The Psychology of Perspective and Renaissance Art

Michael Kubovy
Contents

1  The Arrow in the Eye 1
2  The elements of perspective 17
3  Brunelleschi invents perspective 27
4  Brunelleschi’s peepshow 31
5  The robustness of perspective 41
6  Illusion, delusion, collusion, & paradox 49
7  Perceive the window to see the world 61
8  Marginal distortions 73
9  The Brunelleschi window abandoned 87
10 The psychology of egocenters 101
11 Perspective & the evolution of art 107
List of Figures

1.1 Mantegna, *Archer Shooting at Saint Christopher* ........................................ 2
1.2 Mantegna, *Archer Shooting at Saint Christopher*, detail .................................. 3
1.3 Taddeo Gaddi, *The Presentation of the Virgin* .................................................. 4
1.4 Piero della Francesca, *Flagellation* ............................................................... 5
1.5 Masaccio, *Tribute Money* .............................................................................. 5
1.6 Piero della Francesca, Brera altar-piece ............................................................. 6
1.7 Domenico Veneziano, *Martyrdom of Saint Lucy* ............................................. 7
1.8 Raphael, *Dispute Concerning the Blessed Sacrament* ..................................... 8
1.9 Domenico Veneziano, *La Sacra Conversazione* .............................................. 9
1.10 Pietro Perugino, *Virgin Appearing to Saint Bernard* .................................. 10
1.11 Copy after Mantegna, *Archer Shooting at Saint Christopher* ....................... 11
1.12 Mantegna, *Saint Christopher’s Body Being Dragged Away after His Beheading* .. 12
1.13 Alberti, *Tempio Malatestiano* ................................................................. 12
1.14 Alberti, *Tempio Malatestiano, niche* ............................................................ 12
1.15 Mantegna, detail of Figure 1.12 ..................................................................... 13
1.16 Alberti, Self-portrait ...................................................................................... 13

2.1 Masaccio, *Trinity* ........................................................................................... 18
2.2 Alberti’s window .............................................................................................. 18
2.3 Camera obscura ............................................................................................... 19
2.4 Geometry of the camera obscura ..................................................................... 19
2.5 Main features of central projection .................................................................. 19
2.7 Jan van Eyck, *Annunciation* ......................................................................... 21
2.8 Mantegna, *Martyrdom of Saint James* .......................................................... 22
2.6 The Flying Fish of Tyre (ca. 1170) .................................................................. 23
2.9 Vanishing points .............................................................................................. 23
2.10 Definition of the horizon line .......................................................................... 23
2.11 Plan and elevation of Masaccio’s *Trinity* ...................................................... 24
2.12 Perspective representation of a pavement consisting of square tiles ............... 25
2.13 Leonardo da Vinci, Alberti’s *construzione legittima* ................................... 26

3.1 Depiction of Brunelleschi’s first experiment ..................................................... 28

4.1 Wheatstone’s stereoscopic drawing ................................................................. 32
LIST OF FIGURES

4.2 Fra Andrea Pozzo, *St. Ignatius Being Received into Heaven* .......................... 33
4.3 Mantegna, ceiling fresco ...................................................................................... 35
4.4 Peruzzi’s *Sala delle Prospettive* seen from center of room ......................... 35
4.5 Peruzzi’s *Sala delle Prospettive* seen from center of projection ................. 36
4.6 Focus and depth of field ...................................................................................... 37
4.7 Experimental apparatus for Smith and Smith’s experiment ......................... 39

5.1 La Gournerie’s inverse projection problem ..................................................... 42
5.2 Jan Vredeman de Vries, architectural perspective ........................................ 44
5.3 Stimuli in the Rosinski et al. (1980) experiments .......................................... 45
5.4 Displays in the Rosinski et al. (1980) experiments ......................................... 45
5.5 Data of Experiment 1 of Rosinski et al. .............................................................. 46
5.6 Modified data of Experiment 1 of Rosinski et al. ........................................... 47
5.7 Data of Experiment 2 of Rosinski et al. .............................................................. 47
5.8 Stimulus for Goldstein’s (1979) experiment: Rousseau, *The Village of Bequigny* (1857) . 48
5.9 Data from Goldstein’s (1979) experiment ....................................................... 48

