

How to Use Light and Shadow in Art Spaces?

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ABSTRACT

"Light and shadow" in display design plays a role in shaping exhibits, adjusting the color of the environment, and creating a space atmosphere. The use of different forms of light and shadow in combination with contrast, arrangement and combination of techniques, can produce a unique visual illusion and aesthetic, and play a role in strengthening the visual effect. Understanding and analyzing the form, classification and techniques of light and shadow art design in display space can make the unique beauty of light and shadow art to better serve the design of display space."Light and shadow" not only has the role of highlighting the shape of exhibits and strengthening visual aesthetics, but also is one of the ways to convey emotions by design. The design of light and shadow should not only stay above lighting and strengthening visual effects. The use of light and shadow art can better convey the content and psychological emotions that the exhibition space wants to express, create a very immersive environmental atmosphere and reflect the humanized design of the exhibition. Therefore, the emotional experience of light and shadow art in exhibition hall design is much more than the value of light itself. This paper analyze the form, classification and common expression techniques of light and shadow. Comprehensive discussion of the beauty of the context created by light and shadow and the combination with technical techniques, and the study of the visual and psychological emotional changes of people's production and research in this environment. The integrated use of light and shadow art in contemporary museum exhibitions and the most popular immersive exhibition art are analyzed with case studies. Theoretical knowledge will be applied to the actual practice of creation.

KEYWORDS

Light and shadow; Art space; Emotional experience

1 Introduction

1.1 The Nature and Properties of Light

Sunlight is the necessary condition and core power for the growth of all things. Under the action of sunlight, human beings and animals in nature can survive and develop. Because the sun is so important and great, so early in the beginning of human civilization, people began to use various forms to express this feeling, for example: Brittany Stonehenge, Salisbury Stonehenge, etc. These are the testimony of mankind for the sun to convey their feelings of worship. But light, by its very nature, cannot be touched or seen visually, but it is always around us, so it is easy to understand how magical and great it was for our ancestors. It seems that the study of light and shadow has become a state where we are at a loss for words. Light is the source of life and it is with us all the time. The light we are talking about is not a light source in the broad sense, but a light source that can illuminate us, mainly divided into two parts "natural light" and "artificial light", these two types of light have brightness, color and other characteristics. The reflection of light forms the image of the object, allowing us to identify the material, size and so on. In architecture, natural light and artificial light are relative. The solar spectrum is composed of seven colors: red, orange, yellow, green, blue, and purple, so natural light has a fixed light color. In the original state of nature, natural light has a close connection with outdoor scenery, reflecting the outdoor weather state, space scenery and other dynamic changes in time and angle, sunlight alternates throughout the year, and the immediate and immediate changes of sunrise and sunset produce rich light and shadow impressions in the architectural space, all of which have an important impact on the atmosphere of the space environment.

1.2 The History of Light Gathering

Throughout the thousands of years, human civilization has never ignored the existence of light and the role of shadow while moving forward. Light and shadow keep changing and reincarnating along with time in the long years, people feel the change and passage of time through the change of light and shadow, feel the change of life, feel the infinite vitality and the easily aging time. Le Corbusier once said that the history of architecture is the history of light. China's ancient buildings are mostly wooden structures, relative to the indoor space, the area of the doors and windows for light is much smaller, especially in winter, the indoor light is weak need to burn candles to get light. In China's ancient palaces, the winter in the window paste bright paper to achieve the purpose of maximum light, where the bright paper is a better quality of light-transmitting white paper, in the winter when it snows, through the bright paper diffuse reflection to achieve indoor

lighting effects. In the West, light is not only limited to the needs of lighting, for example, in religious architecture, the use of light is also poured into the designer's grasp of the human psyche, in a period of church buildings, a large number of the use of stained glass decoration, in the light through these splendid patterns, dazzling effect, so that people produce close to the psychological implication of heaven, so that faith to reach an unreachable height. This is the sublimation of human beings from the material level to the spiritual level, and also the use of a broader perspective of light.

