

## The Cosmos in “Ginevra de’ Benci” by Leonardo da Vinci

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### Abstract

Leonardo observed the celestial phenomena to study the phenomenon of light and shadow, which was to be used in painting. The object of the research is the painting “Ginevra de’ Benci”. This work was created in 1474-1478 by Leonardo da Vinci. In the left half of the painting the oval shape detail bordered with faint contour is observed. Through the Paint X program, we moved this detail to the right part of the painting in the place of a round shadow near the face of Ginevra. According to our interpretation, the bright and oval face of Ginevra de’ Benci is a metaphorical image of the moon. The dark background around it is a cosmos with numerous stars. Below the displaced detail is a quarter of the sphere that resembles the Earth’s surface and is associated with our planet. The displaced detail represents the oval and is associated with the moon. The layout of the dark spots on the sphere is compared to the relief of the moon, which is described on a modern photo. Finally we can think that the painting describes the earth, the moon, the cosmos, and the stars.

**Keywords:** Ginevra de’ Benci, Leonardo da Vinci, moon, cosmos

### 1. Introduction

In the 15<sup>th</sup> century, Leonardo da Vinci made observations of the sun, moon, comets and meteors. His observations of celestial phenomena were not primarily for astronomical purposes. Leonardo observed the celestial phenomena to study the phenomenon of light and shadow, which was to be used in painting. During his observations, he noticed how the earth, moon and planets reflected sunlight (Welther 1997)]. Unfortunately Leonardo did not publish his astronomical studies.

### 2. Materials and Methods

The object of the research is the painting “Ginevra Ginevra de’ Benci”. This work was created in 1474-1478 by Leonardo da Vinci (Fig. 1 A). Ginevra de’ Benci was a famous Florentine woman. Leonardo may have painted this portrait to commemorate her marriage to Luigi di Bernardo Niccolini at the age of 16. The woman’s face is presented in a matte color, and around her there is a dark background, which depicts plants with star-shaped leaves.

This painting currently belongs to the National Gallery of Art, Washington and only work by Leonardo da Vinci in the America. It is noteworthy that Leonardo’s fingerprint was found on this painting that show how the Master used his hand as well as a brush to blend colors and create soft, delicate edge.

### 3. Results

We think it would not be an exaggeration to say that the bright color and oval shape of Ginevra de’ Benci’s face in the painting of Leonardo forms an association with the moon. This similarity can be seen as hint from the author of what to look for in this work.

In the left half of the painting, a light colored area can be seen on the dark background behind Ginevra. In this area the oval shape detail bordered with faint contour is observed. Through the Paint X program, we moved this detail to the right part of the painting in the place of a round shadow near the face of Ginevra (Fig 1 B). The area of oval’s final location is bordered by Leonardo with a faint contour that exactly matches the shape and size of the moving detail.

We interpreted the obtained image. According to our interpretation, the dark background around Ginevra’s head is a cosmos with numerous stars. Below the displaced detail is a half of the sphere that resembles the Earth’s surface and is associated with our planet (Fig. 2 A- green line). Here the master depicts the alternation of day and night on the Earth. The left part of „Earth” is darkened in contrast to the right part. The border of the above-mentioned contrast is

conventionally marked by us with a gray dotted line. (Fig. 2 A- Gray dotted line). The water surface can be seen in this area. We think that Leonardo emphasizes the existence of water on Earth as a necessary precondition for life.

