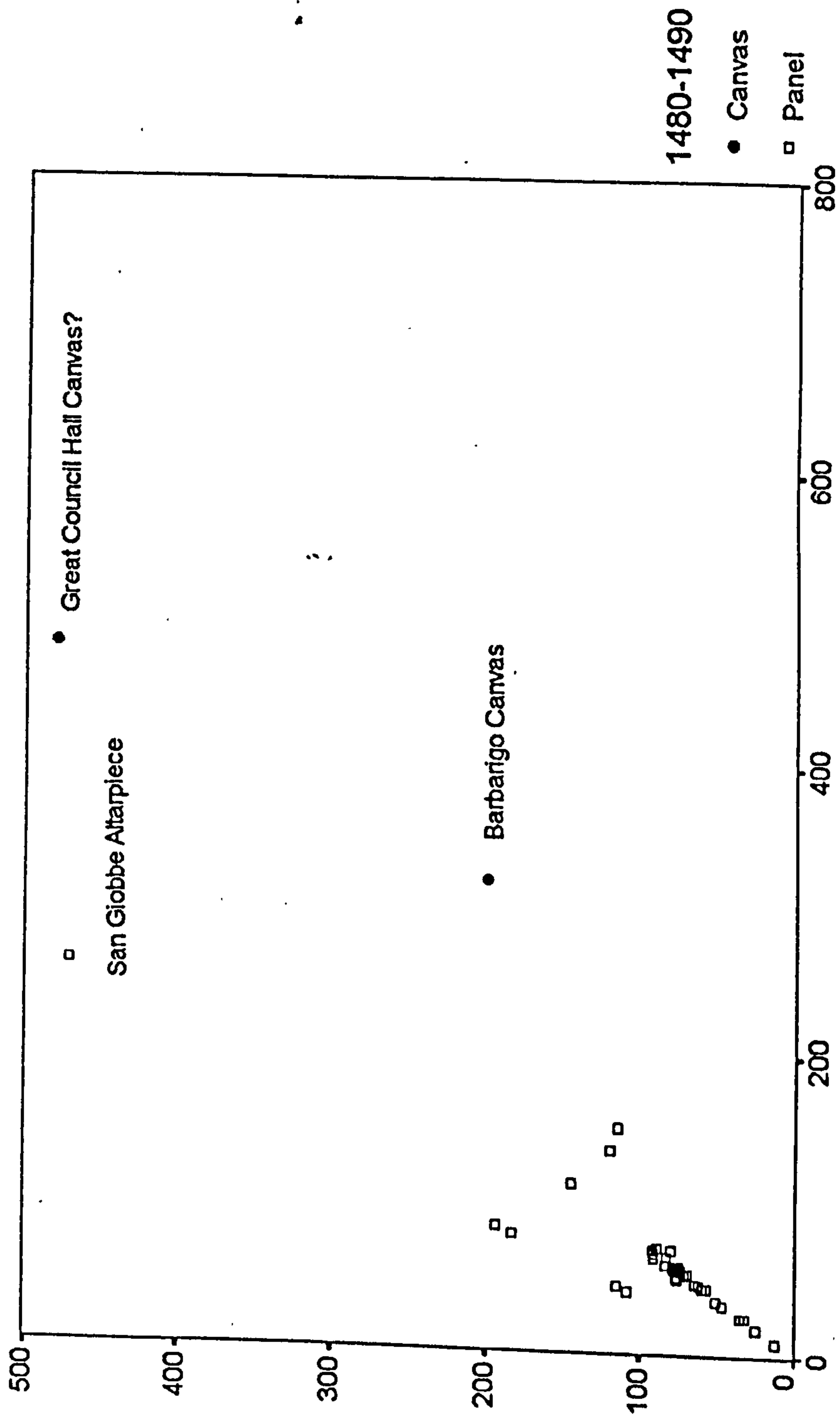


Table 8(e) Distribution of the size of Bellinesque Works in the 1490s