6.1 Stimulus for observing Emmert’s law ............................................................... 50
6.2 A classification of trompe l’œil pictures ............................................................ 52
6.3 Carlo Crivelli (attrib.), Two saints ................................................................... 53
6.4 Antonello da Messina, *Salvatore Mundi* ....................................................... 53
6.5 Jan van Eyck, *Portrait of a Young Man* ....................................................... 53
6.6 Francisco de Zurbärán, *Saint Francis in Meditation* ..................................... 54
6.7 Laurent Dabos, *Peace Treaty between France and Spain* ............................ 54
6.8 Jacob de Wit, *Food and Clothing of Orphans* .............................................. 54
6.9 Cornelis Gisbrechts, Easel .............................................................................. 54
6.10 Jean-Baptiste Chardin, *The White Tablecloth* ........................................... 55
6.11 J. van der Vaart (attrib.), Painted Violin ......................................................... 55
6.12 Jacopo de Barbari, *Dead Partridge* ............................................................... 55
6.13 Edward Collier, *Quod Libet* ...................................................................... 55
6.14 Samuel van Hoogstraten, *Still Life* .............................................................. 56
6.15 Trompe l’œil (early nineteenth century) .......................................................... 56
6.16 Drawing used by Kennedy ............................................................................. 56
6.17 The vase-face reversible figure ....................................................................... 57
6.18 A Necker cube formed by phenomenal contours .......................................... 58
6.19 The vertical-horizontal illusion ..................................................................... 59
6.20 The double dilemma of picture perception .................................................... 59

7.1 Donatello *The Feast of Herod* ....................................................................... 62
7.2 Perspective drawing of a figure and determination of center of projection ........ 63
7.3 How to project a transparency .......................................................................... 65
7.4 Photograph of a photograph (Time, March 29, 1968) .................................... 65
7.5 We can only compensate for one surface at a time: stimulus ......................... 66
7.6 We can only compensate for one surface at a time: what you see .................. 66
7.7 Plan of Ames distorted room .......................................................................... 67
7.8 Distorted room as seen by subject ................................................................... 67
LIST OF FIGURES