The deep history of light and space can be traced back to the Renaissance period in Europe, when painting gradually began to change to a realistic style, which also involves depicting objects such as still life on a flat surface in three dimensions, and in order to show a sense of three-dimensionality, we must pay attention to the performance of light. From Caravaggio to Rembrandt to Monet Impressionism, especially the Impressionists left a lot of works about light and shadow, such as the famous Impressionist painter Monet, he has a series of works depicting straw bales, at different times and even different seasons, we see in his works his sensitivity to light, and he showed us a world where we can not see the shimmering light, the Impressionists brought the color of light to the extreme. The Impressionists brought the color of light to the extreme, observing the subtle changes of each painting, which can indulge people every time, and this is the power of light and shadow. Each of them had their own unique way of observing light and using it. While realist painting and other styles of painting are considered as a form of art that reproduces three-dimensional space on a two-dimensional plane, architectural space is the real physical space. It organically combines space and plane decoration, and creates the enclosure of the solid in various artistic compositions. Only for oil painting, which is a two-dimensional art form to depict three dimensions, light and shadow are the common way of artistic expression, and this is especially true in the artistic creation of oil painting. The painter will use light, brightness, color and contrast imaginatively according to the inherent characteristics of the work and conceptualize the intention and imagination, and break through the conceptualization and formatting of light and shadow in the modeling of light and shadow, reproduce the atmosphere and ambience in the viewer's brain through reasonable design of light and shadow, and evoke people's association with the mood expressed in the oil painting. In the creation process of oil painting the modelling art of light and shadow has a huge way of thinking and concept presentation. The present oil painting is greatly different from the former European Renaissance realistic oil painting, mainly because the modern oil painting can give the admirers a strong visual impact. It has been proved that light and shadow play a pivotal role in the expressive factors of modern oil painting. No matter what kind of painting method or technique, proper and clever handling of the strength and weakness of light and shadow, concise and clear communication of the psychological flavor of the delicate and subtle images in the picture, and the spatial depth of the expression of inner emotions and deep psychology, will produce more and more shocking artistic masterpieces. Light and shadow is a process of aesthetic experience for people's vision. Light and shadow interact with different spaces and materials, showing different composition and artistic effects and finally forming the following complete and integrated spatial state, giving people a perfect visual experience. Finally, the application of light and shadow is systematically analyzed on the level of science and art, providing a scientific basis for rational light and shadow design and laying the foundation for the sublimation of light and shadow in art and aesthetics.

2 Expression of Light and Shadow Art

Point light source is the most basic form of light source and the basic element of visual art performance in display space design, which plays the role of focusing visual highlights and strengthening visual center. Infinitely small volume is the characteristic of point light source, at the same time point light source is also varied, its layout is flexible and arbitrary. For example, in a dim environment, a few sporadic point light sources will produce a dreamy, quiet feeling. And dense neatly arranged points, will make people feel nervous, depressed feeling. Therefore, the clever use of point light sources can create a rich visual effect. "Line" is one of the important elements in visual art performance, according to the form of "line" can be divided into straight lines and curves. In the display space, by shaping the light source into a linear form, it can better express the directionality and directionality of the space form, and shape the shape and state of the space.

The shape and posture of the space can be shaped. The application of straight lines and curves in space will give people different psychological feelings. For example, the curved light source gives the space a dynamic, free rhythm. The horizontal linear light produces a broad, bold vibe, while the vertical linear light symbolizes uprightness and penetrating power. In the exhibition hall, the orderly towering columns with vertical to the ceiling linear light source, the entire atmosphere of the exhibition hall set off a more majestic, solemn.

The surface light source achieves the purpose of uniform distribution of brightness in a region by means of reflection and diffusion of finger light panels. The form of surface light source forms a more integral piece of light in the exhibition hall, and the application of surface light source can make the display space more integral in terms of visual effect. Fragmented exhibits form blocky exhibits under a unified light source. Light reflects the form, color and texture of everything and relates to people's perception of space. A full understanding of the role of light and shadow and the way it is composed helps designers design environments that are more comfortable for people and more in line with their

ideological needs. When the space is not defined by the traditional enclosure, light and shadow give the space a new limited form, a new state of life, and a new spatial context. It makes the space express its potential emotion through light and shadow.

