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Ambiguity and the development of Linear Perspective.

Introduction
This paper forms part of a larger discussion on my part about the history, nature and development of Linear Perspective. In so many ways this is well trodden territory, but when I read much of what is written about perspective, I find myself not recognising what is being described. Most of the discomfort comes from fact that as a practising artist using perspective I have come to question the commonly held notion of linear perspective being a device or a ‘tool’. To me it seems more like a go-between – a ‘medium’. If it were a fixed entity, it would be a tool – a means to an end. It would do exactly what it says on the tin. It would be something that you could use to change something – to manipulate something – to impose something.

Making a drawing using perspective can be that, but it does not have to be like that, and for my studio practise it certainly isn’t like that. My practise uses the geometry of linear perspective extensively, but it also uses and relies on the constant interplay between the diagrammatic and the spatial aspects of a perspective construction. (Fig 1) I am responding in various ways to the physical marks on the surface as well as to the space those same marks may be linked to. My experience also tells me that, although the commonly held belief and assumption is that linear perspective is to do with the problems of describing depth, and quite often deep space, it is in fact as much to do with surface as it is to do with depth, and possibly more to do with shallow space than deep space. Perspective is an entity that for me enables creative thought and I believe that this stems from an essential ambiguity in its nature.
I believe that this element of ambiguity may be traced back to, and may also have been the driving force in linear perspective’s early manifestations in the late mediaeval and early renaissance period. This ambiguity, albeit of different kind, has been re-established due to the more fluid relationships that we now accept exist between the viewer, the object and the picture plane. It was perhaps in times when this fluidity was not accepted, or was over-looked, that
linear perspective became academic and stultifying and became simply a tool and something that acted against creativity. Could it be that the stagnation of perspective has its roots in the very moment of its codification - the moment when the relationships between the viewer the object and the picture plane, were defined by Alberti in 1435?²

**Renaissance perspective**

As well as the experience of my own studio practice, my questioning of the orthodox view of linear perspective also stems from a close study of its underlying geometry. I would suggest that much of what was achieved in the paintings of the early renaissance – some of which are held up as embodying the new found science of linear perspective, could in fact have been achieved without any understanding of perspective as it was described and formulated and by Alberti. The paintings that I am particularly thinking of here are: Masaccio’s ‘Trinity’, Domenico Veneziano’s ‘St Lucy Altarpiece’, and Leonardo’s ‘Last Supper’.

I would go further and say that many of these paintings exhibit certain formal properties that would be impossible to achieve using the methods described by Alberti. For example, there is alignment and apparent interplay between elements on the surface and elements that are further back in space. This kind of alignment, where otherwise spatially unconnected parts of the painting coincide unexpectedly on the picture plane would have been, and still would be, technically almost impossible to achieve using the traditional methods of perspective.³ As well as those alignments, the spatial elements as they appear on the surface of the paintings often seem placed according to simple half, third and quarter divisions.

In addition, because it is assumed that the paintings have been made using the completely rational geometric system of perspective, the spatial structures within the paintings must also therefore be rational. However, all these paintings have defied analysis.⁴ They give the impression of containing a coherent space, but when there is an attempt to specify the exact dimensional properties of the space, it invariably does not stand up to close scrutiny. The spatial clues within the paintings often turn out to be ambiguous and contradictory.

A particularly well known example in which no clear conclusion can be been reached about the nature of the space depicted, and which shows simple half, third and quarter divisions of the surface is Leonardo’s ‘Last Supper’. (Fig 2)
From all this evidence, I would suggest therefore, that when these paintings were made, there was another mechanism in operation. One that was not only capable of allowing the correct diminishing proportions of perspective to be produced, but one which also enabled the artist to consider both the surface relationships and the spatial relationships simultaneously. Alberti’s approach simply does not enable this kind of play to take place – it is not ‘visual’, even though it ostensibly deals with vision.  

A possible resolution of these problems can be found, as I mentioned above, through a study of the geometry involved in perspective and comparing it to the geometric and visual properties of another construction - the repeated drawing of a square within a square. (Fig 3)
This simple construction is the basis of many patterns – those found in some Roman floors, for example, and it is highly visible throughout Islamic art and architecture. More significantly, I believe, it can also be found in several forms in many late mediaeval and early renaissance paintings. Resulting patterns are sometimes ‘on’ the painting – as part of a surround for example, and sometimes they are a pattern that is depicted, as a piece of inlay or as a complete tiled floor.