7.9 Views of John Hancock Tower, Boston .......................................................... 68
7.10 Drawing of unfamiliar object that we perceive to have right angles .................. 68
7.11 Drawing of impossible object that we perceive to have right angles ............... 68
7.12 Drawing of cube indicating angles comprising fork juncture and arrow juncture . 69
7.13 Drawing that does not look rectangular and does not obey Perkins's laws ........ 69
7.14 Irregular shape seen as a mirror-symmetric — it obeys an extension of Perkins's laws 69
7.15 Figure that looks irregular because it does not obey extension of Perkins's laws .... 69
7.17 Shepard and Smith stimulus specifications ..................................................... 70
7.16 Objects used in the Shepard and Smith experiment ......................................... 71
7.18 Results of the Shepard and Smith experiment ................................................. 72
8.1 Two central projections of a church & cloister ............................................... 74
8.2 Oblique cubes under normal perspective ....................................................... 74
8.3 Oblique cubes under exaggerated perspective ................................................ 74
8.4 Marginal distortions of cubes seen from above .............................................. 75
8.5 Four displays and response keys used by Sanders (1963) .............................. 75
8.6 Median reaction time for Sanders (1963) experiment ...................................... 75
8.7 How Finke and Kurtzman (1981) measured the extent of the visual field ......... 76
8.9 Raphael, The School of Athens (1510–1) Fresco. Stanza della Segnatura, Vatican, Rome 77
8.8 Marginal distortion in spheres and human bodies ......................................... 78
8.10 Detail of Figure 8.9 showing Ptolemy, Euclid, and others. ............................. 78
8.11 Marginal distortions in columns ................................................................. 79
8.12 Paolo Uccello, Sir John Hawkwood ............................................................ 81
8.13 Diagram illustrating argument about perspective made by Goodman ........... 84
9.1 Edgerton’s depiction of Brunelleschi’s second experiment .............................. 87
9.2 Doodle .......................................................... 88
9.3 Kenneth Martin, Chance and Order Drawing ................................................. 89
9.5 Marcel Duchamp, Bottle Rack ................................................................. 90
9.4 Jean Tinguely, Homage to New York (remnant) .......................................... 91
9.6 Advertisement for a 3-D (stereoscopic) film .................................................... 93
9.7 Andrea Mantegna, Saint James Led to Execution ........................................... 94
9.8 Central projection in Mantegna’s Saint James Led to Execution ...................... 94
9.9 Leonardo da Vinci, The Last Supper ............................................................ 96
9.10 Perspective construction of Leonardo’s The Last Supper ............................... 97
9.11 Plan and elevation of room represented in Leonardo’s The Last Supper .......... 98
9.12 Leonardo’s Last Supper seen from eye level ............................................... 99
9.13 How the architecture of the refectory relates to Leonardo’s Last Supper ....... 99
9.14 Leonardo’s Last Supper, cropped .............................................................. 100
9.15 Leonardo’s Last Supper, cropped, top only ............................................... 100
10.1 Definitions of two elementary camera movements: pan and tilt .................. 102
10.2 The moving room of Lee and Aronson (1974) ............................................. 104
10.3 Predictions for speed of “reading” letters traced on the head ...................... 105
10.4 The Parthenon .................................................. 106
10.5 Horizontal curvature of Parthenon .............................................................. 106
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1</td>
<td>Paolo Uccello, Perspective Study of a Chalice</td>
<td>110</td>
</tr>
<tr>
<td>11.4</td>
<td>Kasimir Malevich, two Suprematist drawings</td>
<td>112</td>
</tr>
<tr>
<td>11.5</td>
<td>Piero della Francesca (?), <em>Perspective of an Ideal City</em></td>
<td>113</td>
</tr>
<tr>
<td>11.6</td>
<td>Gentile Bellini, <em>Procession of the Relic of the True Cross</em></td>
<td>113</td>
</tr>
<tr>
<td>11.2</td>
<td>Sol LeWitt, untitled sculpture</td>
<td>114</td>
</tr>
</tbody>
</table>
# List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Gablik: cognitive development &amp; megaperiods of art history</td>
<td>111</td>
</tr>
</tbody>
</table>
### List of Boxes

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Drawback of the pinhole camera</td>
<td>19</td>
</tr>
<tr>
<td>2.2</td>
<td>The distance between the vanishing point and a distance point equals the distance between the center of projection and the picture plane</td>
<td>26</td>
</tr>
<tr>
<td>4.1</td>
<td>Photographing illusionistic walls</td>
<td>34</td>
</tr>
<tr>
<td>4.2</td>
<td>Viewing from the center of projection vs. the removal of flatness information</td>
<td>37</td>
</tr>
<tr>
<td>7.1</td>
<td>How the visual system might infer the center of projection</td>
<td>63</td>
</tr>
<tr>
<td>9.1</td>
<td>The aleatory process that generated Figure</td>
<td>89</td>
</tr>
</tbody>
</table>
Chapter 1

Introduction: The importance of perspective and the metaphor of the arrow in the eye

There is a frightening detail in Andrea Mantegna’s *Archers Shooting at Saint Christopher* (Figures 1.1 and 1.2) that shows a man who has just been shot through the eye with an arrow. I see the arrow in the eye as a metaphor for the art of perspective; I have reason to believe that Mantegna did so too.

