



# Functions of "Mirror" in Renaissance Artworks

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**Abstract.** With the continuous development of science and the increasing diversification of art, the cross-integration of science and art has become a hot topic in today's society. As early as the Renaissance, people had achieved a perfect combination of science and art already. At that time, as a product of the development of science and technology, mirrors not only provided convenience for people's daily life but also played an important role in artistic creation. Based on literature analysis and image analysis, this paper studies and summarizes the mirror's various functions in studying perspective rules, observing and learning nature, extending the space of artworks, and changing traditional viewing methods by some artworks during the Renaissance period. This paper tries to make an effort to provide a reference for analyzing and interpreting the mirrors in Renaissance artworks and even modern and contemporary artworks. Moreover, this paper aims to stimulate further interaction and fusion between science and art.

**Keywords:** Mirror, Artist, Perspective, Nature, View.

## 1 Introduction

With the development of science and the increasing diversification of art, science is widely used by artists as a tool, and a large number of modern and contemporary artworks also in some ways support the advancement and ongoing development of science. The cross-integration of science and art has become a hot topic in today's society. As far back as the Renaissance, there are many examples of the perfect combination of science and art. After experiencing nearly ten century's "Dark Ages", people at that time hoped that ancient Greek and Roman literature and art could be reborn. So, they began to oppose theology and advocate individual liberation. Almost all disciplines put emphasis on "nature" and "self". Such thoughts of humanistic led to the rise of natural science and empirical technology at that time. At the same time, art ushered in a new development peak with the intervention of mathematics, anatomy, natural history, and other disciplines.

Numerous papers about the combination of science and art during the Renaissance can be found in both domestic and foreign literature, but most of them focus on individual artists, such as Leonardo da Vinci and Albrecht Dürer, or they discuss the fusion of one specific discipline with the arts, such as perspective, medicine, botany, and so forth. There is not much discussion about the "mirror" in the artworks of Renaissance.

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E. Marino et al. (eds.), *Proceedings of the 2023 5th International Conference on Literature, Art and Human Development (ICLAHD 2023)*, Advances in Social Science, Education and Humanities Research 806,

[https://doi.org/10.2991/978-2-38476-170-8\\_4](https://doi.org/10.2991/978-2-38476-170-8_4)

But there are few studies on the change in the meaning of the image in the mirror through the analysis of various historical contexts. However, this paper takes the "mirror" as a tool to discuss its function inside and outside the painting.

As a product of technological development, in addition to bringing convenience to people's daily life, the mirror's role in the history of art during the Renaissance is also beyond doubt. In artistic creation, except for being used by artists as still-life decorated pictures, mirrors also carry many other functions. Based on literature analysis and image analysis, this paper first analyzes the development of mirrors and the meaning of mirrors in the context of western traditional culture. Then, it analyzes the functions of the mirror in the study of perspective, the observation of nature, the extension of space of artworks, and the change of traditional viewing methods by some relevant Renaissance artworks. It is hoped that this paper can provide a reference for the interpretation of mirrors in artworks during the Renaissance and even contemporary artworks and provide new methods and ideas for artists' creation nowadays.

## **2 The History of the Mirror**

### **2.1 Introduction and Development of Mirror**

Before mirrors were invented, humans used the natural water surface as a mirror. Peaceful pools, vessels containing water were the earliest prototypes of mirrors. Obsidian flakes in Anatolia are the earliest known manufactured mirrors, dating to about 6500 BC<sup>[1]</sup>. In the Middle Ages, the Romans made "lead" mirrors which still looked gray, so the knights at that time still used bronze mirrors. Around the 13th century, the Venetians invented convex glass mirrors, and they coated the glass with mercury. Venetian mirrors became a very fashionable thing. The nobles of Europe and the rich dignitaries are falling over each other to buy. It wasn't until the 16th century that Mirrors made of glass backed with a reflective coating of tin amalgam first came into general use in Europe<sup>[2]</sup>.

