

## Distorted Optics: The Convex Mirror as a Landscape of Play

FARNOOSH FARMER

The Cooper Union for the Advancement of Science and Art

The iconography of convex mirror and its allegorical significance had changed over time. This paper investigates the convex mirror as an architectural object and takes it under scrutiny by looking at its historical roots, as mirrors were initially curved and spherical rather than flat. Throughout the course of history convex mirror had various positions; the domestic object with an unholy notion, the sacred omnipresent of god and the neutral security tool. Here the theory of play is utilized to narrate this shift looking at the playful mirror revolving around key moments in history. The convex mirror refuses the linear law of optics, troubles the mind by its inherent ambiguity and constructs a landscape of play. The scope of convex mirror changes from domestic to urban, the role alternates from the detestable mirror to the space-shifter, and the eye of god expands towards the prosthetic human eye.

In 1792, inspired by the grotesque statues of monsters and the mirrored ballroom in *Villa Palagonia* (1715), John Soane used the convex mirror in designing his house-museum in Lincon's Inn Fields to induct the sense of transparency and penetration in between spaces. Mirrors produce a deceptive landscape in the realm of architecture by casting back an invisible entity to the spectator— manipulating visual and perceptual aspects of the space.

Depending on their type, mirrors separate the space from its image in different ways and interfere in the spatial experience. Unlike the flat mirror, the curved mirror generates distorted spaces. It is impossible to superimpose the actual space onto the falsified image produced by the curved mirror. Consequently, the spectators would not be able to verify the accuracy of their own point of view; the falsehood here transforms the space. The curved mirror, convex or concave, becomes the tool for making a playful and subjective secondary space within another space; therefore it performs as a tool for estrangement as if designing a non-existing, playful mental space.

The history of the mirror traces back to the ancient times and into the use of stone, iron and metal mirror artifacts in ancient cultures. As long as techniques of glass-making and mirror-making remained elusive, mirrors were produced nearly always rounded; either convex or concave. Following development of mirror production techniques, the basic curved mirror shifts to the plane mirror and simultaneously found its way into new philosophy of representation. Many

artists used the convex mirror as the reflective object of territoriality. Renaissance painter Van Eyck and baroque artist Velasquez incorporated the mirror in *Arnolfini Portrait* (1434) and *Les Meninas* (1656), to confirm their miniscule presence in a playful space projected on the two-dimensional canvas. In the *Arnolfini Portrait*, Van Eyck used the convex mirror at the vanishing point of the painting, not only to imply his signature, but also to activate specific aesthetic notions using symbolism. Matsis used the convex mirror in *The Money Changer and His Wife* (1514) to expand scopes of the space, invisible to the spectator, by addressing the exterior within the interior. During the 18th and 19th century, artists used the Black Mirror as a landscape-viewing device to distort the perception of the space for producing a re-configured picturesque representation.

But what spatial dimensions are being revealed, or what realities are being substituted through the convex mirror that makes the space playful? By looking at architectural spaces created in paintings, artworks and buildings, this paper investigates how the convex mirror re-structures space in order to construct a playful landscape. The mechanism of non-Euclidean geometry leads to the reproduction of the space in form of an image, which reveals the distorted properties of the space. Thus, in the experimentation of space from one step to another, a glance after a glance, the sense of playfulness embedded in architecture will emerge.

### INTRODUCTION

Mirror has always been the topic of investigation in different disciplines— literature, cinema, fine arts and architecture. Mirror has had various roles within different studies. It was the mystical object in *Snow White* fiction; the invisible, non-existing entity in Grucho Marx's *Duck Soup*; the object revealing the psychic premonitions of Dany Torrance in *The Shining*; and the physical enclosure to induce aesthetic endlessness and critical immensity in Archizoom's *No Stop City*. These are few examples among many of how mirror as an object is used in the realm of art and architecture.