Why would Mantegna want to incorporate a metaphor for the art of perspective into a fresco? Primarily, he would want to because perspective played a central role among the intellectual and aesthetic concerns of Renaissance artists. Indeed, as we shall see, perspective has been thought to have many aesthetic functions in Renaissance painting. (In this book, I propose yet another, a deliberate discrepancy between the viewer’s actual point of view and a virtual point of view experienced by the viewer on the basis of cues contained in the perspectival organization of the painting.)

The most obvious function of perspective was to rationalize the representation of space: With the advent of perspective, it became much easier to stage, as it were, elaborate group scenes organized in a spatially complex fashion. Compare the pre-perspectival architectural extravaganza to which Taddeo Gaddi was forced to resort in order to define the spatial locations of his figures (Figure 1.3) to the simplicity of means used by Piero della Francesca (Figure 1.4) to achieve a precise definition of relative spatial locations. Then, of course, perspective gave Renaissance artists the means to produce a compelling illusion of depth. We will come back to this illusion and the psychological research that elucidates it in Chapter 3.

In addition to rationalizing the representation of space and providing an illusion of depth, perspective provided the means for drawing the spectator’s eye to the key figure or action in the painting. Take, for instance, Masaccio’s *The Tribute Money* (Figure 1.5). The slanted lines representing the horizontal features of the building that recede into the distance, called *orthogonals* because they represent lines in the scene that are perpendicular to the picture plane, converge at a point known as the *vanishing point* this perspective construction (a concept explained in the next chapter). The vanishing point falls just barely to the right Christ’s head, thus drawing attention to the central actor in the drama Masaccio has represented. In Piero della Francesca’s Brera altarpiece (Figure 1.6), the vanishing point coincides with the Madonna’s left eye. In Leonardo da Vinci’s *Last Sup-
per (see Figure 9.9), the vanishing point is centered upon Christ’s head.

In other cases, such as Domenico Veneziano’s (Figure Martyrdom of Saint Lucy), the vanishing point coincides with a central locus of the action rather than the head of the main figure: the hand of the executioner that has just plunged a dagger into Saint Lucy’s throat. In Raphael’s Dispute Concerning the Blessed Sacrament (Figure 1.8), the vanishing point coincides with the representation of the Host. Or, more subtly, in Piero della Francesca’s Flagellation (Figure 1.4), the scourge, held by the man immediately to the right of Christ’s figure in the picture, is related to the system of orthogonals that recede into the distance. Even though the scourge is vertical and is not itself an orthogonal, its extension passes through the vanishing point.

One should not, however, expect the vanishing point in Renaissance paintings always to coincide with an element that is important to the narrative: Sometimes the vanishing point interacts with the more visual elements of the painting, such as in Domenico Veneziano’s Madonna and Child with Four Saints (Figure 1.9), in which the folds of the Madonna’s cloak form a triangular pattern as it drapes between her knees. The downward-pointing vertex of this triangle (which is echoed in the decoration between the arches) is also the vanishing point of the perspective. It should be noticed, however, that Domenico uses the fan of orthogonals to organize many important features of the painting, just as Piero did with the scourge in the Flagellation. For instance, the eyes of Saint Francis (the figure on the left) fall upon an orthogonal; the left eye of Saint John (the second figure from the left) and the tips of the thumb and the index finger of his right hand fall on an orthogonal; the right eye of Saint Zenobius (the second figure from the right) and the tips of his
index and middle fingers are also aligned on an orthogonal. In other cases, the vanishing point falls on a point in a distant background landscape, such as in Pietro Perugino’s *Virgin Appearing to Saint Bernard* (Figure 1.10).

To these three uses of perspective (the illusionistic, narrative focus, and structural focus) Warman Welliver has recently added a fourth: “The new rules of perspective drawing gave to the painter and relief sculptor . . . a new code for concealing allusion and meaning in his work.” He shows how perspective enabled Domenico Veneziano and Piero della Francesca to translate the floor plans of complex buildings — the architectural dimensions and proportions of which bore allegorical or symbolic significance — into painting. Here is his analysis of certain aspects of Domenico’s *Sacra Conversazione* (Figure 1.9).

