

Scientific Observations and Pictorial Studies in Leonardo's Painting Annunciation

Sijia Dong^{1,a,*}

¹Haileybury School, Hertfordshire, SG13 7NU, United Kingdom

a. sd1004@haileybury.com

*corresponding author

Abstract: This paper examines Leonardo da Vinci's innovative approach to landscape depiction and use of perspective in his painting, *Annunciation*. The painting was Leonardo's first commissioned work, while he was trained in Verrocchio's workshop as an apprentice. Leonardo's careful planning of composition and enthusiastic focus on landscape depicting demonstrate his keen interest in scientific exploration. There are three areas in which the paper aims to cover, including the perspective, composition and additional botanical studies, which would demonstrate the artist's exceptional focus on presenting scientifically accurate results on the painting. Leonardo's precise studies of perspectives and proportional control can be seen through a series of drawing techniques that he summarised with experiences, including the use of the pyramidal triangle to control the ratios and sizes of the objects. The lateral point also acts as a vertical halving line, where the painting is separated evenly and balanced with symmetrical patterns. As a painter who also mastered mathematics and engineering, Leonardo was capable of applying geometrical shapes in their best positions, where the detailed botanical studies simultaneously achieve the goal of expressing nature's beauty with art.

Keywords: perspectives, composition, botanical studies

1. Introduction

Leonardo da Vinci, a prominent figure during the Renaissance period, was not only a painter but also a scientist and engineer. His works reflect his interest in scientific exploration and investigation, as seen in his innovative approach to landscape depiction and use of perspective in his painting, *Annunciation*. In this paper, the author will analyse the composition and techniques used by Leonardo in *Annunciation* to showcase his mastery of both art and science.

Annunciation is a painting that specifically highlights the relationship between art and science during the Renaissance period. Guangqian Zhu had specifically pointed out that Leonardo took a unique approach towards art, referring to art as the scientific investigation of nature [1]. In Leonardo's view, experience is imploded as a major role for researching these scientific areas. Leonardo's careful planning of composition and enthusiastic focus on landscape depicting demonstrate his keen interest in scientific exploration. His innovative approach in including a large proportion of landscape depiction in the painting, unlike other artists who painted the same theme of *Annunciation*, shows his emphasis on presenting the relationship between earthly nature and heaven. Furthermore, his precise studies of perspectives and proportional control can be seen through a series of drawing techniques

that he summarised with experiences, including the use of the pyramidal triangle to control the ratios and sizes of the objects.

Martin Kemp has suggested that *Annunciation* is a typical study of narrative perspectives [2]. The painting structures its lateral point in the centre to create a pictorial effect of extension from the mountain, emphasising the importance of using a focal lateral point and arranging the composition to bring more attention to the mountain depicted in aerial perspective. Additionally, the lateral point also acts as a vertical halving line, where the painting is separated evenly and balanced with symmetrical patterns. As a painter who also mastered mathematics and engineering, Leonardo was capable of applying geometrical shapes in their best positions. The extensive use of symmetries in *Annunciation* effectively achieves the goal of expressing nature's beauty with art, as mirror symmetry dominates both in art and in nature.

This paper will explore the composition and techniques used by Leonardo in *Annunciation* and their relationship to the art and science of the Renaissance period. It will also highlight Leonardo's position in this period as an artist who was interested in both art and science, and how he used his skills to create a painting that showcases his mastery of both fields.

2. Leonardo da Vinci

Leonardo da Vinci, as one of the greatest Renaissance artists and engineers, had taken delicate studies on landscape painting. In the mid-1460s, as Leonardo's family moved to Florence, Leonardo himself became a "garzone" in Andrea del Verrocchio's studio and was trained professionally with technical skills to draft and paint in precise and realistic forms. He had already become a Master in the Guild in 1472, and showed his interest in the studies of perspectives, optical effects and "style in rock-formation and landscape studies" through many of his early drawings, including his earliest datable work, a drawing of an "Aron Landscape" (1473) [3]. The *Uffizi Annunciation*, as one of his earliest commissions, was commissioned around 1472, when Leonardo was trained as an apprentice in Verrocchio's workshop. He was also influenced greatly by Verrocchio on the pictorial depiction and the studies of perspectives of the painting, which discussions will be made in the following sections. As written by Martin Kemp, *Annunciation* had pictured "a young man striving to impress" [2]. It can be observed that Leonardo was experimenting with extensive amounts of elements he mastered in Verrocchio's workshop and experiences based on his own observation. Therefore, a considerable number of diverse explorations are available to be discovered throughout the painting.