But generating the playful distortion is the job of curved or spherical mirrors. There is an inherent surprise and tension present in the falsehood created by curved mirrors. The falsehood in the reflected image of the space, transforms the space itself followed by a sense of playfulness and curiosity. This playfulness has been interpreted relative to the historical and social context.

### GEOMETRIC OPTICS OF THE CURVED MIRRORS

Instead of being made from a piece of flat glass, spherical mirrors have the shape of a section of the surface of a hollow sphere. If the inside surface is reflective, it is called the concave mirror or the converging mirror. If the outside surface is reflective, it is called the convex mirror; and since the actual light rays diverge when striking this type of mirror, convex mirrors are also called diverging mirrors.<sup>1</sup> The difference between the two types is that the concave mirror can produce both real and virtual images, upright and inverted, while the convex mirror only creates an upright, reduced and virtual image. Real images form on the side of a mirror where the object is, and virtual images form on the opposite side.<sup>2</sup> As opposed to the plane mirror, the curved mirror plays with the rules of representation and spatial perception in a

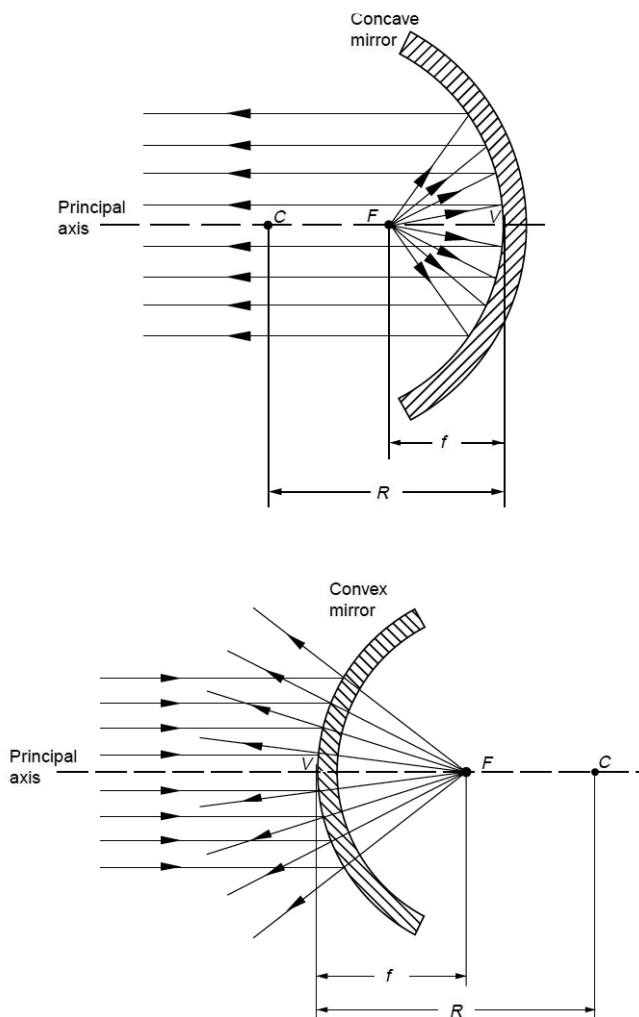


Figure 1: C: the center of the curvature, F: the focal point, V: the vertex of the mirror, R: radius of the curvature, f: focal length. [top] A light source at the focal point F of a concave mirror; [bottom] Light rays from a distant object reflect from a convex mirror and form the focal point F behind the mirror, Abdul Al-Azzawi, *Light and Optics: Principles and Practices*.

different manner. Among the curved mirrors, convex mirror is more relevant to architectural discourse. It combines, joins and distorts. The image produced by the convex mirror is as virtual as the projected drawing in architectural discipline. As a technique and conceptual framework, projection in architecture is being used to measure and depict our universe through a virtual body.

### HISTORICAL ROOTS: THE DETESTABLE MIRROR

The first convex mirrors were found in Egypt: roughly carved and backed with lead. The ancient Romans pioneered in making glass mirror by blowing glass bowls and coating the inside the concave surface with molten lead, then breaking them apart to form poor-quality convex mirrors. The mirror was never bigger than the small segment, possible to cut from the glass ball.