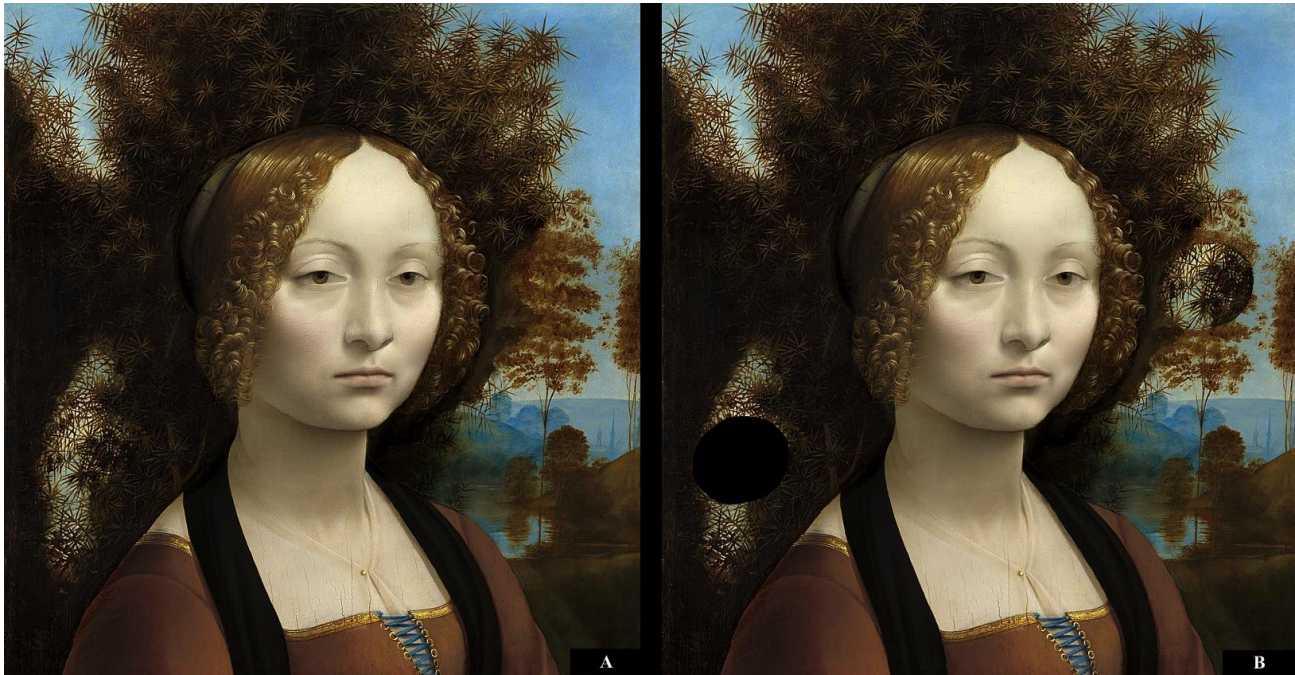


Figure 1 A. Ginevra de' Benci'' by Leonardo da Vinci

Figure 1B. Image obtained by moving the detail

The displaced detail represents the oval and is associated with the moon (Fig. 2 A- oval hinted in blue). Many lines and several dark dots can be seen on this oval. We compared the layout and forms of the dark spots on this oval to the relief of the moon, which is described on a modern photo. The spots on the oval drawn by Leonardo da Vinci coincide with the areas of the moon on the modern photo (Fig 2 A, B). The small upper left part of the oval is presented in a light color, while the rest lower right part is dark. In our opinion, Leonardo described through such a selection of colors the refraction and reflection properties of a ray of light on the moon.

Finally we can think that the painting describes the earth, the moon, the cosmos, and the stars.