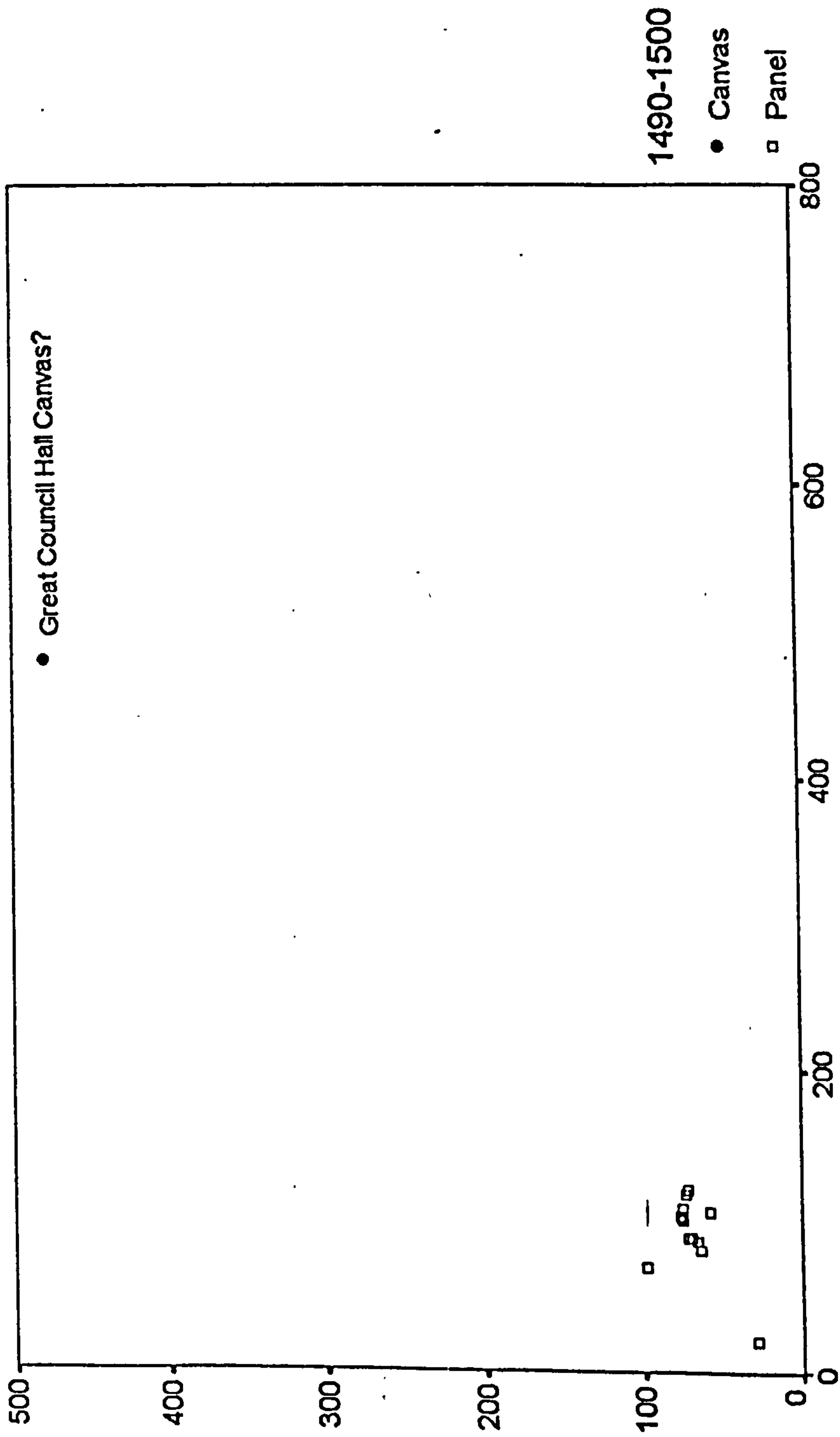


Table 8(f) Distribution of the size of Bellinesque Works in the 1500s