The convexity of mirrors was not so much dictated by taste as imposed by technical or financial imperatives. Compared to flat mirrors, producing convex and concave mirror was more economic and convenient. Consequently convex mirrors were the only mirrors available on the market. As long as the procedure for producing a flat, thin and clear glass remained elusive, the technical difficulties led to the producing of curved mirrors. The Roman technique was affordable and made the mirrors more accessible to everyone. The technique remained popular until the Middle Ages, when the use of the convex mirror was very common in Europe.<sup>3</sup>

But the convex mirror was condemned for a while. People owned it, but no one spoke of having it. There was a mistrust in the convex mirror and the less pleasing image produced by it. The distorted vision as to the visual errors used to have a demonic reputation. The convex mirror was called a “witch” as a source of errors and fallacies. As it can be observed from the late 15th century wood carving, the convex mirror is “the real ass of the devil”, as Jurgis Baltrušaitis the symbolist poet describes.

“The devil is the deceptive mirror par excellence, the speculum fallax; he is the father of lies who creates illusions, usurps resemblance, and cause man to turn away from his true model. The devil is sometimes allegorized in iconography through the image of a monkey playing with a mirror, since each one counterfeits the world, for the devil wants to rival his creator by producing simulacra.”

—Arnaud Maillet, *The Claude Glass*

While the woman in *Vanity and the Devil* combs her hair in front of the mirror, the devil is dancing on the other side of the room. Here the domestic use of convex mirror coincides with its diabolical image, as the convexity of the mirror reflects the devil’s backside rather than the seductive female figure.



Figure 2: Vanity and the Devil, Attributed to Albrecht Durer, woodcut illustration from Ritter vom Turn (Basel: Michael Furter, 1493)

In various Flemish paintings, convex mirror is present, as it was an imperative functional object for a family and domestic space. According to general difficulties of mirror manufacturing, the mirror maintained a bulging shape curvature until 17th century. Consequently it was none of a consequence that *Arnolfini's Portrait* (1434), *A Goldsmith in His Shop* (1449), *Saint Luke Paining the Maddona* (1470) and *The Moneylender and His Wife* (1514) came to existence earlier than *Las Meninas* (1656), the painting that started a thorough discourse on perspectival studies based on a piece of flat mirror.

### THE SPACESHIFTER

In the common reading ascribed to Van Eyck's painting, the convex mirror is placed in the center of the composition, as the eye that resembles the omnipresence of God. Historically, the convex mirror in this painting becomes the tool for questioning the principles of the classic Aristotlian and Thomistic aesthetics, which believed in the right proportion and size in representation.

Architecturally speaking, the mirror is depicting a space that cannot be seen by the spectator immediately. In a thesis project done at The Cooper Union (figure 3.), using architectural medium and through the use of plan, elevation and section, the painting is analytically dissected towards the emergence of an architectural narrative.

The study is looking at three major sectors in the painting: the actual room, the wall of the mirror and the virtual room behind that. In this reading, the architectural space is gendered according to the presence of the bride and the