Human wisdom allows us to create a variety of materials, and the combination of different materials and different light sources will bring a different artistic expression to the exhibition hall. For example, the light source hits the rough stone, highlighting the texture of the stone to reflect the heaviness of history. While the polished smooth stone surface reflects the delicate light, presenting an elegant temperament. Light combined with different materials can highlight the personality of the material and differences, bringing people exquisite, rugged, learning techniques, modern, vicissitudes and other different feelings. In historical museums, they often operate some materials with rough and non-glossy surfaces so that light can be reflected evenly and visitors can view the exhibition in a more softly lit environment. For example, in the Jinsha Site Museum in the early theory of pottery exhibition hall design, the exhibition wall will deliberately use rougher materials made of light and soft sand wall, stand also choose soft linen, through the sand wall, linen reflecting dim light can make the exhibits of shimmering light production research silent and historical pale sad effect, the formation of a unique charm of the ancient melancholy light environment. And after polishing and polishing, the smooth surface of the material will be under the action of light source hair research reflection, such as the use of metal, mirror, opaque glass and other materials in the exhibition hall, it will get the reflection of light and shadow, forming a gorgeous effect. For example, in the exhibition of Flower Dance Forest and Future Amusement Park, one of the exhibition halls is designed with such materials, and the reflection of mirrors from different angles creates a highly academic and colorful artistic atmosphere.

The contrast of light and shadow in the exhibition space is mainly divided into the contrast of warm and cold colors, the contrast of light and darkness, and the contrast of volume and size. Use the overall color of the environment with the local changes of light source to form the contrast of light and dark, size, warm and cold changes, to create an environmental atmosphere. Appropriate use of this means will bring strong artistic influence to the design. For example, in the Nanjing Massacre Memorial Hall, the contrast between light and dark, and size is used to create a solemn and mournful environmental atmosphere. The overall environment of the exhibition hall is dark, and the roof and ground are randomly scattered with bright lights, as if walking into the boundless night sky. The huge luminous fonts above the head are written in a striking manner with the number of victims 300000, which makes people immediately integrate into the mournful mood.

Natural lighting in buildings can be divided into lateral lighting, top lighting and mixed lighting. The Guggenheim Museum in New York, known for its unique spiral structure, is precisely because of its unique form, the interior of the exhibition hall. The lighting method is based on the structure of the building, forming a spiral inclined high side window lighting belt. The Louvre Abu Dhabi, through the use of openwork steel dome combined with natural light to create a unique and attractive architectural form. The dome covering the museum is made up of eight openwork layers that are superimposed to create a diffuse and reflective effect, as if a "rain of light" had fallen, reminiscent of the cascading palm trees in the oasis of the UAE. Each gallery is an independent gallery, and the exhibits are distributed among these galleries, both large and small. The effect of natural light on the exhibition halls is the result of the artistic spark that is created by the collision and fusion of three major lighting methods and the building's own shape. On the contrary, spotlights, track lights, downlights and spotlights are frequently used lighting equipment in showrooms. In the showroom design, the use of different lamps and lanterns will produce different effects from the color temperature, light color, brightness and other aspects, forming a different atmosphere. Such as the use of When using fluorescent lamps with color temperature greater than 5000K, the light color is blue-white, bringing people a cool feeling, while the color temperature in 3300-5000K fluorescent lamps will bring a dry, comfortable feeling, such as white fluorescent, while the color temperature is less than 3300K, the light color presents Warm white, making people feel heavy, calm, such as white woven light. The angle of artificial lighting includes top light, bottom light, smooth light, side light, and fill light. Top light is the light source from the top down to hit the light. It will cast a large shadow on the exhibits and is not conducive to the shape of the exhibits. Bottom light is the light source from bottom to top, as a kind of supplementary light source, it can better highlight the exhibit shape and enhance the three-dimensional sense. Smooth light is the light source from the front of the exhibit, the exhibit in the smooth light, the shape can be normal to show, projection is also relatively small, but does not play a role in shaping the image. Side light effect exhibits three-dimensional image, but the exhibit light and dark junction is too strong, lack of soft sense. Therefore, when arranging the lighting design of the exhibition hall, a variety of angles should be used in combination to achieve the effect of better display of exhibits and reflect the perfect shape of exhibits.

