

What is the function of color for architecture to establish connection with Geography and Humanities?

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Keywords: component; Color, harmony, contrast Introduction

Abstract: The research is about how the various characteristics of color affect the environment and people's emotions. The study from Steelcase company and the case from the renovation of Post-World War II Italy Building can serve as our theoretical support. When we chose the color of the house, we not only referred to Marion Boddy-Evans's mother color theory but also paid tribute to classic Mondrian color scheme. For human, color will influence their psychology and show on daily behavior. Also, our study tries to create a relaxed living space through analyzing the color from three variables. To improve the happiness of building, external outlook becomes the key part that we borrow some ideas from the study of Piet Cornelies Mondrian's artwork. With more Lego elements adding into building, we hope to bring more innocence of childhood into adult's life to release people's mental pressure. From the perspective of a lodger, the pellucidity of color could provide an effective way to make the surrounding environment and the building better integrated. As a result, we realized how vibrant color may amplify the brightness under natural circumstances and less resemble the color of real architecture. Color could transmit information like language, and they should be organized humanely and scientifically. In fact, color in architecture has become a permanent question that is worth investigating continuously to achieve color harmony.

1. Introduction

As an essential part of architectural design, color is often used to express specific architectural effects. From different hues to lightness, as well as the harmony between colors, the colors in buildings can be used to strengthen the architectural style and mobilize people's emotions. When browsing the academic papers of related research directions, the relevant papers have carried out specific case studies on how light and color affect the space in the building. (how color and light change our perception of space). In this research, based on the architectural model design completed by the team members, we will explore the color matching to the surrounding environment, and more importantly, how the occupants will be affected by the color.

2. Mechanism

It is necessary for architecture to take into account the colors that the human eye can directly accept, for example, the human eye is too fragile to look directly at the sun to receive the light and color that the sun gives. (From The Family of Sunlight-Related Eye Diseases) This is also recognized by Goethe and in some experts in environmental diagnostics perception. (From Color in Architecture and the writings of Pseudo---Dionysius, The Areopagite.) In fact, the connection between indoor and outdoor -- the window, a part of countless knowledge, he can subtly control people's living mood changes. The human eye is so sensitive to color, just to take green for example, that it can distinguish more than 2,000 different shades of green. (From <https://www.aao.org/eye-health/tips-prevention/how-humans-see-in-color>) When people live in a building, the color they see through the window also affects

people's evaluation of a building. Also, the relationship between humans and plants is known as Biophilia. Human beings do not pay much attention to their life, but they generally hope that the area they live in is surrounded by other creatures. As usual, people are likely to grow more living plants rather than placing some artificial plants. (From Creating Urban health through the promotion of green walls) For instance, a study found that at Steelcase company 42% of office employees brought plants to their offices. Another study found that plants at workplace reduce anxiety, anger and fatigue by 37%, 44% and 38% respectively, and increase creativity and productivity by +15% (From Green Plants for Green Buildings, 2019). For outdoor, an increasing number of factors should be considered into the color decision. When a brand-new building appears in a street, no doubt, it has to be a good match for the surrounding buildings. Also, for pedestrian, the color and shape of constructions should not include any aggressiveness to eyes and achieve a balance to other objects, such as greenbelt and local ancient buildings.

