The Philosophy of Perspective:

Math as Reality

A fairly standard formula for the application of linear perspective to the art of painting was presented in Leon Battista Alberti's text *De Pictura* of 1436, although the theory had been introduced earlier by the artists Brunelleschi and Massacio. Why did Western Europe of the fifteenth century need this concept of linear perspective? Why indeed. Some historians of the twentieth century propose that the concept of linear

perspective in Renaissance painting was far from necessary. The reasons for the widespread acceptance of this formula/technique (to be discussed later) can give us a clue to the deeper significance of the concept in our world. The adoption of Alberti's concept has a far greater relevance to our lives than the way it influenced the style of Renaissance painters and the familiar checkerboard floor motif trend it initiated in their works. Yes, above and beyond the tangible paints and canvases of fifteenth century Western Europe lies the true import of the theory and practice of linear perspective. The general enthusiasm for the concept is nothing less than a clear example of Western culture's compulsion (then and now) to order the world around it in terms of mathematical theories and constructions.

Linear perspective is an imposed reality. Dwight Lahr, Professor of mathematics at Dartmouth College, writes of the concept of imposed reality in his book, "Mathematics and Knowledge: Models of Reality." An imposed reality is something we take for granted in the world, a model for some part of our experience that is not necessarily true or false but helps us to think about the world in an ordered fashion (Lahr 4). Lahr speaks of the virtual reality games that have gained popularity in the late twentieth century. With the sensors that give the player senses of touch and smell, the game "is a construction that presents itself as an all-inclusive reality" (Lahr 5). So too did Leon Battista Alberti's concept of linear perspective present itself to the world of fifteenth century Western Europe as a method of best depicting an all-inclusive reality.

There are differing opinions on the catalyst of the development of linear perspective. Some art historians suggest that the artists of the fourteenth and fifteenth century had been actively seeking out a method to lend a greater sense of naturalism and reality to their work. They "shared a desire to discover a principle by which a painting could be organized to suggest a single, unified space" (Taylor 74). Alberti's explanation of the technique of painting in linear perspective would thus have been the answer to their prayers. Alberti's linear perspective used the principles of mathematical geometry to establish guidelines for the production of a "unified and homogeneous pictorial space" (Wilde 49). Still other art

historians contend that the painters of the fourteenth century were entirely *without* the need of linear perspective. Renowned art historian Erwin Panofsky states that there had been no "struggle for an exact perspective construction" prior to Alberti's treatise. Rather than a "decisive improvement of means towards the recognized ends of pictorial naturalism, linear perspective was...an impingement on painting from without" (Kuhn 114). This fact is key to an understanding of the true import of linear perspective.

Regardless of the exact origins of linear perspective, though, the fact remains that the artists of the Renaissance responded to it with great enthusiasm and made it an integral part of their work. Perhaps it would benefit the reader to briefly examine the basic rules of linear perspective and illustrate them with some examples.

Alberti explained that the canvas could be considered as an open window onto the scene that was being observed. Looking through this window, the artist must decide how high he would like the human figure closest to the window to be. As three *braccia* (a unit of measurement) equal the height of a man, this determines the size of each *braccio* unit of measurement (Wright 66). The base line of the painting is then divided into these braccia. Next, the centric point is found three braccia above the base line, i.e. at the eye-level of a three braccia-high man. *Orthagonals* are then drawn to connect the centric point with the braccio divisions along the base line. If the floor in the pavement is imagined to be a checkerboard floor (as is the case in many Renaissance paintings) then the orthagonals are the receding joint lines of the floor (Wright 66).

The horizontal floor joints are then placed parallel to the base line, getting closer together as they recede into the distance. The generally accepted ratio of space between the lateral lines was 3:2, or each subsequent space being "two thirds of the corresponding space below it" (Wright 66). The height of objects at different distances from the viewer is determined by the size of the braccio at that position in the painting. If an object is to be two units/braccia high at a certain place, then the length of the braccia at that place is determined, and the corresponding height of the object is established (Wright 69).

Consider this example where the artist wants the nearest human figure to be 1 1/2 inches tall. This means that each braccio is 1/2 inch in length. The base line is divided into units/braccia of 1/2 inch and orthagonals are drawn from the centric point (1 1/2 inches above the base line) to the braccio divisions. A tree of 6 braccia (i.e. 3 inches) height in the background would be drawn according to the corresponding length of braccia at that position in the painting.

The result of the application of this technique to Renaissance paintings was two-fold. It both opened and closed possibilities for artistic representation (Wilde 50). By introducing a method of depicting objects and scenes more realistically, linear perspective changed what could be painted and how it was perceived. A Greek temple, for example, could be presented in all its splendor, with careful attention paid to the proportionality of its construction; this in turn highlighted the classical beauty and perfection of the structure apart from its significance as a religious building.

However, just as linear perspective widened the scope and impact of painting, so too did it narrow it (Wilde 50). One potential problem was the depiction of supernatural forms in the context of this strictly realistic format. It is something of a contradiction to depict an archangel hovering over a carefully-conceived piazza in perfect perspective, when the angel could never really have true perspective. The fourteenth century painter Giotto's work of 1305, *The Pentecost*, clearly illustrates the problems of melding two distinct paradigms (Shlain 52) - in his case, traditional religious depiction and the perspective of the time. In the painting the Apostles are seated around a table, half of them with their backs to the observer. The halos posed a problem for, if placed in proper perspective and according to general convention, they would obscure the back of the Apostles' heads (Shlain 51). Instead, Giotto chose to place them in *front* of the heads so that the Apostles were looking through golden halos at the dinner table! *The Pentecost* is a bizarre and amusing work to say the least, as well as a perfect illustration of the conflict between artistic subjects and realistic perspective in the Renaissance.