3 Light and Shadow in Space

In the architectural space which is closely connected with people, the degree of people's demand for light and shadow is also released from the most basic function of meeting lighting and so on. It pays more attention to the level of space

and the beauty of space, creating a unified effect including the color, pattern and shape of the space as a whole, creating a more imaginative and creative art of light and shadow.

Leonardo da Vinci first proposed the relationship between light and shadow in the Renaissance: "What is light and shadow - shadow is the lack of light, and shadow can only be created when dense objects block the way of light. The shadow is darkness, and the bright light is light; one wants to hide everything, the other wants to show everything; they always follow the object, always complement each other. The shadow is stronger than the light, because it hinders the light and can accomplish depriving the object of its light, while the light cannot drive the shadow from the object completely." Of shadows, he also argues, "Shadows are both accessory and projected." Shadow is the level of light and darkness produced by an object under the light, and is an important factor in constituting the visual three-dimensionality of an object. Shadow is the product of light and object together, and shadow reproduces all objects in nature in a negative way. There are also descriptions of shadows in our idioms, and "immediate shadow" is one of the ancient words to describe objects and the image of light and shadow, showing the state of the projected shadow under the change of light, with the light born with the shape of the object and the form of light determines the shape of the shadow. The shadows projected onto the surface of the medium can be divided into "light and shadow" and "object shadow" according to the brightness of the architectural space where they are located, the way they are expressed and the size of the space. The "object shadow" is the shadow of the object or the shadow of the building components, which is the shadow in our sense in the bright space with sufficient light, and the "light shadow" is the light falling shadow in the dark dominated space, which appears in a small area. The "light and shadow" can take a clear shape on the gray walls and floors. The floor of the Finnish pavilion at the Shanghai World Expo used dandelion patterns on the ground to guide the movement of the entire space, and it is being widely accepted and adopted in other spaces as well. The shadows and shadows are dark and light.

Light and shadow is a relatively dynamic process. By incorporating the concept of "light and shadow" design into the concept of time, taking into account the aesthetic trends and cultural changes of different times and even different eras, there is a relatively complete aesthetic history of light and shadow in both Eastern and Western architecture, which demonstrates the inherent cultural essence of the aesthetics of light and shadow in both East and West. In the long history of architecture, "catching light and shadows", we can feel the development and changes of architecture with the passage of time. The design of light and shadow in the architecture of each era and historical period is different and related, and from the vertical perspective of history, it must have changed dramatically with the advancement of construction technology and structural design, based on the inheritance of later generations. From the round skylight in ancient Roman architecture to the rose-colored windows in Gothic architecture. The space of the building has changed from closed to open, from a single light source to the expression of the internal form of the building by light and shadow. And the changes of light and shadow in architectural shape and space have different connotations in different times, but at the same time, light and shadow are static in a long time. We can only call a space a space if it is defined, and only if it is defined does it have meaning. The longest contact we have with this kind of limitation is the physical enclosure, the house we put in every day, and light as a new material of space limitation is also beginning to be used in the more cutting-edge design. Contrast is the basis of definition, the difference between light and dark makes people naturally can be identified by the naked eye light and dark easily contrasted, in these strong contrast objects are located in the inherent space also with the shadow and light in the space is clearly outlined. For example, it is common for people to rest in the shade of a large tree at noon outside, which is the shadow of the tree, invisibly dividing a virtual shaded space for people; the same reasoning is used to delineate the light and darkness in the atrium of a large public building, where natural light shines directly and strongly in the interior through the transparent canopy and dome, contrasting with other dark objects in the interior shadow. The contrast is striking. A public, open place of rest and interaction is defined. Under this "limitation", the division and outline of space by light is obviously different from other methods of dividing space by entities, because light itself cannot be seen or touched, it has a clear edge and specific form that cannot be defined. The form of the light gap has the natural property of a line, and the light it absorbs is the most reductive way to define space. Therefore, using lines to emphasize the edges of space is the most original way to define space.