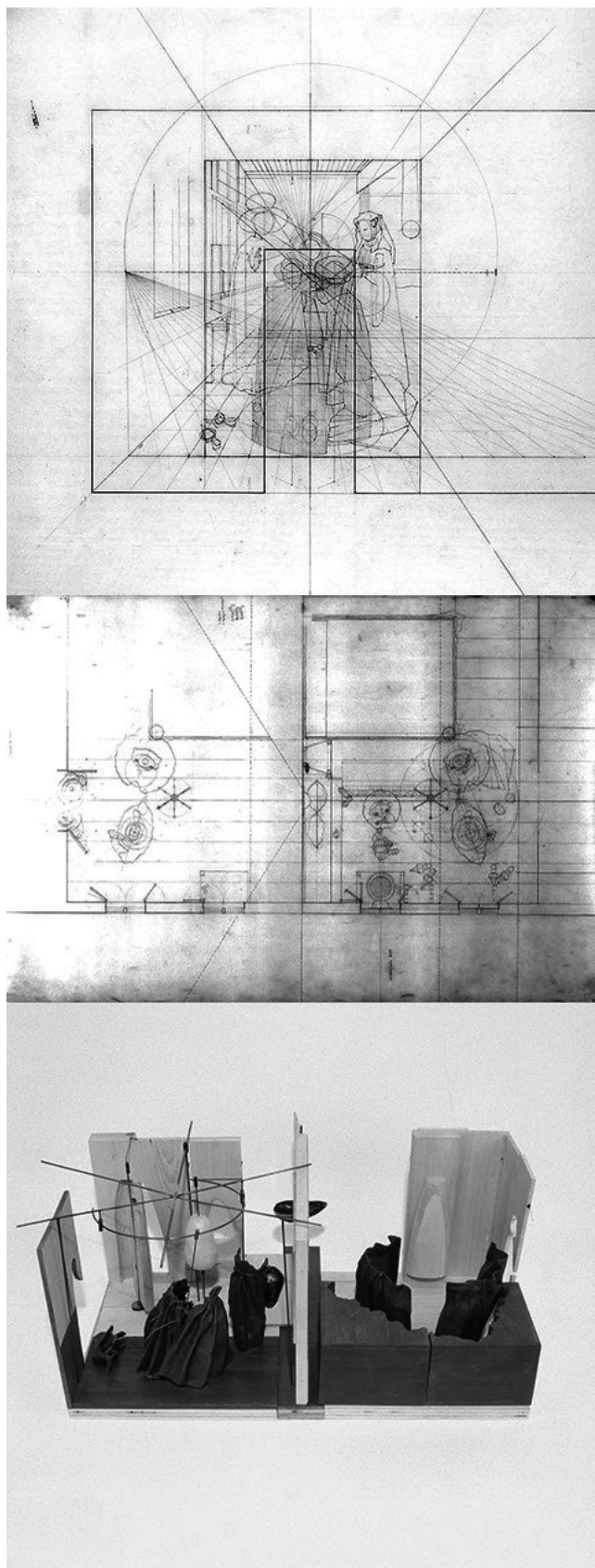


Figure 3: Spatial Edges, Analysis of Paintings. Natalie Fizer. Thesis, 1988-89. Faculty: Peter Eisenman, John Hejduk, Regi Weile. Courtesy of The Irwin S. Chanin School of Architecture Archive.



groom. The convex mirror here acts as a hinge. It “unites and separates back from front, actual from virtual and seen from illusory”.<sup>4</sup> As the virtual image in the convex mirror is formed on the focal point behind the mirror, the unseen/virtual room is embodied behind the mirror wall. This virtual room is the transitory space, where the pre-nuptial bath is taking place.

Later in the eighteenth and nineteenth-century, convex mirror became more of an ornamental and decorative item, rather than a domestic object. Claude Mirror or Black Mirror—a piece of convex tinted mirror—appeared in 18th century and was used by tourists, poets and mainly artists to contemplate, describe and paint the landscape. Giving the landscape a specific tint, the instrument was available in a wide range of tints, shapes and convexity to meet the user’s expectation, from white to silver, green and black. Black Mirror played with the politics of the mainstream picturesque and the sublime of the century. The disobedient convexity in the Black Mirror depicted a reductive image and distorted the idealism of picturesque by defining a center and a periphery for landscape.

The convexity plays a major role in relation to the perception of the space and perspectival challenges. An outward curvature of the convex mirror creates a reflection that places the viewer in the center and bonds a spatial hierarchy around him/her. In that sense, the effect of the convex mirror on the visual field is similar to the curvilinear perspective.

One of the earliest and best known examples of implementing convex mirror as an architectural tool is the breakfast room in John Soane’s house museum. John Soane used the convex mirror in designing his house-museum in Lincoln’s Inn Fields to induct the sense of transparency and penetration in between spaces.