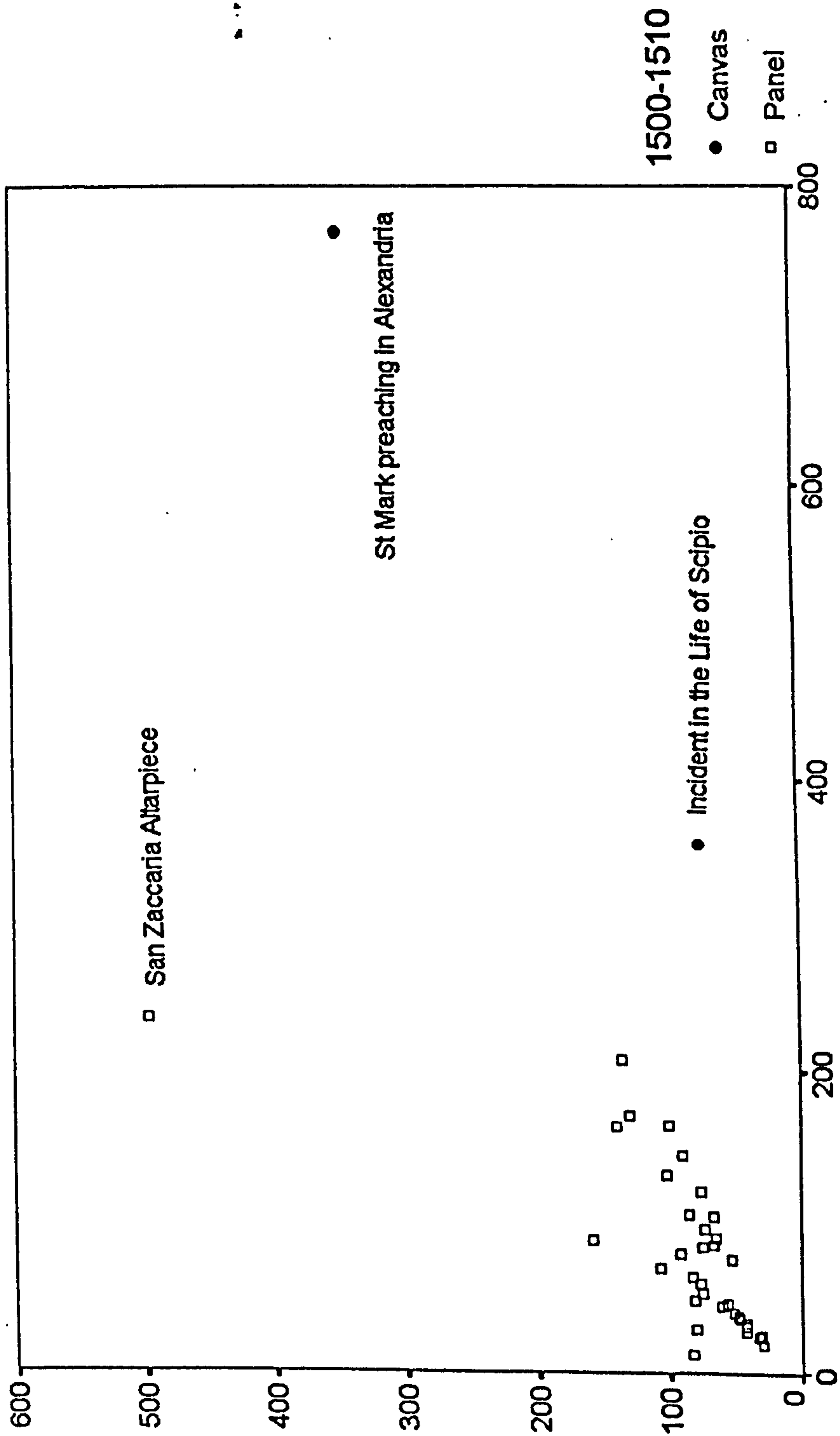


Table 8(g) Distribution of the size of Bellinesque Works in the 1510s