However, the color of the building needs to be considered not only for humans but also for the environment. The designer needs to have an in-depth understanding of the surrounding light conditions and types to determine the saturation of the building color and the texture of the building materials. In Pietro Zennaro, Katia Gasparini, and Alessandro Premier's scientific assessment and renovation of public housing buildings in Post-World War II Italy, they advocated interventions that focused on building surfaces by adjusting colors and surface totems. (From Color and light in the requalification, regeneration and valorization of residential building) To make them look more integrated, they are divided into two color modes: day and night. Considering the integrity, we decide to use add five huge glass walls as a nice viewing-window that prevents people from feeling that they are isolated in nature. In shape, to distinguish from formal office buildings, we avoid using too much regular geometries in design. More circular elements are adding into outlook to make the building have a sense of belonging and mildness. About the integration, in color, the mother color could provide an effective way to achieve it. Originally, By Marion Boddy-Evans, the mother color is a color people used in painting to reflect the overall theme of the painting. In architecture, mother color will help it to unify the building by bringing the colors into harmony with one another and making them portion of the same family of colors. The primary color can be used as the dominant color in a painting, or it can be used less prominently. (<https://www.liveabout.com/definition-of-mother-color-2577647>) There is a danger of using primary colors too strongly, which are too similar in tone and do not give enough contrast to the exterior of the building, making the building boring. Mondrian's ideas on color are amazing and his masterpiece also profoundly influenced our choice of main architecture color. His mood changed a lot during world War II, and he created his own form of work, and his work became less happy and replaced by black lines that are interspersed across the canvas horizontally and longitudinally. (From Cultural production in peripheral urban spaces: lessons from Barriera, Turin, Italy) But Mondrian's classic color scheme is awkward in the building, with over-saturation and over-brightness making the building look like a work of art rather than something that was built to be lived in. For example, the bright red gives people a sense of attack. In this environment, people might get negative moods, such as anxiety and depressions. To address the problems, it is useful for people to do extra work in tints, tones, and shades. Based on Mondrian's three primary colors, the exterior and interior of the building become brighter or darker by adding white, gray and black. This change weakens the visual impact brought by the original RGB color and makes it easier to bring people's emotions into the environment of functional rooms inside the building. (From <https://color-wheel-artist.com/hue/>, <https://www.liveabout.com/tints-tones-and-shades-3862946>)

The subjective nature of human color recognition was explored broadly by Josef Albers, a well-known cutting edge American painter, scholar, and teacher amid the 20th century. His most popular arrangement, Respect to the Square, may be a collection of works of art each counting three or four settled squares of diverse colors or color power. (From Color perception: Experiments In the Sciences and The Arts <https://caltechletters.org/science/color-perception>) These creative tests outline that how a color is seen by people is based more on the encompassing environment than the color itself. People as a creature species have a one-of-a-kind capacity to render color within the setting of the encompassing environment, counting miniature changes in power and unobtrusive gradients.

Within the chance to design an architecture, it gives the opportunities for us to discovering the casualty of the color of the architecture and the environment, further relates to the color psychology as deeper research. Objectively, the color is a stimulation and symbolism for human, but subjectivity, the color gives a natural reflection of human further become an action. the color psychology starts with vision influences, developing into first thought impression than turns into emotion, ideology, further symbolize. The core of color psychology is that the physiology affection and mental affection on humans, especially the relation of object's color and the emotion which been developed. the color mostly has three variables: hue, lightness and purity. It is interesting to point out that one pure simple color could create different psychological affection under different illuminants with different angles. While the illuminant resource gives a luminous beam, the color temperature of the beam may mix with the color, which may cause opposite to the emotion that the intrinsic color causes to the audiences.

The research from Cuykendall, S. B., & Hoffman in his literal "From color to emotion: Ideas and explorations" suggests that the kinship between colors and emotions is laid down by at least three different sources namely, evolution, culture, and personal experience. Happiness, hardness; warmth, cold; depression, and carefreeness are all the direct emotions that humans can receive from color. Example such as warm color, especially red, red could create powerful visual impact, easily arouses an emotional wave of a person, has possibility raises a person's blood pressure and stimulate the brain. (From Connecting with Color. (n.d.). <https://www.lyquix.com/blog/connecting-with-color>) Moreover, the purity and pellucidity of color could also give different affection, from the personal research experience, the thick, pure gloomy color would express a solemn atmosphere for the architecture. Also, some studies indicate that brightness, saturation, and hue of colors may have an impact on arousal, dominance, and pleasure. (From Valdez, P., & Mehrabian, A. (1994). Effects of color on emotions. *Journal of experimental psychology: General*, 123(4), 394). However, within our group design, the purpose of our architecture was to create a relax enjoyable living area for a man to luxuriating in the fascinating landscape of Lysefjord which locates in Norway. we believe the idea: color is a tangible recognition, and as any tactile discernment, it has impacts that are typical, affiliated, synesthetic, and enthusiastic. (From Color in Architecture Is it just an aesthetic value or a true human need? by Ahmed Hosney Radwan) with its affection, our group firmly believe that the color could be the foundation of the design objectives.