“Another variant of Soane’s delight in seeing and his magician-like play with spatial illusions is the use of convex mirrors. In the dining room pairs of convex mirrors add a note of caprice to an otherwise rationally organized room.”

—Susan Gail Feinberg, *Sir John Soane’s “Museum”: An Analysis of the Architect’s HouseMuseum in Lincoln’s Inn Fields*

In the dining room pairs of convex mirrors figuratively duplicate the collected objects of the museum, as well as capturing the domestic space of the 18th century house. The mirrors, as the playful apparatus, miniaturize the antiques of the house-museum, select the frames for the spectator to view and depict the landscape of play.<sup>5</sup>

#### THE TRUTH TELLER

As mirrors became more commonplace, the convex mirror gradually lost its magical and symbolic exclusivity and began to reflect the daily life. As an example, in the movie *The Servant* (1963) the convex mirror becomes the cinematic tool to concentrate on the interrelations among the master, the servant, their fiancés and their battle over domesticity. Here, the convex mirror gives a picture of the hidden-illegal homosexuality, while performing as the architectural domestic object that observes people, entities and the events taking place within the space.

Historically convex mirror became a part of the domestic life, even before the plane mirror did. Today, the convex mirror aids vision in concealed driveways and exposes shoplifters in supermarkets. Ironically part of historical mission of the convex mirror was to reflect the domestic space and the omnipresence of god, but eventually it shifted toward being merely a functional tool.



Figure 4. *The Servant* (1963), Joseph Losey.

Now it appears that convex mirror is coming back, in a different scale and in a critical level. Artist and architects implement the playfulness of convex mirror as a tool for optical delusion. In Anish Kapoor's *Sky Mirror* (2006), the concave side of the massive size mirror reflects the sky, the convex side concentrates on the urban life of New York City. The massive convex mirror becomes a prosthetic eye for observing the urban context. Another recent example is Bjarke Ingels ORB which is a huge reflective spherical body, displayed in *The Burning Man 2018*; although the shiny globe had become controversial over social media so far—regarding the huge difference between the 3D rendered image and the actual dusty object. But then again it can be read as an object to extend the human visual field of understanding of the horizon, another prosthetic eye. In supermarkets. Ironically part of historical mission of the convex mirror was to reflect the domestic space and the omnipresence of god, but eventually it shifted toward being merely a functional tool.

Now it appears that convex mirror is coming back, in a different scale and in a critical level. Artist and architects implement the playfulness of convex mirror as a tool for optical delusion. In Anish Kapoor's *Sky Mirror* (2006), the concave side of the massive size mirror reflects the sky; the convex side concentrates on the urban life of New York City. The massive convex mirror becomes a prosthetic eye for observing the urban context. Another recent example is Bjarke Ingels ORB which is a huge reflective spherical body, displayed in *The Burning Man 2018*; although the shiny globe had become controversial over social media so far—regarding the huge difference between the 3D rendered image and the actual dusty object. But then again it can be read as an object to extend the human visual field of understanding of the horizon, another prosthetic eye.

As an object of optical experiment, the convex mirror essentially deconstructs “the dialectic of essence and appearance”.<sup>6</sup> It reveals specific spatial dimensions contextually and renders an invisible space within the actual space. Through the interplay between reflections and the spectator a new playful space emerges in the perception of the spectator.

As the object of spatial rhetoric, convex mirror generates new dimensions and configurations for the prevailing architectural space. The lack of accuracy in the image produced by the convex mirror, constructs the playful landscape. The distortion of the physical and mental space shifts the convex mirror from a simple piece of shiny glass towards an object of hallucination and optical experiment.

