



# The Influence of the Mogao Cave Paintings on the Greek Revival Architectural Design Style

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## ABSTRACT

This research aims at analyzing the effects that the Murals of Mogao Caves had on the concept of the Greek Revival style of architecture- a fusion of the eastern and the western art. In its attempts to provide an answer to the question, the study concentrates on the evaluation of the structural, aesthetic, and thematic properties of the Mogao murals that might have influenced the formation of the Greek Revival architectural style in the 18th and 19th centuries. Employing methods derived from the various disciplines, the research started with the identification of the crucial examples of the murals in Mogao Cave, for examples, the “Flying Sky” and “Xuanzang Westbound,” and the Greek Revival building such as the British Museum, and the Constantinople Cultural Centre. Using Panasonic 3D scanner E2022, detailed images of the murals are taken; the structural analysis is performed by SolidWorks 2006. To complement this analysis, statistical comparisons are made using the Statistical Package for the Social Sciences (SPSS ver. 17). 0 for geometrical perspective, colour combination and line placement. Overall, the analysis shows a strong resemblance between the element of construction, coloration, and distinctive line in the Mogao murals and the Greek Revival styles. More particularly, the research establishes that while adopting the premise of symmetry, geometric figures and integrating colours in balance as attributes of the Greek revival architecture, the architecture reflects visual and structural dependency on the Mogao Cave murals. This research adds another piece to the puzzle of studying cultural exchanges along the Silk Road and can be considered as offering new insights into the Chinese art that played a major role in shaping European architecture. The research findings may prove useful to scholars and practitioners concerned with cross-cultural impact on art and building design.

**Keywords:** Mogao Grottoes, Mural, Greek Revival Architecture, Design Style, Impact.

## INTRODUCTION

In the course of more than 2,000 years of development, the murals of Dunhuang Mogao Grottoes have been continuously improved by painters of the Tang and Yuan dynasties, including Buddhist kilns, Zen kilns, Nirvana kilns, and monk kilns. Although the murals in the Mogao Grottoes have been baptized over the years (Abrams, 2021), they are still very clear and complete, and the sculptures and buildings can still be clearly displayed in front of the world. In the Sui and Tang Dynasties, the number of Mogao Grottoes murals increased, and the color paintings were decorated with a variety of colors, which became valuable materials for the current architectural design research (Bolong et al., 2022), and these Dunhuang Mogao Grottoes architectural paintings were not only preserved very completely, the picture was clear, but also the content was wonderful and rich, which was an important essence of modern architectural painting research. Between 786 and 848, the Tubo regime made

Dunhuang its territory and had economic, cultural, political, and military influences. As a result, the Mogao Cave paintings of this period increased, enriched in content and style. Among them, the wooden decorative paintings of Buddha kilns and Zen kilns have architectural research significance (Duan et al., 2021), and the content and structural comparison in the murals can show the characteristics of different architectural paintings. At the same time, the proportions of mural composition, pattern patterns, color distribution, etc., have unique aesthetic value and also enrich the domestic architectural painting system (Duan et al., 2021).

## ANALYSIS OF ARCHITECTURAL ELEMENTS IN MOGAO CAVE MURALS

### Elaboration of Relevant Research Methods

This paper takes the castle architecture of the Greece Renaissance in the 17~18th century, the murals of "Flying Sky" and "Xuanzang Westbound" in the Mogao Grottoes of the Tang Dynasty as the research object, and the modeling characteristics, composition structure and color ratio are the research directions. SOLIDWORKS 2006 software was used to analyze and compare with the contents of Feitian, Xuanzang and other murals in Dunhuang murals. At the same time, SPSS 17.0 software was used for statistical analysis to compare the influence of Mogao Grotto murals on Greece Renaissance design. Among them, the data acquisition device Panasonic 3D scanner (Tokyo, Japan, E2022 type), formed. SLDPRT and .JPG type software to lay the foundation for post-analysis.