For achieving the goal, of comfortable architecture, the external outlook of architecture became significant as it is the determining factor of the first impression of the audience about the architecture. Remind the childhood memory is the breakthrough point during the design. The product of the panel discussion was that home, is the most comfortable place for people to satisfying themselves. As the architecture design with a pleasant tone, it may remind the home area from childhood that further could relax the lodger as they could refresh the happiness they had within the childhood. The Lego became the inspiration as the representer of innocence of childhood, and the strong, pure color of the Lego intensified its vitality to the viewer, further been used in the appearance of the architecture. The appearance is designed to reflect the undulate of precipice, the sophisticated decorate and color could only increase its solemnness and unsuitable for the environment. So, the choose of color become seriously important. Our anticipated for the color is that it has similarity with the Lego. Fortunately, with the study of Piet Cornelies Mondrian's artwork, we found some relation between the goal that we are achieving for and the color that Mondrian choose to use within his later work. Within the simplistic style of drawing, we detect the logic layout which further express the beauty of phenomenal order and equilibrium. After that, we define out project's style base on the word "simplistic" which kept the core of Mondrian style, but with large area of pure and high lightness color, we trying to create balance for the solemn, magnificently cliff landscape and the small area architecture.

Firstly, the appearance color was designed to use bright, pure three -primary colors which may create pleasurable tense. However, from the perspective of a lodger, high purity of color is variable under unmanageable sunlight or another illuminant resource. But eventually, we found out that an increase in the pellucidity of the color could offset the defect which could further turn into a feature of the architecture. with few times experiences, it was obvious to understand the benefit for increase the pellucidity, the landscape becomes easier to admire within the architecture, connection that has been

built between the environment and the lodger who may integrate into the environment. The theory from the learning experience was that the color could be effective in a variety of ways, however, consider the local culture and geographic environment, property use of different pellucidity and purity of color could build a connection between the lodger and the local environment

3. Results

When actual architectural designers choose colors for buildings, they need to think carefully and make scientific measurements. Sibel Ertez Ural once studied a set of mature processes for the color selection of buildings. The designer of this process considers very comprehensively, and the sequence is very efficient, which greatly assists the actual operation and results. (from multiple choice of color in architecture by Sibel Ertez Ural) She divided the project into seven major blocks, from conception to measurement and evaluation to application and modification. Each step gives a mature oper

4. Conclusion

Through viewing the masterpieces of the great architects and artists and combined with the original architecture and color theory according to several pioneers, we illustrated the function of color and its specific application so as to generate the effects in the above statements. To start with, colors, which can be perceived variously among humans' eyes, can form different combinations to transmit the messages. According to the division of color in exterior and interior, as well as the primary color and subordinate color, colors are designed to be more logical and organized. From the analysis of color and its environmental function, the trait of alleviating anxiety and bringing vitality is demonstrated. Besides, colors are also used to represent human feelings like happiness, excitement, and sorrow. Furthermore, with respect to the saturation and pellucid of color, we have realized how vibrant color may amplify the brightness under natural circumstances and less resemble the color of real architecture. Actually, the balance of color use is a permanent question in the field of architecture, as the subtle variation may result in greater harmony in the projects. Thus, more solutions such as decreasing the pellucid or adding more transparency to the color might be adopted.

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