Exploring Perspective in Renaissance Art: Leonardo Da Vinci's Works as An Example

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Abstract. Leonardo da Vinci's progress in perspective is crucial to the Renaissance art. This study, mainly focuses on the specific aspects of Leonardo's experiment and theories on vision and perspective, his applications of research results in painting, and how these skills contribute to his art. This study used the documentary analysis method as the research method in order to analyze information from different sources, such as the explanation of his experiment and the outcomes, which helps the reader to get acquainted with Leonardo's idea in a more comprehensive and multifaceted way. The research turns out that Leonardo's method of perspective was appropriate and considerably accurate. There is an imperfection in Leonardo's perspective, and there remain queries that haven't been solved yet due to the limitations of the times, but still, his evolutionary way of perspective makes his paintings unprecedented and extraordinary. His achievement is thus influential and undisputed for later generations.

Keywords: Renaissance; perspective; vision.

1. Introduction

Renaissance art holds an irreplaceable position in art history, because of its doctrines that combine art and science and the great masters who innovated new techniques [1]. This study focuses on Leonardo da Vinci's contribution to the Renaissance perspective. This study is very meaningful for the recognition of the scientific values in Leonardo's artworks. This study mainly focuses on the specific aspects of the validity of Leonardo's perspective, and how his ideas give his art a profound meaning. The documentary analysis method was used to search and read relevant materials and literature, and the advantage of this method is that it can analyze documents with ideas from different angles well, which is conducive to the research process; The ultimate research goal of this study is to give an insight about the link between art and science in Leonardo da Vinci's paintings.

2. Overview

The origin of the Renaissance was both extensive and deep. They are related to the development of towns and late medieval trade, the emergence of wealthy and strong capitalist patrons, and the advancement of technology that had an impact on both economic and artistic life [2]. However, the spiritual world must be the first place to look for the origin of spiritual development. In this case, the Church's gloom and the pessimism surrounding its fundamental doctrine take center stage. It is no coincidence that both the Renaissance and the Reformation had their roots in the world of ideas.

A key aspect of Renaissance culture is illustrated by the rediscovery and interest in ancient Greek texts. The Renaissance initiative for the resurrection of classical writings included both literary and scientific texts.

3. Painter's Life Experience

A Florentine lawyer and a peasant woman had an illegitimate child, Leonardo da Vinci, who was born in Tuscany in 1452 close to Vinci [3]. He relocated to Florence in 1466, studied under Verrocchio, and later earned master status in the Brotherhood of St. Luke, a guild for artists. His fame was established by his adoration of the Magi. He relocated to Milan in 1482 to begin serving the

Sforza family's court there. He finished a number of significant works throughout his 16-year stay [4]. Returning to Florence in 1499, Leonardo continued his scientific and inventive research while also painting the Mona Lisa. Francis, I eventually invited him to stay in Chateau de Cloux, which is now Clos-Luce in Amboise, central France, where he later passed away in 1519, leaving most of his work to his pupil Francesco Melzi [3].

One important aspect that makes Leonardo a master is his unique skills that were invented or improved by him and then used widely in his works [5]. He perfected perspective in the Renaissance age, including sfumato, a kind of aerial perspective. According to Leonardo, perspective is nothing more than observing a scene or certain objects through a translucent piece of glass. The surface on which the objects behind the glass are intended to be depicted. The pyramids of the vision are cut by the glass plane, and they can be followed to the point of the eye.

Anyone who replicates Leonardo's experiment will note that the drawing in perspective on the glass window does not alter when the eye adjusts naturally in its orbit, as it does in everyday vision. However, Leonardo's experiment calls for the use of only one eye and the immobilization of the head. Leonardo was aware that it is impossible to create a flat image that gives the same impression of depth in binocular vision that one may achieve in uniocular vision when the head is kept motionless [6]. Here, it requires two distinct perspective images, one for the right eye and one for the left. These cannot be assembled on the window in the conventional manner. A stereoscope or other viewing tool must be used to see them independently. Therefore, a simple artwork created with the Renaissance perspective is unable to provide the same precise representation of the real things when viewed with both eyes as it does when view with one eye. However, the Renaissance perspective is still a respectable approximation—more importantly, it is likely the best approximation that is conceivable.