3. *Annunciation*

This was the earliest known commission work painted by Leonardo. The artwork's inspiration is derived from Luke 1.26–39, portraying the moment when the angel Gabriel informed Mary that she would miraculously conceive and give birth to a son, Jesus, who would be known as "the Son of God" and rule forever. The subject of the *Annunciation* was popular and had been portrayed multiple times in Florentine art, including by Fra Angelico.

It can be highly possible that Leonardo had been influenced by Flemish artists and Netherlandish paintings, which leads to the emphasis on the "incidental" objects of the painting, such as the marble table, the lilies and the wings of the Archangel. The marble table depicted in front of Mary is believed to have been "motifs from Verrocchio's repertoire", influenced by Verrocchio's sculpting of the tomb of Piero and Giovanni de' Medici in the Basilica of San Lorenzo, Florence, during the same period [4]. The angel holds a Madonna lily, which acts as a symbolism for both Mary's virginity and the city of Florence. It is thought that Leonardo, being a keen observer of nature, painted the angel's wings to resemble those of a bird in flight. Such precision in depicting the picture was also adapted in the landscape painting of the artwork, where a similar quality is presented.

Despite this, the painting is considered to be an early commissioned work by Leonardo that showcases his signature techniques, including sfumato and atmospheric perspective, which append to the in-depth studies of landscapes. The paper can be summarised into three sections to discuss Leonardo's precise studies about the individual objects, perspectives, compositions of the painting, where each of them represents Leonardo's unique expression of biblical events that parallels his explorations between art and science.

3.1. Leonardo's Practice on Perspectives

It is undoubtedly that in *Annunciation*, Leonardo has specifically designed to apply large proportions of landscape depiction, which acts significantly for widening the canvas of the painting visually, as it would also vividly present a vast landscape of Monte Oliveto, in which the painting refers to. It should be noted that the painting was designed to be viewed not on the front, but viewed from the right side at a certain angle, evidently shown by the distorted anamorphic image of Mary's reaching arm [5,6]. Thus, it should be considered that the proportion of landscape would be utterly more significant in the entire background, taking almost 80 percent of the area. This would imply Leonardo's careful planning of the composition and his enthusiastic focus on landscape depicting. It is a rather innovative approach made by Leonardo, since artists who painted the same theme of *Annunciation*, including Fra Filippo Lippi and Sandro Botticelli's *Annunciation*, did not construct to include massive proportion of landscapes and botany, suggesting them as less keen to investigate on a scientific basis. For Leonardo, it is not only the presentation to emphasise the sacredness of Archangel Gabriel and the relationship between earthly nature and heaven, but also striving to present all his delicate botanical studies on landscapes in the background, which sets the overall calming tone of the painting.

Martin Kemp has suggested *Annunciation* as a typical study of narrative perspectives. He argues that the painting "was designed in conformity with what a young artist would be expected to know about the construction of pictorial space," since the use of lateral perspectives provides a uniformity to the picture and provides aesthetic pleasance [2]. The painting structures its lateral point in the centre, creating a pictorial effect of extension from the mountain in the centre. It may be relevant to suggest the importance of using a focal lateral point and arranging the composition, which is to bring more attention to the mountain depicted in aerial perspective. It is quite evident that Leonardo had taken precise studies of the perspectives through a series of drawing techniques that he summarised with experiences, in particular parallels with the studies of eyes. Since the perspectives of the painting are mostly extended from the centre, it creates the pyramidal triangle that is used to control the ratios and sizes of the objects, in which Leonardo demonstrates the idea further in his collection of notes "A Treatise on Painting". He specifically stated how to present the "appearance of the natural size" in a painting, and includes the fact that smaller objects can be drawn closer and larger to the viewer, whereas larger items need to be seen in a distance, so it would be smaller to be observed fully. Kemp also pointed out the evidence where Leonardo takes careful decisions of the proportions. An analysis suggests that "if you place the intersection one braccia from the eye, the first object, being four braccia from your eye, will diminish by three-quarters of its height on the intersection.", which closely suggests a detailed proportional study made by Leonardo. It overall illustrates clearly the results from Leonardo's studies, where the function of the eye is being acknowledged, thus a suitable proportion of the objects in *Annunciation*, such as the distant trees and the close marble table, is controlled with precision.