The most obvious factor in Domenico’s scheme of dimensions and proportions, as might be expected, is three. The elemental shape from which the pattern of floor tiles is derived is the equilateral triangle; the viewing distance, or invisible floor, is three times the visible floor; the Gothic facade consists of three bays and is three \( G \) (\( G \) = the interval between columns of the Gothic loggia) high (including the putative entablature) by three wide; the floor is feet wide at the base-
line and the total depth of the architecture beyond the baseline is 27, or $3^3$ feet.

A second and less obvious element in the proportions is the interplay between We look across a floor which is $G$ deep at an elevation (without the entablature) of which the base is $G$ below eye level and the proportions above eye level are the overall proportions of the elevation, $2^3 : 3^2$. The proportions of the four large rectangles of floor into which the plan forward of the exedra naturally divides are, beginning with the invisible floor, $3 : 2, 1 : 2, 1 : 3$, and $2 : 3$.

No doubt the theological allusion of this coupling of 2 and 3 is the expansion of the dual deity to the Trinity with the coming of Christ. (Welliver, 1973, p. 8)

Having seen how important perspective was for Renaissance art and the central role it played in Mantegna’s *Archers shooting at Saint Christopher*, let us now return to Mantegna’s tragedies befell this fresco painted on the wall of the Ovetari Chapel of the Eremitani Church in Padua. By the time it was first photographed in color, during the Second World War, it had deteriorated to such an extent that its bottom third and the figure of the saint on the left were defaced beyond recognition; on March II, 1944, soon after the fresco was photographed, the entire east end of the church, which contained the Ovetari chapel, was destroyed in an American air raid on the nearby railway yards of Padua. Frederick Hartt writes:

Only pathetically small fragments of Mantegna’s frescoes were recovered, and these ... are now mounted in the chapel upon frescoes reconstructed from photographs. The reconstruction, however painstaking, gives
Figure 1.4: Piero della Francesca, Flagellation (probably 1450s). Panel. Galleria Nazionale delle Marche, Palazzo Ducale, Urbino.

Figure 1.5: Masaccio, Tribute Money (ca. 1425). Brancacci Chapel, Church of Santa Maria del Carmine, Florence.
Figure 1.6: Piero della Francesca, *Madonna and Child, Six Saints, Four Angels, and Duke Frederico II da Montefeltro* (Brera altar-piece) (ca. 1472-4). Panel. Pinacoteca di Brera.
only an echo of the lost masterpieces. (Hartt 1969, p. 350)

Fortunately, there exists a copy of the fresco, shown in Figure 1.11 which can give us a reading of the parts of the fresco for which no photograph exists. For instance, we can see that Saint Christopher was (as Jacobus of Voragine puts it in his *Golden Legend* a thirteenth-century compendium of legends about the lives of the saints often consulted by Renaissance artists) “a man of prodigious size, being twelve cubits in height, and fearful of aspect” (Jacobus de Voragine, 1969, p. 377). Jacobus describes the relevant episode of Saint Christopher’s martyrdom as follows:

Then the king [of Samos] had him tied to a pillar, and ordered four thousand soldiers to shoot arrows at him. But the arrows hung in mid-air, nor could a single one of them touch Christopher. And when the king, thinking that he was already trans fixed with arrows, shouted invectives at him, suddenly an arrow fell from the air, turned upon him, struck him in the eye, and blinded him. Then Christopher said: “I know, O king, that I shall be dead on the morrow. When I am dead, do thou, tyrant, make a paste of my blood, rub it upon thine eyes, and thou shalt recover thy sight!” Then at the king’s order he was beheaded; and the king took a little of his blood, and placed it upon his eyes, saying: “In the name of God and Saint Christopher!” And at once he was made whole. Then the king was baptized, and decreed that whoever should blaspheme against God or Saint Christopher should at once be beheaded. (Jacobus de Voragine, 1969, pp. 381–2)