### Architectural and Cultural Elements in the Mogao Grottoes

In the historical development of more than 2,000 years, the Dunhuang Mogao Grottoes murals have formed a complete human intangible culture, including different murals (He et al., 2021), rich in visual art creation value, aesthetic value, cultural value, architectural design value, etc. (Hu et al., 2023). Therefore, the Mogao Grottoes are not just a treasure trove of Chinese art and culture. At the same time, it is also a valuable material for human civilization, cultural exchange, integration, and research. In order to study the Mogao cave paintings, we need to have a more detailed understanding of them, but the solution to the Mogao cave paintings often needs to contain a lot of content (Hwang, 2023).

First, the visual art connotation of openwork. From the visual modeling layer of the Mogao cave paintings, their colors, lines, and structures are linked. Then, combined with the visual image layer, consider the pattern of the Mogao Grottoes, etc. At the same time, the nine-colored deer in the "Deer King Bunsen Diagram" of the Northern Wei Dynasty in Cave 257 was analyzed, and the results are shown in Figure 1.

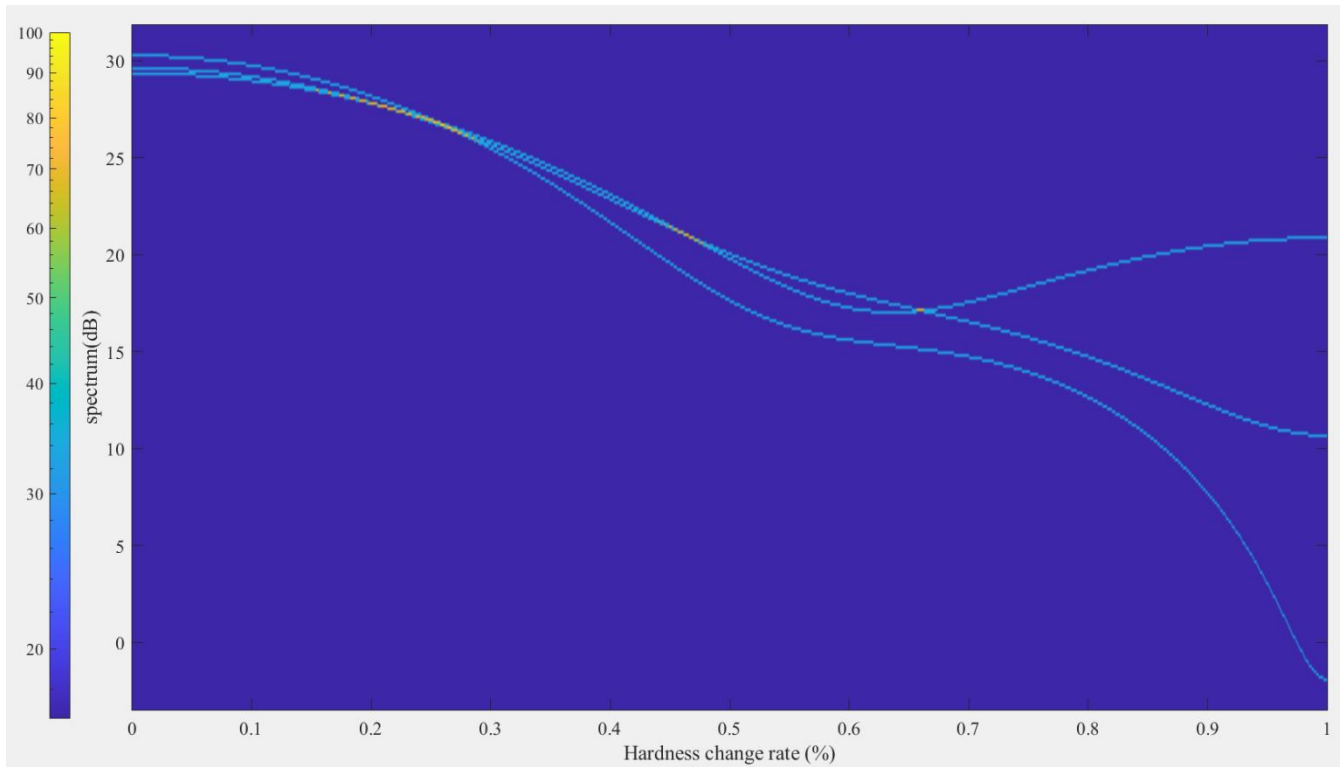


Figure 1. Electron Microscopy Analysis of the Mural Structure of Mogao Caves

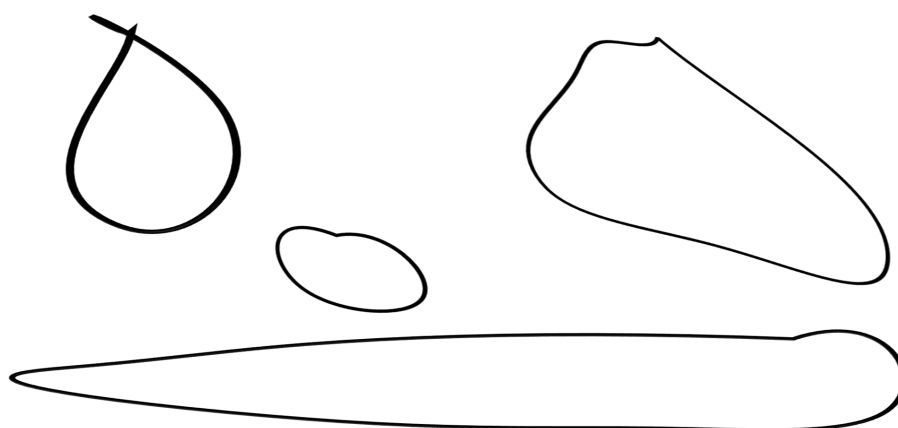
From the analysis results of [Figure 1](#), it can be seen that the elemental structure in the nine-colored deer is mainly quartz structure, indicating that the dye of the mural is a mineral dye. In the analysis of the Mogao cave murals, it is found that the reading method of the murals is "from left to right" (Liu et al., 2023), which is contrary to the reading methods of the Tang and Yuan dynasties. Digging deeper, it was found that the left side is regarded as the main part, stabilized and examined, while the right side is the secondary part and can be interpreted as a secondary element. For example, the king of the nine-colored deer is on the right, as evidenced by this. In the nine-colored deer mural, the overall posture of the nine-colored deer and the "spiritual outlook" with more "anthropological" characteristics give people a more "head held high" posture, which is similar to the design form of modern skyscrapers (Ma et al., 2023).