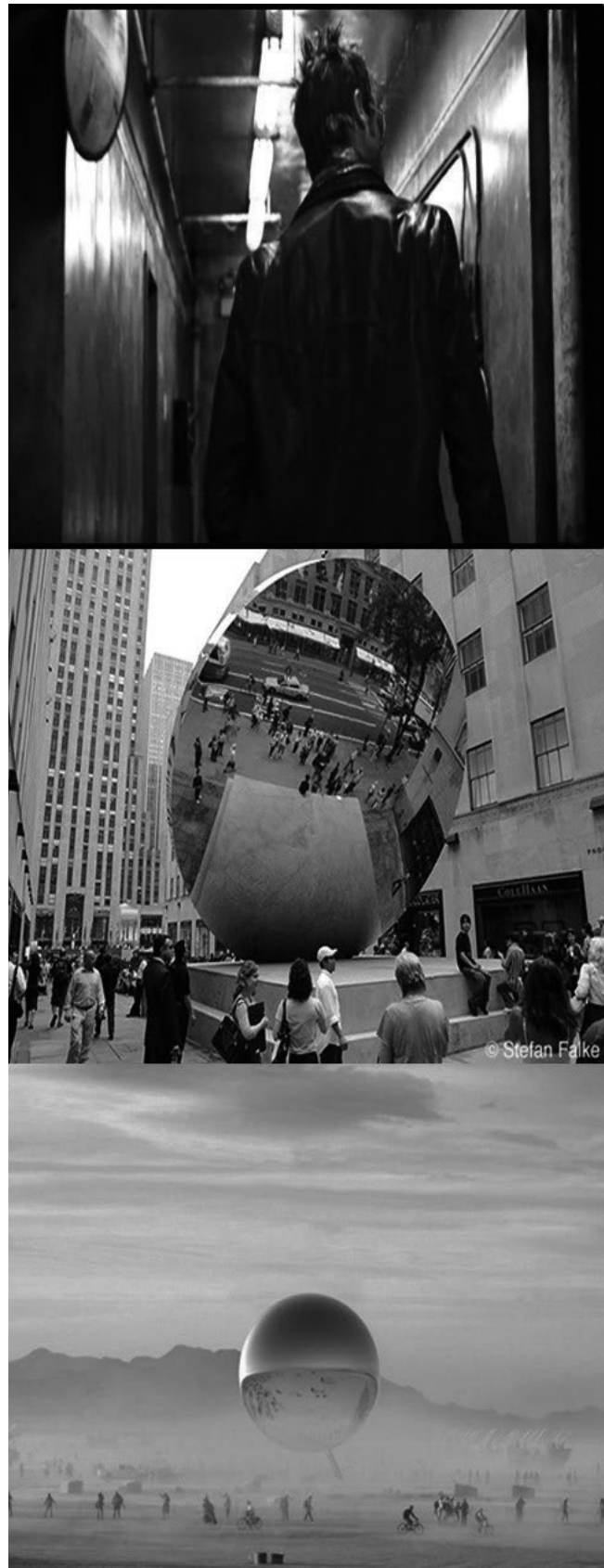


Figure 5: [Top to Bottom] *Fight Club* (1999), David Fincher; *Sky Mirror* (2006), Anish Kapoor; *The Playa* (2018), Bjarke Ingels and Jakob Lange.

**ENDNOTES**

1. Al-Azzawi, Abdul. *Light and Optics: Principles and Practices*. (Boca Raton: CRC Press; Taylor and Francis Group, 2007), 149--153.
2. Halliday, David, Robert Resnick, and Jearl Walker. *Fundamentals of Physics*. 9th. (John Wiley & Sons, 2011), 930.
3. Melchior-Bonnet, Sabine. *The Mirror; A History*. Translated by Katherine H. Jewett. (New York: Routledge, 2001), 12--17
4. Fizer, Natalie. *Spatial Edges, Analysis of Paintings*. (Courtesy of The Irwin S. Chanin School of Architecture Archive., 1988-89).
5. Furján, Helene. "The Specular Spectacle of the House of the Collector." *Assemblage* (The MIT Press), December 1997: 56-91.
6. Melchior-Bonnet, Sabine. *The Mirror; A History*. Translated by Katherine H. Jewett. (New York: Routledge, 2001), 3.