However, perhaps the most important attribute of this drawing, pattern, construction or diagram – whatever term is appropriate, and why I believe it may be important in the development of perspective, is that it contains diminishing proportions that are indicative of spatial recession. It is a flat diagram that also reads spatially. The geometry within it is, in fact, interchangeable with that of linear perspective, and furthermore, the drawings embody a particular form of perspective construction that relies on the so-called ‘distance point’.6 (Fig 4) The pattern when fully elaborated also generates the sequence of simple harmonic proportions of 1/2, 1/3, 1/4, 1/5, 1/6 etc – the same surface divisions that appear to exist in the paintings.7 (Fig 5) I believe, therefore, that notwithstanding the new knowledge and methods described by Alberti, that the visual, spatial and geometric properties of this construction were recognised, and consequently used by artists in preference to Alberti’s approach.
Possibly the most important aspect of these perspective-like constructions for the artist is that, unlike Alberti’s theoretical approach, they are visual. Spaces that feel very different from one another can be generated easily from the same basic construction. (Fig 6 & 7) There is no need for the artist to specify at the outset the dimensions of the space, and perhaps more importantly, there is the potential for the artist to ignore the strict spatial logic of the image and mix the two systems, the flat diagram and the spatial, together. An element that should, in theory, be placed back in space can be treated as a surface element, and vice-versa. This is the reason, I believe, why these paintings have defied conventional analysis – the artist has either ignored or not felt any need to be held to the strict logic of linear perspective. It may be the resulting tension and
ambiguity created between the surface and depth, and between logic and intuition that explains why these paintings still hold our attention now.

(Fig 8) Masaccio, ‘Trinita’, 1427
Santa Maria Novella, Florence
Courtesy: akg-images / Erich Lessing
Earlier use of patterns

Within my thinking about simple geometric constructions, ambiguity and perspective, a painting that points to the significance of patterns in relation to the development of perspective, is Ambrogio Lorenzetti’s ‘The Presentation in the Temple’. (Fig 9) The floor is very distinctive, and there are elaborate patterns both on the support of the painting and on the structures depicted within the painting.

(Fig 9) Ambrogio Lorenzetti, ‘The Presentation in the Temple’, 1342
Tempera on wood, 257 x 168 cm
Courtesy: akg-images / Erich Lessing
Painted almost one hundred years before Alberti’s writings on perspective, the pattern in the floor appears to be based upon hexagons or six-pointed stars set within rectangles. It is essentially the same floor pattern that was constructed almost one hundred years later in 1445 by Domenico Veneziano in his ‘St Lucy Altarpiece’. This is a painting that already presents an awkward technical problem in the orthodox story of perspective because it is debatable whether a strictly Albertian method to construct such an apparently complex floor was actually available when it was painted. So how was it made and how was the Lorenzetti floor, which also appears to involve hexagons, constructed one hundred years earlier?

(Fig 10) Ambrogio Lorenzetti, ‘The Presentation in the Temple’, (detail)

(Fig 11) The geometric construction of the floor pattern

(Fig 12) The 6 pointed star pattern developed from the root 2 pattern

The solution to this is relatively straightforward, but when combined with the evidence presented above, it is one that to me suggests the interesting possibility that late mediaeval and
early renaissance artists discovered the means to construct, initially floor patterns and then whole spaces ‘in perspective’, through playing with the geometry of the patterns themselves.⁸

Although the pattern in the floor appears to be based on a hexagon or a six-pointed star, the pattern can in fact be derived from the repeated drawing of a square within a square. (Figs 10, 11 & 12) In the case of the Veneziano floor, he has used the common ‘distance point’ construction, but has then derived the slightly more elaborate hexagonal pattern from the resultant transversals, orthogonals and diagonals, rather than a rectangular pattern for which that system is, in theory, intended. (Fig 13) Because he has used ‘distance points’ to construct the floor, the perspective recession of the whole floor is consistent, whereas the recession within the Lorenzetti is not consistent.⁹

(Fig 13) The floor construction in Domenico Veneziano’s ‘St Lucy Altarpiece’

(Fig 14) The pattern in perspective

Domenico Veneziano has used the geometry in a way that is clearly at odds with the purpose and methods associated with the geometry of perspective, as it was presented by Alberti. He has not used the geometry of perspective as a tool – a geometric device for determining how a specific shape in one plane will appear in another plane, that is, the picture-plane. We will of course never know Veneziano’s intentions, but this example immediately raises many questions, not least about the relationship between intention and outcome, which within
Alberti’s definition of perspective is clear. Was he attempting to depict a real floor – a floor he had seen, or was he simply playing with geometry? Was he playing with the images that the geometry suggested to him, in a way not dissimilar to Leonardo’s idea of aiding the imagination through extracting images from apparently random and accidental marks on a wall? Did his interest in pattern and surface simply override everything else?