The idea of perspective is fundamentally dependent on this well-known experiment. It explains why Leonardo's theory was accepted and mostly unopposed for many years. This experiment served as Leonardo's fundamental introduction to the study of perspective. He stuck to the outcome, appropriately, despite the theoretical challenges. His understanding of how the eye creates an image of an outside object was unclear. Leonardo had a sneaking suspicion that the fundus was where a fabricated image was created, but he found it difficult to accept this theory. He also gets perplexed with understanding the "point of the eye," or center of perspective, which forms the peak of his pyramid of seeing.

Questions regarding eye reversal evoked Leonardo's curiosity in learning about eyesight. Leonardo reasoned that the image entering the eye was reversed at the pupil based on his understanding of camera obscura [7]. The issue that he considered as the primary challenge was "How the species light rays emanating from an object that is being viewed, which pass through some aperture to the eye, imprint themselves on its pupil upside-down, and the common sense sees them upright. "According to Leonardo: 'find out what re-inverts the species that intersect inside the pupil'. That the brain may have some function in recording an eventual upright image that he does not know [8]. The only option he had was to contrive a second inversion within the eyeball so that the image inverted during the passage through the pupil would be upright before falling on the end of the optic nerve. He was left with no choice but to make a second inversion within the eyeball, causing the picture that had been inverted while passing through the pupil to go upright before striking the end of the optic nerve.

The use of light and shadow to depict depth or chiaroscuro, is a recurring aesthetic device in Leonardo's work, and it is related to sfumato. More than any other artistic subject, he wrote extensively on the subject of shadows, classifying different kinds of shadows, discussing reflected and rebound light, and conducting experiments with optics. Leonardo placed a high value on the use of shadows rather than lines.

4. The Theory of Perspective in Works of Art

A painting's depth and three-dimensionality are created using perspective techniques [9]. On a two-dimensional surface, these methods imitate visual patterns found in the real world. The

illusionistic technique of using perspective to make things appear three-dimensional on a two-dimensional surface makes paintings more appealing. It appears that Brunelleschi is responsible for a crucial artistic discovery—perspective—which likewise dominated the art of later ages. As it has been shown, even the Greeks, who were adept at foreshortening and producing a sense of depth in paintings, were unaware of the mathematical principles governing how objects get smaller as they fade into the background.

4.1. Background of Artwork

Duke Ludovico, Leonardo's patron, commissioned him to paint the dining room in the Dominican convent of Santa Maria delle Grazie, which also served as the duke's family chapel [10]. Several hundreds of years before, in front of pictures of the apostles and Christ at the table, monks or nuns ate silently. It is intriguing to envision how the monks who commissioned the painting would have perceived it. The mural adorns one wall of an oblong room that served as the dining area for the monks at Milan's Santa Maria delle Grazie monastery. Imagine what it must have looked like when the painting was uncovered, and the table of Christ and his apostles suddenly appeared next to the long tables of the monks. The sacred episode had never previously seemed so close and real. It appeared as though a second hall had been erected to their own, where the Last Supper had taken physical form. A comparison with Castagno's The Last Supper, painted half a century earlier, demonstrates that the theme of the Last Supper was typical for monastic refectories [11]. Though deeper and more atmospheric than the preceding fresco, Leonardo creates a spatial environment that resembles an addition to the actual interior of the chamber, similar to Castagno. The exact center of the painting, behind the head of Jesus, is where the perspective system's primary vanishing point is situated, imbuing it with symbolic importance. The gap in the wall behind Jesus is also symbolic, serving as the building's version of a halo. Leonardo chose to let natural light frame Jesus rather than Castagno's burst of marble veining or an artificially made gold disk. The picture's lighting, composition, colors, and setting all draw the viewer's attention to Jesus. The apostles on the side of Jesus do not merely react to the words that "one of you shall betray me." Instead, each shows off his own personality and relationship with Jesus. Peter pulls a knife out of nowhere in the group to his right, John stands next to him with a blank expression, and Judas—the figure reclining on the table in the group to Jesus' right—retreats into shadow as he turns away from him. Leonardo carefully considered each pose and attitude he made to ensure that the drama unfolded over the picture plane.