### **2.2 "Mirror" in Ancient Greek Mythology and Philosophy**

There was some recognition of mirrors before the Renaissance. Early Western descriptions of mirror images are derived from ancient Greek mythology. Narcissus, the son of the river God Caiphesus and the goddess of water Liliope. After Narcissus was born, his parents asked the famous prophet Tirisias about the fate of his son. The prophet said he could live as long as he did not see his own face. So, although Narcissus grew up to be the most handsome man in Greece, he never knew what he looked like. Once, on a hunting trip, he was so thirsty that he went to the lake to drink. The water was as calm as a mirror, and when Narcissus bent down to drink, he fell in love with his own reflection. Immediately, he becomes infatuated with it and cannot leave it. Eventually, he died of depression and turned into a narcissus<sup>[3]</sup>. This story implies that the "mirror" has the function of observing, examining, and knowing oneself. At the same time, it suggests the mirror conveys a psychological feature of self-infatuation.

Plato also talked about mirrors in the *Republic*. He considered that the mirror is capable to catch the reflection of the sun, the earth, or anything else, but it's just a superficial image, like a painter creates something on his canvas <sup>[4]</sup>. This shows that Plato asserted that the reflection in the mirror is a representation of nature, but that would be fictitious only. It's mistaken to believe that shadows, mirror reflections, or something like this to have the existence of a solid <sup>[5]</sup>. The fact is they can be all-encompassing and yet empty.

### 3 The Application of Mirror in Renaissance Artworks

With the progress of science and technology, mirrors gradually enter people's daily life and have a certain practical value. Flat mirrors are often used for grooming, and curved mirrors have two types: concave and convex, which are mainly used as optical instruments, telescopes, furniture accessories, etc. In addition to bringing convenience to people in daily life, mirrors also provided inspiration and ideas for artists in their artworks during the Renaissance. Mirrors can not only appear in paintings as still-life, but also as scientific tools to help artists change the traditional way of painting and viewing, adding scientific, interactive, and interesting to the artworks of the Renaissance.

#### 3.1 Mirror and Perspective

"Perspective" comes from the Latin word "prospectus", meaning "looking through" <sup>[6]</sup>. It was nothing new during the Renaissance, since the ancient Greeks when many artists tried to break away from the graphic style of ancient Egypt and create the illusion of depth of space. Euclid, Vitruvius, Ptolemy, and others also put forward some theories about perspective, But the scientific use might first be traced back to around 1000 AD, Ibn al-Haytham, Arab scholar, physicist, mathematician, gave what is considered to be the first correct explanation of vision. This science of vision was called perspective <sup>[7]</sup>. But it was Filippo Brunelleschi who first utilized the mirror as a tool to derive the formulation of mathematical perspective and influenced all subsequent perspective's developments by artists and theorists alike.

Brunelleschi had stayed in Rome for certain years. He almost visited all the ancient sites in Rome and nearby with Donatello, so that he gets an in-depth understanding of the architectural style of ancient Rome. Brunelleschi recorded these buildings, and then deeply summarized the essence of classical architecture embodied in ancient Rome architecture -- the combination of art and science. This laid a solid foundation for his later research. Around 1407, Brunelleschi returned to Florence. And a few years later he conducted an experiment in linear perspective which had termed Brunelleschi's Peep-show. According to Giorgio Vasari, the author of *Lives of The Artists*, Brunelleschi held a mirror in one hand and a painting with a small hole in the other hand. His eyes looked at the reflected image in the mirror through the small hole. After overlapping and comparing the reflection with the actual building, he found that the real building was completely consistent with the image in the painting. This verified that a painting made with perspective could be as accurate as a photograph. That's how *The Baptistery Painting*

was done. Brunelleschi also restricted the formula of one-point perspective to three elements through this experiment: vanishing point, horizon line, and orthogonal line.

Such discovery and application indeed improved the painter's skills to a great extent and realized a combination of art and science. On this basis, many artists in the Renaissance also made their own contributions to perspective, such as Masaccio, Alberti, Leonardo da Vinci, Albrecht Dürer, and so on. Accordingly, the realistic painting reached an unprecedented height.