Mantegna’s interpretation agrees with Jacobus’s account; so at first blush it would seem that Mantegna’s representation of the arrow in the eye is traditional and that there is therefore no evidence of a metaphorical role for this aspect of the picture.
CHAPTER 1. THE ARROW IN THE EYE

However, when one looks for pictorial antecedents for the arrow lodged in the king’s eye, one realizes the novelty of Mantegna’s interpretation — for there are none. In Italian painting, Saint Christopher — like all the other saints appears both in isolated images and in cycles depicting the saint’s life. Twenty-four isolated images of Saint Christopher have been cataloged, most of which represent him in the act of carrying the Christ-child across a river (whence his name, which means “Christ-bearer”). Only one of them depicts the miracle of the recalcitrant arrows: It is part of a polyptych on various subjects painted by an anonymous Venetian painter between 1325 and 1335. It does not show the arrow in the eye. All seven cycles (including the one to which Mantegna’s fresco belongs) contain a scene representing the recalcitrant arrows but as far as the poor state of preservation of these frescoes allows us to tell, only Mantegna’s shows the episode of the arrow in the eye. If this is true, and if we may assume that Renaissance artists did not deviate easily from traditional practice in the representation of scenes from the lives of the saints or from the life of Christ, it suggests that Mantegna may have had good reason for drawing the viewer’s attention to the arrow in the eye.

Let us now see what the arrow in the eye may have meant to Renaissance artists. Beyond the observation that rays of light traced from points on an object painted by Bono da Ferrara and Ansuino da Forli.

---


3 For an illustration, see Pallucchini, 1964, Figure 217.

4 Not all of which were painted by Mantegna; some were frescoes. In northeastern Italy: Ridolfo Guariento (active in the Church of San Domenico at Bolzano (these frescoes have been destroyed); School of the Veneto (early fifteenth century) in the Church of Santa Lucia (partly ruined); Bertolino dei Grossi (attribution uncertain) between 1417 in the Valeri family chapel in the Cathedral at Parma. In Tuscany: Spinello Aretino (ca.1346–1410) in the Church of San Domenico, Arezzo; Parri Spinelli in the Cathedral at Arezzo.
Figure 1.9: Domenico Veneziano, *Madonna and Child with Four Saints*, also known as *La Sacra Conversazione* or the Saint Lucy altarpiece) (ca. 1445). Panel. Galeria Uffizi, Florence.
Figure 1.10: Pietro Perugino, *Virgin Appearing to Saint Bernard* (1488–9). Panel. Alte Pinakothek, Munich.
into the eye suggest arrows penetrating the eye (see Figure 1.3), perspective and arrows were compared in several texts written by Mantegna’s contemporaries.

In 1435, about two decades before Mantegna painted the *Archers Shooting at Saint Christopher*, Alberti wrote *On Painting*, which contains the earliest known geometric and optical analysis of linear perspective. After his exposition of perspective he writes:

> These instructions are of such a nature that [any painter] who really understands them well both by his intellect and by his comprehension of the definition of painting will realize how useful they are. Never let it be supposed that anyone can be a good painter if he does not clearly understand what he is attempting to do. He draws the bow in vain who has nowhere to point the arrow. (Emphasis mine. Alberti, 1966, p. 59)

Because Mantegna had most probably read Alberti’s treatise, the arrow in the eye (which represents soldiers who have just drawn the bow in vain) could have been a veiled reference to Alberti’s text. Indeed the architecture in the fresco is strongly reminiscent of Alberti’s style. For instance, the bridge in *Saint Christopher’s Body Being Dragged Away after His Beheading* (Figure 1.12) is very similar to the flank of Alberti’s Church of San Francesco (the *Tempio Malatestiano* Figure 1.13). Furthermore, the frieze in Mantegna’s fresco that underlines the first floor in which the King of Samos was hit in the eye reminds one of the frieze that serves as a pedestal for the columns of the *Tempio Malatestiano’s* flank (see Figure 1.14). In this context, we are also led to notice the similarity between the inscription visible on which he suggests that the source of this aphorism is in Cicero, *De oratore*, I, xxx, 135; *De finibus*, III, vi, 22.