4.2. The Theory of Perspective

Sfumato is a smokey representation of contours that avoids any form of distinct borders in the external world of the picture by gently blending colors into one another [12]. Aerial perspective, sometimes known as a perspective of color, is a notion linked to sfumato in that it holds that the further away an item is, the more of its distinct color it loses. Some claim that Leonardo resisted the then-blooming idealism of line by endorsing these tactics. According to some, Leonardo should be viewed as revealing the inner ambiguities of Renaissance thinking in a more general manner. According to all appearances, Leonardo experimented with linearity and perspective in his early work with the same enthusiasm for creation that is evident in his later work. The Last Supper may be where this love of experimentation and joy in the complexity of perspectival creations achieves its pinnacle. Scholars have made various attempts to prove that Leonardo's Milanese fresco contains an extremely complex perspective system. The Last Supper, in its ultimate shape, might, nevertheless, also be seen as an early attempt to simplify the difficulties of perspective. Some have hypothesized that Leonardo was going for a particular proportional relationship between various areas of the structure based on the scored lines of the perspective architecture that were revealed by the most recent restoration of the fresco. Leonardo was intensely interested in the proportionality of perspective and the rational component of sight, namely in the measure of sight, as seen by these scored lines and the theoretical insights on perspective.

Although Leonardo was a master of geometry and respected it, he believed that the intricacy of nature could not be understood through mechanical analysis and figures. His particular focus on characteristics, dynamism, and general perspective is a crucial component of his research, which is still evident in complexity theory and modern systemic techniques. "Perspective is nothing more than a thorough knowledge of the function of the eye". "Shadow is the means by which bodies display their form". A point of view, both objectively and figuratively, is called perspective. Like many of his contemporaries, Leonardo used perspective to give his work depth and focus the attention of the observer. Architectural lines of sight in The Last Supper direct attention to Jesus, the primary figure. Leonardo also explained how color and clarity deteriorate with distance along with linear perspective, which is a mathematics concept about reduction in size with distance. These artistic methods focus the viewer's attention and give the work of art vitality.

5. Artwork Analysis

Mona Lisa is Leonardo's most famous painting today. Its image can be seen in later artworks and modern products. It is pervasive in culture. The painting's ongoing reputation is due to a number of important components. Sfumato and aerial perspective are two methods that are used to create a naturalistic but impressive image. The figure interacts with the generic setting created by the painting's composition, which includes how the person and landscape are arranged, to give the figure a sense of a broader purpose. The painter must leave the viewer with a few inquiries. This appearance of dryness and stiffness can be avoided if the contours are not nearly as sharply drawn and the form is left a little vague, as though vanishing into a shadow. This is Leonardo's signature creation, known as "sfumato" in Italian. Its blurred edges and subdued hues allow one figure to blend into another while constantly leaving room for imagination. In order to optically obscure the picture plane and prevent the production of distinct lines, glazes are applied one on top of the other. Using this technique, the painting's forms take on the appearance of having hazy or smokey borders. Because the convention involved in producing a human-made representation of reality is absent from the painting, sfumato makes a painting appear more three-dimensional and illusionistic. By eliminating the usage of the line, the edge blurring adds to the painting's authenticity. The three-dimensionality is enhanced by the gentler transitions and the figure's enduring presence. It can also be seen in the background that the scenery is quite vague. In atmospheric perspective, distant background objects are shown with a little blurred, bluish tinge. This simulates the eye's inability to distinguish features at a great distance. By using sfumato, Leonardo enhanced the portrayal of the decrease of clarity and the faint bluing of hues in the distance in the atmospheric perspective system. The use of atmospheric perspective enhances the artwork's subdued naturalism while also making the background appear slightly less clear, more ambiguous, and difficult for the viewer to place it in any one place. People therefore only consider the work's content and not its link with a particular place when deciding what they want to see in it [7].

6. Conclusion

The research findings of this study show Leonardo's understanding of perspective is scientific and his application of his skills in his painting is significant for the development of painting. The linear perspective formed during the Renaissance is supported by scientific evidence that is in accord with the anatomy of vision since light rays leave paintings and travel in straight lines to the observer's eye. Due to the fact that typically look at paintings with both eyes when viewing them, the Renaissance perspective is inevitably flawed. However, Leonardo's employment of his theory in his paintings like The Last Supper and Mona Lisa leads to a realistic and vivid effect. Further leading to the conclusion that Leonardo's perspective is valid to the scientific extent and valuable to the artistic extent; This study provides valuable reference significance for future research in this direction, mainly affecting the present view towards the Renaissance perspective, and pushing people to pay attention on how

perspective changed Leonardo's art. Future research should focus more on the possibilities that could remedy the limitations in Leonardo's perspective system for in-depth exploration.

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