### 3.2 Mirror and Nature

By the end of the 15th century and the beginning of the 16th century, people gradually recovered from the control of medieval theology, and various subjects began to pay attention to humanism and naturalism. It's the same in the art circle. Leonardo da Vinci was one of the pioneers. He proposed the "Mirror Theory", which advocated understanding, imitating, and expressing nature through mirrors. His "Mirror Theory" can be roughly summarized in three aspects. First of all, he emphasized the realistic technique. He believed that the mirror could reflect the image truthfully for the painter. On the contrary, the painter could also check his own picture through the mirror. Second, the artist can observe the natural distribution of light through the mirror, summarize the experience and reinforce it in the painting. Third, he believed that the painter should think while painting, and reflect the object as it is depicted, like a mirror. It can be seen that in Leonardo's mirror theory, the mirror not only refers to the physical mirror that can observe nature but also represents "nature" or the external world, as well as the painter and his way of cognition<sup>[8]</sup>.

Holbein's *The Ambassadors* is a good example, a full-length double portrait set against a green satin background. The shelf they were leaning against was covered with an exquisitely painted Persian blanket. There are celestial instruments, sundials, levels, lute, and so on in the middle. These symbols of arithmetic, geometry, astronomy, and music objects, perfectly display the Renaissance humanism spirit. Most striking, however, is the elongated skull at the bottom of the painting. It was placed between the two ambassadors obtrusively. It is difficult to recognize from the front and can only be seen from a specific angle beside the painting. From the perspective of technique, how did Holbein paint such a unique angle of the skull? It's impossible that he did that only by his imagination alone. Presumably, he was able to draw the strange skull, but with such accurate perspective, by looking at its reflection in a mirror at a particular angle. Emotionally, skulls are often symbols of death and nothingness in Western culture, suggesting the glitz of the outside world. So why did Holbein go further and create such "visual traps" in the picture? Jacques Lacan once proposed his famous "Looking Awry" when analyzing the painting. He considered that the image is deceptive, and we can only see the skull at the bottom of the picture sideways, just as the truth of the subject can only be obtained by squinting. But certainly, the "mirror" belonged to Holbein was visible only to himself.

### 3.3 Mirror and Space

Due to the physical reflection characteristics of mirrors, they can reflect the real world outside the mirror. People can feel the real space through the mirror so that the originally limited space can be extended to infinite space<sup>[9]</sup>. These changes in spatial amplification can be divided into two main categories. One is "scene space", and the other is "narrative space" or "metaphorical space". The "scene space" is easy to understand. In traditional paintings, the picture generally depicts the space of the painter's horizon. But with the intervention of the mirror, the image in the mirror can reflect the space opposite to the painter's vision field or other space relative to the mirror, thus increasing the capacity of the painting. As for "narrative space", simply speaking, it refers to the thoughts or emotions that the painter wants to express through the image in the mirror.

Quentin Matsys's famous work *The Money Changer and His Wife*, completed in 1514, can well illustrate this point. This art piece depicts a 16th-century pawnshop in which the moneylender is absorbed in weighing coins while his wife looks on as she leafs through the Bible. The mirror placed in the center of the lower part of the painting undoubtedly adds to the overall expressiveness of the art piece. To start with the "scene space", the window, the trees outside, and the tall building on one side are reflected in the mirror. The artist brings the space beyond the pawnshop to the audience through the mirror image, which enriches the content of the picture. Of course, this is not the whole purpose of the painter. He also wanted to reflect the living conditions of the Netherlands through the street scene in the mirror, to indicate the rise of capitalism, and to echo the subject of the picture -- the moneylender weighing the coins. In addition, the cross-shelf shown in the mirror echoes the wife's religious beliefs. By dealing with these details in the mirror, Quentin emphasized the hesitation and entanglement between religious belief and the capitalist spirit of people in the early stage of the rise of capitalism, which extended the overall "narrative space" of the artwork to a certain extent.