6Leon Battista Alberti (1404–72) was not himself a major painter. He was a playwright, mathematician, lawyer, cartographer, humanist, architect, linguist, and cryptographer — in short, the prototypical Renaissance man. In 1435 and 1436, he published *De pictura* in Latin and *Della pittura* in Italian (Alberti, 1966). See Gadol, 1969.

7See J. R. Spencer’s footnote 52 in Alberti, 1966, p. 117. in
the facade of Mantegna’s building and the inscriptions on the funerary urns on the flank of the Tempio Malatestiano (Figure 1.14). Furthermore, there is a resemblance between one of the onlookers watching Saint Christopher’s body being dragged away and a portrait of Alberti (compare Figure 1.15 to Figure 1.16). Finally, the main event taking place in the fresco on the left (the tyrant being hit in the eye by the arrow) is seen through a window. Given all the other evidence that indicates that this fresco is an homage to Alberti, the location of this crucial scene in a window may be a reference to Alberti’s window, a central concept in perspective, which Alberti explains as follows:

First of all, on the surface on which I am going to paint, I draw a rectangle of whatever size I want, which I regard as an open window through which the subject to be painted is to be seen.\(^\text{11}\)

\[\text{Figure 1.12: Andre Mantegna, Saint Christopher’s Body Being Dragged Away after His Beheading (1451–5). Fresco. Overtari Chapel, Eremitani Church, Padua.}\]

\[\text{Figure 1.13: Leon Battista Alberti, Church of San Francesco, Rimini (Tempio Malatestiano) (foundation laid 1450).}\]

\[\text{Figure 1.14: Leon Battista Alberti, Church of San Francesco, Rimini (Tempio Malatestiano) showing frieze and inscription on an urn in one of the niches.}\]

\(^{11}\text{Quoted by Edgerton (1975, p. 42), from Grayson’s (1972) translation. We will return to this concept in Chapter}\]

\[^{2}\text{This key concept is often unjustly called the Leonardo window (Pirenne, 1970) or da Vinci’s pane (Danto, 1981); it ought to be called Alberti’s window after its originator.}\]
So if the setting in which this dramatic event is taking place is Albertian, and the scene of the arrow in the eye is seen, so to speak, through an Alberti window, then the conjecture that the arrow in the eye is a reference to Alberti’s text becomes plausible.

Our conjecture gains further support from the existence of a second reference to arrows, in a text by Filarete. In his *Treatise on Architecture*, Filarete discusses the technique of drawing in perspective; much of what he has to say on this topic is an improved exposition of Alberti’s ideas. At one point, while he is explaining how to draw square buildings, Filarete writes:

If you wish to make doors, windows, or stairs, everything should be drawn to this point, because, as you have understood, the centric point is your eye on which everything should rest just as the crossbowman always takes his aim on a fixed and given point. [Emphasis mine. Filarete (Antonio di Piero Averlino), 1965, pp. 304–5]

Because the treatise is later than Mantegna’s fresco (it was written between 1461 and 1464), Filarete could have borrowed it from Mantegna, from Alberti, or perhaps from yet another source.