Another limitation (perhaps affecting more Renaissance paintings) of linear perspective was the frontality that it imposed on innumerable works. Much Renaissance art displays an "extraordinarily thorough conformity to the frontal format" (Kuhn 129). Gardens, piazzas, and courtyards were rarely painted at an oblique angle. Instead, artists chose to use linear perspective in its most simple form, not for lack of skill at painting oblique angles, but rather because of the "prestige of the frontal format." This frontality

lent an “aura of architectural determinacy” to many Renaissance paintings, giving the viewer the feeling of being in “designed space, not found space” (Kuhn 130). This fact is a telling one in what it reveals about the mentality of the Renaissance painters and the general public.

The people of the Renaissance were increasingly preoccupied with the relationship of humans to the world. In particular, they were striving for a more thorough understanding of its workings, and for complete control of their surroundings. This is evidenced by the new focus on New World exploration, colonial conquest, the study of astronomy and other sciences, and the emergence of the humanistic movement. Fifteenth century people wanted to *know* their world. And so this attraction to linear perspective is completely understandable. With Alberti’s mathematical method of painting artists could more effectively order the content of their work, and in so doing, make the subject more accessible to all (Wilde 51). Art historian Carolyn Wilde contends that the structuring process of Renaissance painting became a mediating process of the relationship between mathematics and the world (Wilde 56), connecting the “clear mental gaze of the mathematician with the sensible and sensuous properties of things in the material world” (Wilde 58). Images shown in perspective “claimed a relation to their object like that of a well-made map: public and secure, because rule-governed and corrigible” (Kuhn 131). Art historian Naomi Miller goes so far as to say that perspective paintings might be considered as didactic paradigms of Euclid’s texts, stressing the primacy of geometry as a means to perceive the world in scientific rather than empirical terms” (221).

The historian John Russell speaks of the great significance of linear perspective:

> By taking as its first premise a single point of vision, perspective had stabilized visual experience. It had bestowed order on chaos; it allowed elaborate and systematized cross-referencing, and quite soon it had become a touchstone of coherence and even-mindedness. To “lose all sense of perspective” is to this day a synonym for mental collapse (Shlain 54).

Clearly the people of the Renaissance, with their apparent desire to fetter reality, were primed for the introduction of linear perspective as a way to more accurately depict

their well-ordered and harmonious world. But wait. Were paintings in linear perspective in fact more accurate? In truth, they were not. At best they were more accurate based on a new way of viewing the world. Although purported to be a more objective system of depiction, linear perspective simply involved a new criteria for "objective" perceptual judgment (Wilde 49). It was necessary for painters to develop specialized perceptual skills, for them to be trained to see in a certain way (Wilde 52). Alberti himself suggested the artist should use a "veil" apparatus, a grid of threads through which he could more accurately dissect a scene into its mathematical parts.

This raises the question of whether or not there indeed exist mathematical principles underlying nature, if there exists a "deeper harmony of things" that makes it possible for us to use math to reproduce and understand nature in paint (Wilde 52). Or are we simply imposing a mathematical overlay on the world, much in the way we accept the imposed reality that North America is on top of the globe and South America on the bottom (Lahr). I contend that, as it is necessary to re-train one's perceptual skills to be able to paint in linear perspective, it cannot be said with certainty that there lie definite mathematical laws at the roots of nature. Linear perspective is not a concept basic to the structure of the world.

The people of the Renaissance deemed it necessary to order their world according to specific criteria to have a better grasp of it, to master it, and so do we. We are trained to perceive the world in a specific way, as were Renaissance painters. We *choose* to explain much of the world, to fetter reality, in mathematical terms. But there is no such ultimate reality that is common to all people.

Take, for example, the case of a group of Africans who were shown a video about a mosquito plague and, when questioned, claimed the video was about chickens. They said this because a chicken in one shot of the film was the only meaningful thing they had seen. "All else, falling beyond their range of experience, was meaningless, and therefore virtually nonexistent, except the chicken," writes Anthony M. Alioto, author of *A History of Western Science* (162). He continues:

> We are those Africans, for all facts, even so-called scientific ones, are like this. They depend upon perspective. They do not come upon us pristine, pure and naked; rather, they are selected and molded into meaningful forms with the tools of habit and culture, in the workshop of preformed expectations...(163)

Renaissance painters selected and molded the meaningful forms of their world with the new tool of linear perspective. They depicted new "facts" for the general public, supposedly based on the fact that math underlies nature, when in fact they *made* it underlie nature. This is the ultimate example of Renaissance peoples' intense desire to explain their reality. We of the twentieth century do much the same thing, constantly developing new theories of math and physics that help us to understand our world. This should not undermine the importance of mathematics to our society. Regardless of whether or not math can be proved to be inseparable from reality, our attribution of supreme importance to it in our everyday lives (as with Renaissance painters and their linear perspective) is testament to its inseparability from *our* reality and the realities of centuries past.

Works Consulted

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