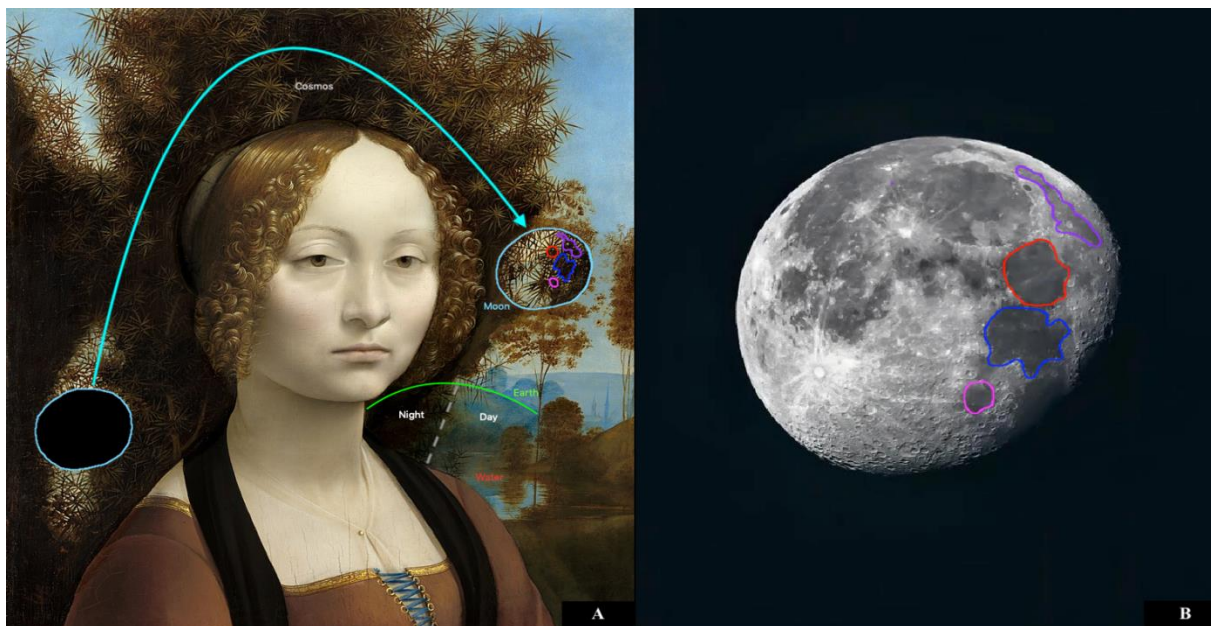


Figure 2 A. The blue arrow indicates the final location of the moving oval detail; half of the sphere associated with the Earth is bordered with the green curved line; gray dotted line show the conventional border between the day and night; The spots on the oval detail are marked with a colored markers

Figure 2 B. Modern photo of the moon- The relief of the moon is marked with a colored markers

#### 4. Discussion

Leonardo da Vinci made a number of important discoveries in his observations of the planets, which he used in painting. He was interested in transmitting a ray of light from one celestial body to another (Kemp 2006). Martin Kemp makes a comment, „the planets and the world were, for Leonardo, reflective balls of variegated earth and water, borrowing radiance from the marvelous sun” (Kemp 2006). As a result of his observations, he formed his own view of the refraction and reflection of a ray of light (Fig. 3 A). Leonardo described light and shadow sources in his notebooks. He applied the knowledge gained by observing the planets and light ray in painting, especially when drawing a human face (Such 2005). Leonardo da Vinci tried to avoid mathematical issues in astronomy. The visual aspect was important to him (Clark 1988). He explained astronomical reflection on the principle of optical pyramidal theory and noted that the shadow resembles a pyramid that increases with increasing distance and has no end (Such 2005). Leonardo studied not only what visible physically, but he also sought to unravel the invisible details of planetary motion. Through astronomical observations, Leonardo gained detailed knowledge of the refraction and reflection properties of a ray of light (Bitler 2011).

There are three drawings by Leonardo da Vinci that might attract the attention. These three drawings describe the surface of the moon (Fig. 3 B). Information about them is scarce in the astronomy literature. They appear in Leonardo’s notebooks, Codex Atlanticus 310 recto, and 674 verso. None of the drawings indicate the existence of lunar craters, on the basis of which some researchers have concluded that Leonardo had never seen the moon through a telescope (Reaves et al 1987).