It becomes harder yet to believe in a coincidence when we discover that the metaphor also occurs in Leonardo’s notebooks. In discussing the question of whether rays of light emanate from the eye or from the bodies that are seen, Leonardo expresses the view that “the eye [is] adapted to receive like the ear the images of objects without transmitting some potency in exchange for these” (Leonardo da Vinci, 1938, p. 251). And then, to support his view, he says:

The circle of the light which is in the middle of the white of the eye is by nature suitable to apprehend objects. This same

---

12Filarete is the nom-de-plume of Antonio Averlino (ca. 1400–ca. 1469), a Florentine sculptor and architect.

13Filarete seems to be conflating two concepts here: If he is talking about a point in the picture plane, he must be referring to the vanishing point, to which converge the images of lines orthogonal to the picture plane; if he is talking about the eye, he must be referring to the center of projection; see Chapter 2.
circle has in it a point which seems black and this is a nerve bored through it which goes within the seat of the powers charged with the power of receiving impressions and forming judgment, and this penetrates to the common sense. Now the objects which are over against the eyes act with the rays of their images after the manner of many archers who wish to shoot through the bore of a carbine, for the one among them who finds himself in a straight line with the direction of the bore of the carbine will be most likely to touch the bottom of this bore with his arrow: so the objects opposite to the eye will be more transferred to the sense when they are in line with the transfixing nerve. (Emphasis mine. Leonardo da Vinci, 1938, p. 252)

Every technical field develops certain stock images that are proven pedagogical tools. It would be a very unlikely coincidence if three authors used the arrow-in-the-eye metaphor in discussing perspective and optics unless it had become part of the imagery involved in thinking about perspective, a metaphor they lived by.

But if a small circle of experts lived by this metaphor, could Mantegna expect his audience to read this undeclared rebus? I believe so. Puzzles and esoteric allusions were a pervasive feature of Florentine art. Renaissance Florentines, for all their interest in geometry and mathematics, should by no means be considered to be rationalists in the post-Cartesian sense. Indeed, shortly after Mantegna painted the frescoes in the Ovetari Chapel, in 1460, Marsilio Ficino (1433–99), a priest, the founder of the Platonist Academy in Florence, and one of the quattrocento’s most influential philosophers, translated part of the Hermetic literature, a collection of treatises concerned with astrology, alchemy, and other occult sciences, written between CE 100 and 300. The text appears to have filled a need and gained a wide readership. As Welliver says:

One very strong manifestation of the tendency of Florentine art to be intellectual was the Florentine penchant for the subtle and the esoteric. The Florentine artist or poet frequently spoke a much different message to the initiate from that received by the profane; indeed it would hardly be an exaggeration to say that the most typical kind of Florentine work was a riddle concealed from the profane by the trappings of innocence. This was a tradition sanctified by the example of Dante and increasingly reinforced, throughout the fifteenth century, by the rediscovery of Plato. It was the consistent element in Florentine nature which impelled the observant Jew from abroad, Joachim Alemanni, to write in 1490 that no people had ever been so given to communication by parable and riddle as the Florentines. (Welliver, 1973, p. 20)

It should be noted that these observations can legitimately be generalized to include the artists of Padua as well, because many artists of Florentine origin were active in the North (Gentile da Fabriano and Pisanello in Venice; Andrea del Castagno in San Zaccaria; Filippo Lippi, Paolo Uccello, and especially Donatello in Padua).

Thus, by showing that the arrow in the eye may have been a commonly used metaphor in Renaissance artistic circles, and that esoteric references were common in Renaissance art, we support our claim that Mantegna’s audience would appreciate a subtle reference to perspective in a painting.

The thesis of this book is that there is yet another role for perspective in Renaissance art. It is a subtle role, having to do with the spectator’s experience of his or her location in space with respect to the physical surface of the painting and with respect to the room in which the painting is viewed. I will show in the following chapters that Renaissance painters deliberately induced a discrepancy between the spectator’s actual point of view and the point of view...
from which the scene is felt to be viewed. The result is a spiritual experience that cannot be obtained by any other means. So, whether or not Mantegna intended the arrow in the eye to draw the spectator’s attention to the deeper significance of perspective, I hope this book will.