A different approach would suggest that the pyramidal triangle is often used for explaining light reflections received by people's eyes, which is a scientific principle Leonardo used frequently in his work to achieve the naturalistic quality of the painting. The artist clearly believes in the importance of experience and constant practice to carry out further studies of science. In his later sketches, such

as “The Model of The Eye and Diagram of a Visual Path”, or diagrams from he used in his Linear Perspectives section of notes “A Treatise on Painting”, demonstrates his skills of painting based on close observation and experiences. Leonardo had suggested the importance of observing nature with one eye while making sketches, which would allow sufficient focus on an explicit image [7]. This undoubtedly states the reason Leonardo selected one centre focal point as the ultimate structure of the whole painting, since it is concise in its simplicity and easy for a young artist to demonstrate his ability. Probably not significantly creative, but provides an emphasis on thoroughly presenting each object with full details.

Furthermore, the lateral point also acts as a vertical halving line, where the painting is separated evenly and balanced with symmetrical patterns. Further analysis about its relationship with mathematical studies will be explained later in the paper.

3.2. Composition

Being a painter who also mastered mathematics and engineering, Leonardo was already capable of applying geometrical shapes in its best positions. As a simple work “striving to impress”, people can observe an extensive use of symmetries, which effectively achieves the goal of expressing nature’s beauty with art [8].

It has been stated by Alexander V. Voloshinov that the most commonly used symmetry in “arts of architecture and painting” was “mirror symmetry”, which also “dominates both in art and in nature [9].” Leonardo would thus use this “well-known laws of beauty” in his first commissioned work. The first noticeable mirror symmetry would be the evenly spaced trees in the background, which seem to be presented as the garden’s decoration. However, it is more likely that the firmly placed trees were intended to act as structured pillars that reinforced the castle-like atmosphere of the painting. This adds to maintaining the balance of the painting and the conformity of it, portraying the entire composition of the painting as rigorously in order. It can be noted that symmetry often suggests the relationship between the two parts, such as the relationship between the two trees. It acts as an illustrative example of symmetrical visual effects, where the harmony of the painting is balanced.

Furthermore, the symmetry is able to perform as symbolism to the formal statement from the Archangel, at the same time it suggests the scientific arrangement made specially for the painting. The uniformity of the trees should also not be ignored, where the form and shape of the trees are depicted almost as duplications of each one. However, it is the details which shows Leonardo’s skilled techniques in portraying the trees with the slightest variations, so the most naturalistic form is brought out. Although there are no surviving sketches for preparing the painting of the trees in this painting, people can still reference from his remaining collections of notes to investigate his insight of landscape studies.

3.3. Object Depictions and Botanical Studies

The precision and details Leonardo focused on in the painting should also not be ignored, since they represent Leonardo’s wide range of studies, including the area of optics and botany. It should be noted that the sketches made by Leonardo are advanced studies of the period, since the research of botany did not exist and much of the studies were lost in the 1450s [10].

“The Drawing of Lily”, as one of the surviving sketches arguably made for *Annunciation*, demonstrates Leonardo’s close observation and detailed notes made while preparing for the painting. The details illustrated are clearly an emphasis to the purity of Mary, with lily being a symbol of sacredness and pureness. It acts as a typical example of Leonardo pursuing his beliefs, in which he argues the importance of investigating with experience and becoming closer to the natural world. At the very first chapter of his collection of notes, he states that every painter student “must study Nature,

in order to confirm and fix in his mind the reason of those precepts which he has learnt” [7]. His statement further proves the importance of closely observing nature, and learning from their form and structures. However, some art historians, including Popham, argues that survived lily sketch was not the one used for *Annunciation*, since the lily’s position does not match with the one in the painting [10]. Nevertheless, considering the fact that the sketch was drawn around the time when *Annunciation* was drafted and painted, and it is more convincing that Leonardo was trying to add in small variations to prove his skills. Thus, the material is still valuable for exploring Leonardo’s botanical studies.

The trees in the background not only acquire their significance in symmetries, but also thrive in their details. It seems that Leonardo had taken delicate depictions with the addition of small variations, making the tree more realistic. He even specifically illustrates a description on how to paint trees in his notes, where he suggests that wild trees should be painted darker than cultivated plants, and the trees should be “of a deeper azure”, where “the air is thicker”. Such descriptions may all point towards the *Annunciation*, where all of these experiencing techniques are used, emphasising the efforts put in to support the naturalistic qualities of the painting.