Whether either artist knew that the patterns they were creating were not quite what they seemed is debatable, but I believe these two examples in particular demonstrate that both artists have obviously recognized the potential for creating an illusion from an essentially flat geometric construction, rather than any desire to depict reality. This approach to constructing or developing the space in pictures allows for a kind of fuzzy logic – it actively allows ambiguity to be part of the creative process. It is this particular aspect that keeps the whole process fluid and which allows it to be open-ended and creative, something which is difficult to achieve if there is no ambiguity. After all, we are dealing with flat images that have their own integrity and not representations that are merely substitutes for real things and real spaces.

**BIBLIOGRAPHY**


Veltman, Kim, The Perspective Unit. [http://www.sumscorp.com/perspectiveindex.htm](http://www.sumscorp.com/perspectiveindex.htm)


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1 It is as if this interplay can only happen in a shallow, almost haptic space. A space that I can stay connected to through the actual surface of the drawing. My involvement with perspective came about through making originally sculpture and attempting to incorporate or comment on the 'point of view'.

Alberti defined perspective as a projection, and thereby described and defined the geometric relationship between the viewer, the picture plane and the thing viewed. The picture plane is considered the equivalent of a window through which the real world is viewed, and the geometric procedures described by Alberti enabled the correct transformation of the real world on to the picture plane to take place. Alberti's description of the mechanics of creating a perspectival floor is brief and incomplete as it was probably not written for artists.

Kemp, Martin 1992. The Science of Art: Optical themes in western art from Brunelleschi to Seurat. New Haven, CT: Yale University Press. (First ed. 1990). Kemp writes: 'In the Flagellation, the artful ambiguity is less developed, but there is no question that Piero (della Francesca) is sharply aware of surface interplays such as those between the sharply silhouetted light and dark forms inside and outside the praetorium. I think it is true in general to say that the greatest perspectivists - we may think of Masaccio, Piero, Leonardo and Saenredam as among such - have not only exhibited complete mastery of the construction of space, but have also shown a heightened awareness of the shapes of forms when projected on to the flat surface of the painting'. Speaking of Domenico Veneziano, Kemp also writes: 'His St Lucy Altarpiece not only contains a virtuoso display of advanced perspective but also exploits a marvellously cunning series of visual conjunctions which compress elements at different depths into an interlocked composition'.

The nature of perspective projection is such that the process is reversible, and given certain assumptions about exactly what shapes are believed to be represented, the true ground plan and elevation can, in theory, be recovered from an image. For example, many attempts have been made to unravel the architectural space in Masaccio's Trinity. [Field 1997], [Field, Lunardi and Settle 1988], [Aiken 1995], [Kern 1913], [Schlegel 1963], [Janson 1967], [Coolidge 1966], [Polzer 1971], [Sanpaolesi 1962] and [Cristiani-Testi 1984].

It is thought that Alberti in 1435 was codifying knowledge that Brunelleschi had obtained through experiments/demonstrations, probably done around 1413, that involved small paintings, one of which apparently had to be viewed through a small hole, via a mirror. The demonstrations were partially documented by Manetti, but exactly what was being demonstrated and what knowledge was gained from these experiments is not clear. Nothing that I am suggesting in this paper contradicts anything that is known about Brunelleschi’s involvement in the development of linear perspective – in fact my suspicion is that, he too was aware of the spatial qualities of simple patterns and was using them to make the paintings that Manetti describes. The geometry of projection that Alberti described would inevitably have been discovered if Brunelleschi had then decided to work out what real three-dimensional space was represented by one of these flat patterns.

The distance point is a point on the horizon to which all 45 degree diagonal lines in the horizontal plane converge. A seemingly common practice in early renaissance paintings was to place this point at the edge of the painting.

It is known that Leonardo was interested in the proportions generated by perspective constructions.

Rather than through an increased knowledge and understanding of optics and other practical forms of geometry such as surveying, map making and astronomy, and Brunelleschi's investigations into controlled diminution within architecture leading to the discovery of linear perspective.

Although the perspective in each horizontal set of tiles in the painting is internally consistent, the horizontal sets are not consistent with one another. The space, therefore, is not coherent. The receding sets of tiles have been linked to the same central vanishing point, but their correct diminution as they move back in space is not correct. It is as if each horizontal set has been drawn separately, but using the same method. The result is that as the tiles go back in space, the equivalent diagonals of the tiles are in fact parallel. This may have been brought about by simply reducing the depth by a third each time. This, I believe, explains the illusion of curvature within this floor and was a common error in method that Alberti in Della Pittura was later to comment on.