### 3.4 Mirror and Viewing

As soon as human civilization emerged, people began to show great interest in the "self". The ancient Greek myth of Narcissus mentioned above is also regarded by Alberti as the source of human self-portraits. Early self-portraits were often hidden in group portraits. According to Woods Marsden, the artist makes himself the central figure, rather than casting themselves as supporting characters in religious or war scenes<sup>[10]</sup>.

During the Renaissance, people affirmed human rights, advocated individual liberation, and emphasized attention to "human" and "nature". Just as Marsilio Ficino said in his letter, "Know yourself, offspring of God in mortal clothing<sup>[11]</sup>." This is part of the reason why more and more self-portraits appeared during the Renaissance. Besides, it is also due to the development of mirror-making technology. It could be argued that mirrors play a pivotal role in this regard and can even be part of a self-portrait. The process of creating a self-portrait is a process in which the artist sees and examines himself. sequentially, to get self-awareness, self-presentation, and the social

construction of the self<sup>[12]</sup>. Mirror as the inter-media enables artists to avoid interference from other people's eye contact and other actions and establish a private space where they can face and view themselves alone. Self-portrait by Marcia, the first work recorded by an artist who painted a self-portrait in a mirror, was published in France in 1402 in a codex of Giovanni Boccaccio's *De Mulieribus Claris*. The painting depicts a female with a mirror in her left hand and painting a self-portrait on a canvas with her right hand.

Apart from that, mirrors can also make a kind of "presence" view, which includes the presence of the painter and the viewer. For example, Jan Van Eyck's famous painting *The Arnolfini Portrait* completed in 1435 depicts the engagement of the wealthy Italian merchant Giovanni di Nicolao and his wife. In the lavishly decorated room, the painter placed a mirror on the back of the wall which is also the visual center of the picture. In this way, the audience can not only see the subject of the portrait -- Arnolfini and his wife but also see two people watching at the door from the mirror, one of whom can be presumed to be the painter himself. As Gonbrich said in his book *The Story of Art*, this work is "For the first time in history the artist became the perfect eyewitness in the truest sense of the term<sup>[13]</sup>." Painter's "presence" makes the work achieve a combination of reality and representation. Another person at the door actually represents the audience who is viewing the painting. Jan Van Eyck in this way subtly lets the audience experience the scope of his vision and blend into the picture, making the process of looking at the artwork more interesting. The whole thing goes like this: The painter is looking at the Arnolfinis; the Arnolfinis are looking at the audience, and the audience is looking at all of them. The painter connects the figures in the portrait, himself, and the audience together through the mirror, constructing a stable and triangular viewing relationship.

## 4 Conclusion

As a daily necessity, the "mirror" also plays an important role in artistic creation. This paper takes the Renaissance period as the background, analyzing some artworks at that time, and discussing the different functions of the "mirror" in artistic creation from perspective, nature, space, and viewing.

First of all, mirrors play a crucial role in the study of perspective principles. Brunelleschi made experiments with a mirror and summarized the basic formula and operation method of linear perspective. Secondly, the mirror is a good medium for painters to observe and learn about nature. The analysis of Leonardo's "mirror theory" and Holbein's *The Ambassadors* shows that artists can use the mirror as a tool to observe nature and express their inner feelings. Third, mirrors can extend the "scene space" and "narrative space" of artworks. The mirror in Quentin Matsys's *The Money Changer and His Wife* not only depicts the street scene outside the window but also hints at the background of that time. Fourth, mirrors can transform the traditional way of viewing. On the one hand, the artists look at themselves through mirrors and create self-portraits. On the other hand, mirrors realize the "presence" of the artist and the viewer. It makes for an interesting viewing relationship.

In conclusion, the "mirror" as a non-traditional tool has its unique functions in Renaissance art creation. In today's era, artistic expression forms also emerge in an endless stream with the intervention of various tools and technologies. Mirrors are still used as materials and tools to bring new possibilities to contemporary art. It is hoped that this paper can provide a theoretical reference for the application of mirrors in artistic creation, enrich the research content in the combination of science and art, and achieve sustainable development of both.

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