In addition, Leonardo also suggests the undeniable principle of “close to nature” should not be carelessly taken. In “A Treatise on Painting”, the famous “sponge analogy” highlights Leonardo’s beliefs on the vitality of exploring nature. Leonardo heavily criticises the views of Sandro Botticelli, who believes the leaves of a tree could simply be depicted by only “throwing a sponge” and “a lovely landscape might be discerned”. Compare the *Cestello Annunciation* made by Botticelli with Leonardo’s *Uffizi Annunciation*, it can be spotted that the leaves in Botticelli’s painting are less detailed, and it is likely that the leaves were merely painted by blocks of leaf patterns, whereas Leonardo controlled the slightest details in the trees’ leaves. Certainly, Leonardo’s dedication to the work allowed him to develop significantly strong scientific studies in the field of painting.

4. Conclusion

In *Annunciation*, Leonardo’s unique perspective and composition techniques, combined with his interest in botanical studies and optics, make this painting a remarkable example of his scientific and pictorial studies. The complexity and precision of the painting are evident in its geometrical structure and the balance of its aesthetics.

From a perspective point of view, Leonardo utilised a unique approach that created depth and dimensionality in the painting. He used linear perspective, which is a mathematical system that allows an artist to create the illusion of three-dimensional space on a two-dimensional surface. Leonardo was one of the first artists to use this technique, and his mastery of it can be seen in the painting. The angles of the architecture and the positioning of the figures create a sense of depth that draws the viewer into the scene.

In terms of composition, Leonardo effectively applied geometrical shapes to *Annunciation*. The painting exhibits extensive use of symmetries, especially mirror symmetry, which dominates both art and nature. Symmetry not only suggests the relationship between two parts but also serves as symbolism to the formal statement of the Archangel while suggesting scientific arrangement. The trees are depicted almost as duplications, but slight variations in their portrayal showcase Leonardo’s skilled techniques in portraying nature realistically. Despite no surviving sketches for the trees in this painting, Leonardo’s remaining collections of notes provide insight into his landscape studies.

Botanical studies were also a significant part of Leonardo’s work, and they are present in the *Annunciation* painting. The lilies that are present in the foreground of the painting are painted with great detail and accuracy. Leonardo’s interest in botany and his study of plants allowed him to accurately depict the lilies in the painting, which were symbols of purity and grace during the Renaissance period.

In conclusion, it can be said that Leonardo da Vinci's *Annunciation* painting is a remarkable example of the relationship between art and science during the Renaissance period. His scientific and pictorial studies of this painting were significant achievements that set him apart from other artists of his time. He was a master of perspective, composition, botanical studies, and optics, and he was capable of using mathematical systems to structure his work and bring about a balanced aesthetic. What makes him unique is the geometrical field that is reminded throughout the painting, which was accomplished through precision and observation. The perplexity of his work still leaves people wondering about the mastery of such an artistic work. Leonardo's position in the Renaissance period was significant as he paved the way for other artists to follow in his footsteps and explore the connection between art and science.

References

- [1] Zhu, Guangqian. (2015) *The History of Western Aesthetics*. 1st edn. Sichuan Literature and Art Publishing House, Sichuan.
- [2] Kemp, M. (1992) *The science of art: optical themes in western art from Brunelleschi to Seurat*. Revised edn. New Haven: Yale University Press.
- [3] Rosci, Marco. (1977) *Leonardo*. Bay Books Pty Ltd.
- [4] Murray, Peter., Murray, Linda. (1997) *Dictionary of Art & Artists*. 7th edn. Penguin Reference.
- [5] De Girolami Cheney, Liana. (2011) *Leonardo Da Vinci's Uffizi Annunciation: The Holy Spirit*. *Artibus et Historiae*, 32(63), 39–53.
- [6] *The Open Scholar*, <https://uva.theopenscholar.com/neh-institute/leonardos-annunciation-perspective>, last accessed 2023/04/26.
- [7] Leonardo, D.V., Rigaud, J.F., Poussin, N., William Brown, John. (2002) *A treatise on painting*. Revised edn. N.Y.: Prometheus Books, Amherst.
- [8] Kemp, M. (2007) *Leonardo da Vinci: the marvellous works of nature and man*. Revised edn. Oxford University Press, Oxford.
- [9] Voloshinov, A. V. (1996) *Symmetry as a Superprinciple of Science and Art*. *Leonardo* 29(2), 109–113.
- [10] Morley, B. (1979) *The Plant Illustrations of Leonardo da Vinci*. *The Burlington Magazine* 121(918), 553–562.