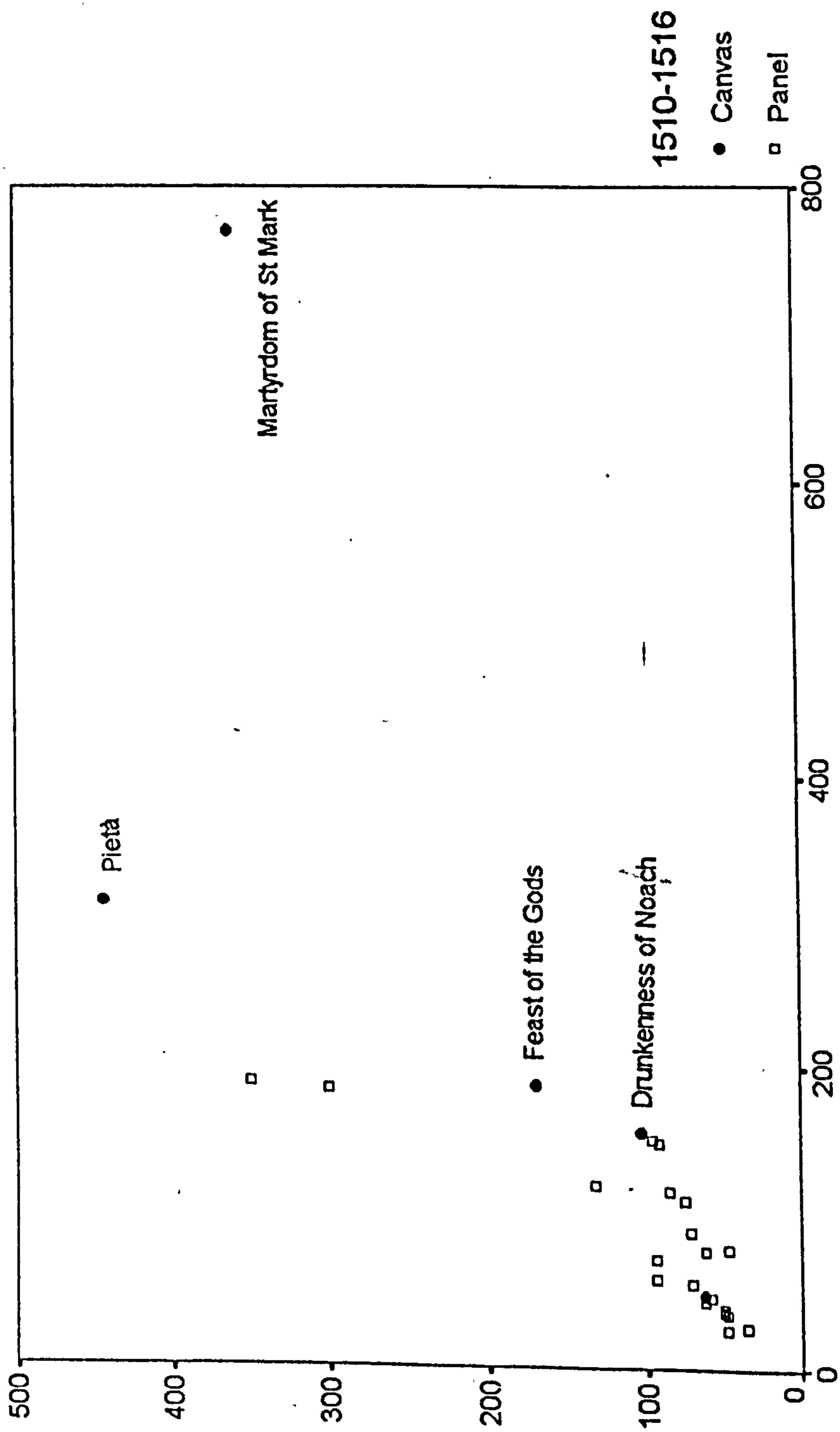
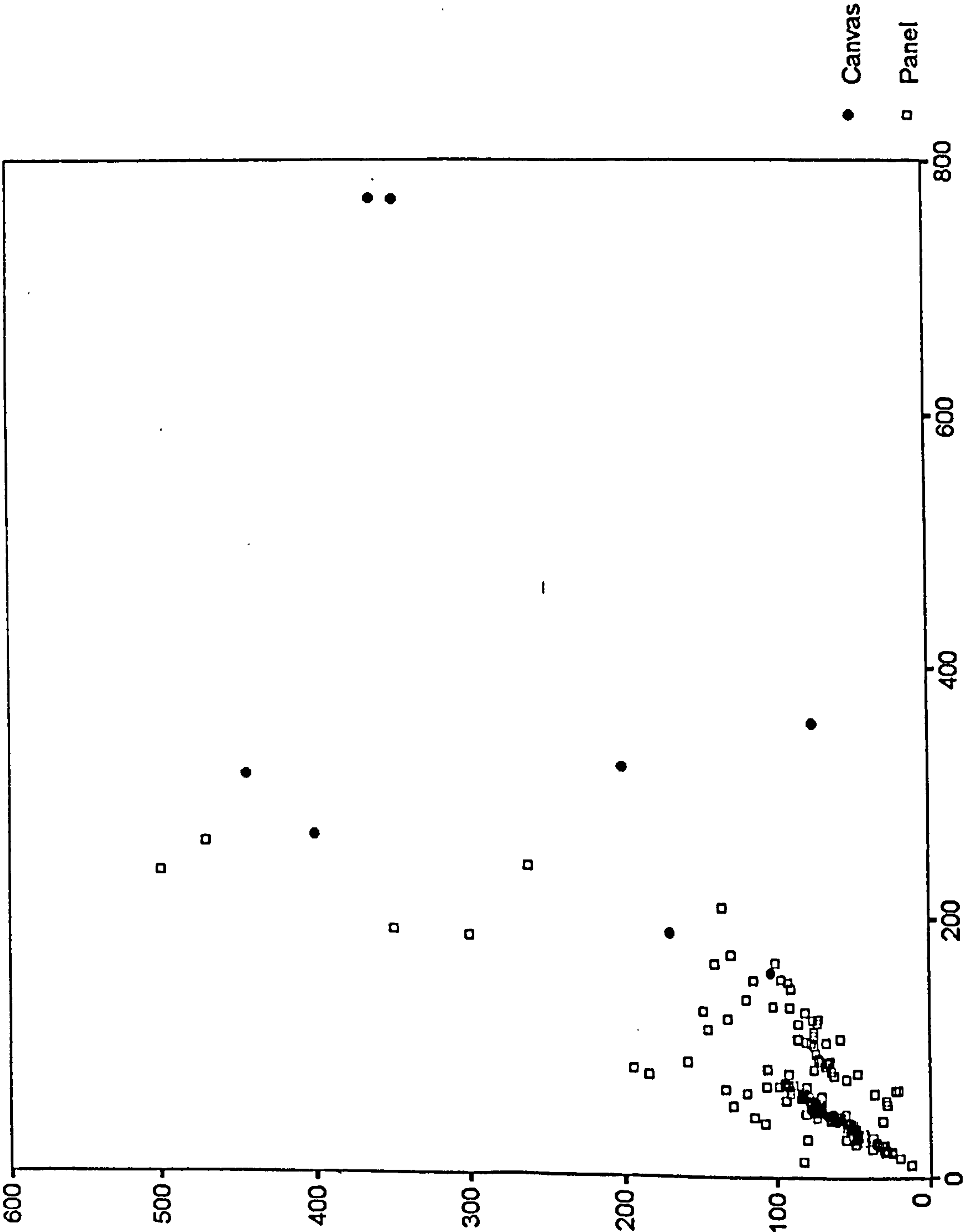


Table 9. Comparison of the size of Bellinesque Canvas and Panel Painting.



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