Light is essential to every impressive piece of architecture. Of course there is light and there is shadow, and the inseparable feeling between them gives the architecture the concept of time and life, and along with the development of architectural history makes it a monument. It creates the structural, textural, atmospheric and emotional beauty of architecture. The beauty of atmosphere and emotion even sustains the harmony between architecture and people. The richness of light and shadow in the space The richness and color of light and shadow in space makes space more interesting. Therefore, light and shadow have been used as an architectural material rather than just a decorative It has a role in setting the mood of the architectural space. It has the role of setting the atmosphere in the architectural space, reflecting the level and connotation of the architectural space. The intensity of light and shadow affects the visual perception of objects. The change of light direction causes the distribution of light and shadow. of light and shadow, people's perception of the object will also change, so that it can be shaped into a colorful This can create a variety of images.

4 Case Study of Light and Shadow

"Let the light do the designing" is a famous quote by the famous architect I.M. Pei. The light and shadow in space is an indispensable formal element and an ancient subject in artistic expression. Many outstanding artists and famous architects can be called "masters of light", and their ability comes from their respect for light and shadow and their unique perception. Light and space are seen as air and life, not just as a means to eliminate darkness. It is light and shadow that constantly undergoes subtle changes in architectural space, and symbiosis and collision exist simultaneously in the space. The buildings designed by these architectural giants can subconsciously trigger people's heartfelt love for natural light and shadow, feel the poetic architectural space with the fusion of light and shadow, and feel the architecture they have created to create both aesthetic and healthy.

4.1 Matsumoto Civic Hall, Japan

In the design of the Matsumoto Civic Hall, the exterior wall of the building is made of GRC panels, a type of fiberglass material, with many different shapes of glass windows, so that the light can shine from the small-scale windows and form small columns of light fall on the interior walls, overlapping and staggering, creating architectural spaces of changing light and shadow. Toyo Ito has won the Pritzker Prize for Architecture, and in his work we can see the powerful practice of letting light do the designing.

4.2 Metropolitan Chapel

In the design of Mexican architect Ricardo Ligoretta In his design of the Metropolitan Chapel in the capital of Nicaragua, the designer has set up a series of small circular holes in the dome where the altar is located, and the light enters through these holes to create a meditative space like a starry sky at night, creating the feeling of an endless space. Here the designer used the characteristics of point light to simulate the trace effect emitted by the stars. Compared with the eternal linear light expressed in the Pantheon, the point light is meant to express a kind of absolute and transient light. Such point light is a kind of flexible light with imaginative meaning, allowing infinite space for fantasy.

4.3 German Museum of Decorative Arts

In the Museum of Decorative Arts in Germany designed by Richard Meyer The entire wall enclosure and even the roof of the entire space are supported by transparent glass attached to the window frame, so that the sunlight shines through the enclosure into every corner of the space, and the white frame through which the sunlight shines leaves a staggered dappled shadow on the interior wall, directly enriching the composition of the entire space. The composition of the whole space is enriched by the atmosphere of the space. These shadows change and rhythm with the time and the sun rising and setting in the east and west.