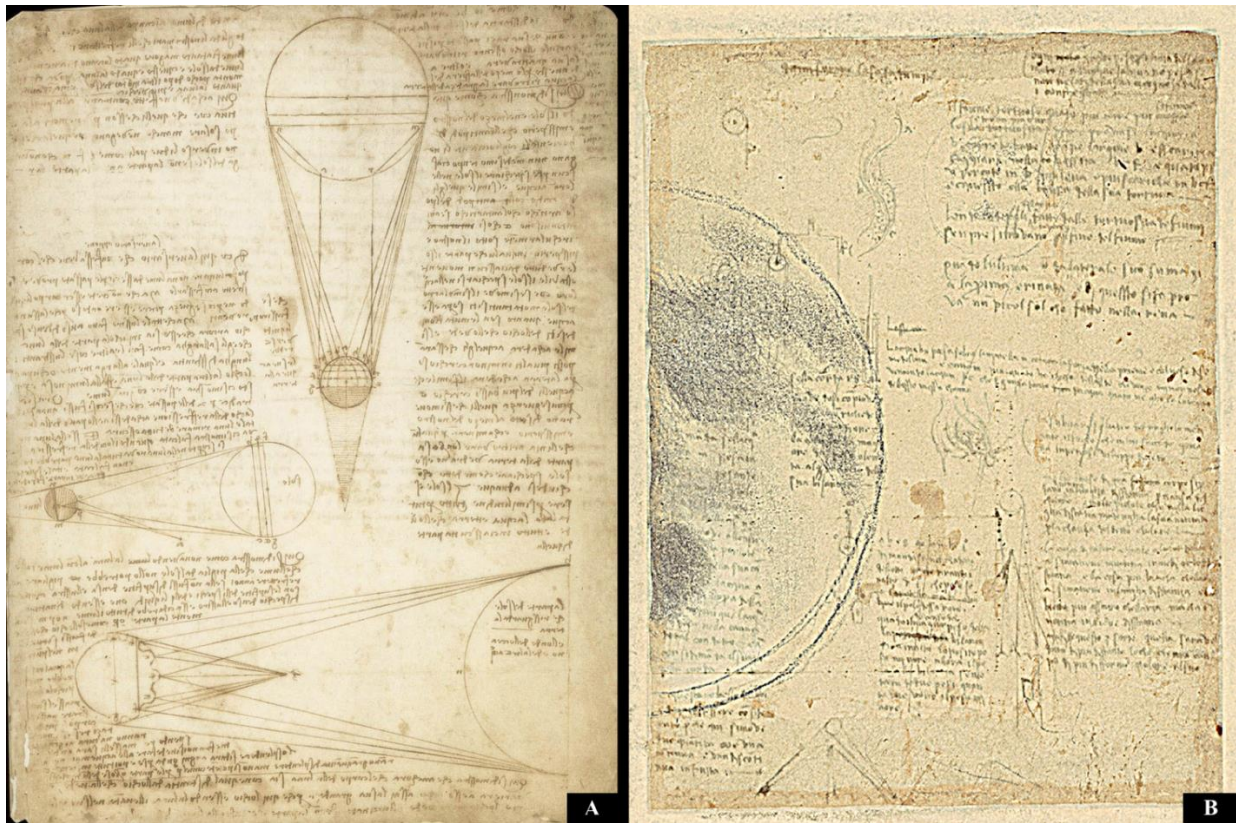


Figure 3 A. Studies on the “Ashen Glow of the moon” from Leonardo da Vinci’s scientific treatise „Codex Leicester”

Figure 3 B. Sketches of the moon, Codex Atlanticus, fol. 674 v.

There is no evidence that Leonardo created the telescope, although in his notebook is described the device with which he intended to observe the moon (Livio 2017).

However, Professor Andre Buys says in an interview that Leonardo has a sketch depicting a reflecting telescope (page 59(b) of the Leonardo’s Codex Atlanticus). He concluded that, „Leonardo had the knowledge and skills to make a telescope. He used a telescope to enlarge the image of the moon. The optical quality was, however poor and he did not discover the craters on the moon. Leonardo’s telescope anticipated of the later invention, including Newton’s and Herschel’s...” (Buys 2011).

On one page of the Codex Leicester, Leonardo writes that there is an atmosphere and oceans on the moon. He suggested that the moon is a good reflector of light since there is a large amount of water on it and the „ghostly glow”, he explained by the fact that a ray of sunlight is reflected from the earth and meets the moon. Leonardo was wrong in two things. First, there are no oceans on the moon. Second, the earth’s oceans are not a source of Earthshine. But, Leonardo da Vinci understood the basics well enough (Phillips 2005).

We think in some of Leonardo’s works, the content of the painting changes as the detail moves. We used this method to interpret Leonardo da Vinci’s other paintings as well (Keshelava 2020 a-g).

## 5. Conclusion

According to our interpretation, the dark background around of Ginevra’s head is a cosmos with numerous stars. Below the displaced detail is a quarter of the sphere that resembles the Earth’s surface and is associated with our planet. The displaced detail represents the oval and is associated with the moon. Finally we can think that the painting describes the earth, the moon, the cosmos, and the stars.

## Declarations:

No conflict of interest

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