4.4 Jewish Museum Berlin

Narrow slits, slender windows, these channels of light, usually related to the structure of the building, to the meaning that the building wants to express, people are always accustomed to the traditional way of lighting, those square randomly placed on the walls of the light windows make the architectural space lifeless and dynamic. While people are still following the rules, there are always designers who use to break these seemingly unbreakable truths, these traditional patterns that are ingrained in people's minds, to design and create different spaces. Architect Daniel Libeskind is one of these designers. His design of the Berlin Jewish Museum in Berlin is one of the most exciting in the history of museum design. In the overall architecture of the museum, the use of linear elements that slope and intersperse in a seemingly conflicting way is also an interpretation of the entire Jewish history of the time, creating a strong visual impact, and some of these linear lines are Libeskind found inspiration in the map, where he connected the Jewish settlements with lines, converting the resulting patterns and line segments into window shapes, addressing the traditional sense of incongruity between windows and architecture. Through this method of transformation, Libeskind connects some writers, composers, painters and poets from Jewish history in an irrational display of windows that filter light into the interior spaces of the building, creating a very wonderful effect of spatial light and shadow. It gives a strength to survive in the cracks, and through the light makes the building's life force show more tenacious.

4.5 Church of Light

Tadao Ando is one of the most influential architects in Japan and even in the world today, and it must be said that he is a very talented architect, even though he has never been professionally trained, he has built a piece of amazing architecture with his talent and hard work. Tadao Ando's works are rich in cultural connotation, and each of them leaves infinite room for imagination and reminiscence. The famous American contemporary architect Peter Eisenman has praised his works: "Calm, reasonable, poetic and solemn, it is a shock to the whole body. It is as if there is something else, a

sense of fear and awe that floats in the air." The work he creates is very personal, with the meaning of Eastern culture, that is, the materials used are similar to those of Western architects, but he is very good at using fair-faced concrete and light and shadow to expand the space of "Tao" in his mind with the concept of Japanese dry landscapes. Even in this church, we can strongly feel the taste of the East that he shows. On the other hand, the experience of light space in traditional Japanese architecture and the perception of light space in Western classical and modern architecture provoke people to explore a more individual light space. Inheriting the oriental culture's respect for nature and integration with nature, but without being confined to it. Ando has his own unique view and expression of nature. In a gentle and "confrontational" way, he uses the elements of nature in an abstract way as his own expression of architecture.

He uses the elements of nature in an abstract way as an element of his own architectural expression. He is good at leaving white space in his architecture, which gives people more room for imagination and light and shadow. His works are infinitely blended with nature and return to nature. In the shaping of architectural entities, Tadao pursues the artistic sculpting of entities. Light and shadow play an important role in his entire architecture, and can dominate the feeling of architectural space. The materials used with his oriental perspective become a powerful tool for his architectural expression, giving a unique elegant and serene oriental quality. Without the towering spires of other European churches, the Church of Light embodies the beauty of silence allows people to find a place for their hearts and spirits, giving it a religious meaning on a spiritual level. The arrangement of the building, especially the space of the chapel, is determined by the orientation and angle of the sun. The cross is cut into the concrete wall on the front, and the sun shines through to create a beautiful light cross effect. In order to emphasize the visual impact of the light cross, the windows were reduced in other locations of the chapel, making the space The light shining from the light cross into the chapel The light entering the church from the light cross also changes with the angle of the sun. The dynamics of light and shadow contrast with the dynamics of the church, allowing the passage of time. The arrangement of the building is based on the original location and the orientation of the sun. The arrangement of the building is determined by the original location and the orientation of the sun. The building is enclosed to create a dark space, so that people who enter the building feel instantly isolated from the outside world. The concrete wall of the front of the chapel has a cross-shaped cutout, presenting a light The cross-shaped cutout in the concrete wall of the front of the chapel presents the light of the crucifix. The interior of the building has as few openings as possible and is limited to the expression of natural light. The spiritual expression of light in the plain spatial structure presents an unusual mystery.

5 Conclusion

To sum up, the art of light and shadow is a comprehensive science, which requires not only visual aesthetics, but also attention to the psychological state of human beings, as well as keeping pace with the academic technology. Using the power of science and technology to mobilize the audience's visual, auditory, tactile and other sensory stimulation, in order to achieve the exhibition effect. The visual feast brought by light and shadow art as well as the psychological and emotional experience are the manifestation of the expressive power of display design space. However, while pursuing the effect of light and shadow, we must grasp the design concept of "green design, energy saving and environmental protection" proposed by the state, and combine natural lighting and artificial lighting into the exhibition hall design.

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