Second, the "essential characteristics" of the pattern layer are contrasted. The cliff jump of Prince Satan in the Mogao Grottoes is a multi-layered mural design. It is difficult to judge the overall dynamics of the jumping in a static position in the frame, but it is presented in a posture of "hands together" and "close to both ears", as shown in [Figure 2](#).



[Figure 2](#). Prince Saban's Cliff Jump

The overall composition structure in [Figure 2](#) is balanced, and the schematic diagram is shown in [Figure 3](#).



[Figure 3](#). Cliff jumping Structure of Prince Sabian

[Figure 3](#) shows that although there are many characters in Prince Saban's cliff jump, the overall structure is balanced, showing symmetry on the left and right, up and down, and the center of gravity is in the lower left, and the structural design is more reasonable. The posture in this mural is triangular in shape, and its structure is relatively stable. Moreover, the calmness and firmness of Prince Sayan's sacrifice and jumping off a cliff presents an auspicious pattern, similar to Buddhist meditation, and also blends with the surrounding natural environment (Tamburini et al., 2021), which can express a spiritual connotation.

Third, the obvious characteristics of the Western Regions. With the development of the Silk Road, a large number of plants and ornaments from the Western Regions appeared in the murals of the Mogao Caves, such as

prebiogranate patterns, nine-colored deer and so on. Among them, the nine-colored deer represents goodness and justice, and the prebiogranate pattern represents "many children and many blessings" (Yang et al., 2022). However, many murals have different meanings than those in the Central Plains, for example, the lotus flower represents "holy in the Central Plains", the Western Regions represent "gentlemen", and in Buddhist culture, it represents people who want to go to the Western Pure Land. Due to the Silk Road, the lotus patterns in the Mogao cave paintings are numerous and rich in connotation.

### **Construction Structure in the Murals of the Mogao Caves**

The connection between architecture and art lies in the art of space, and if space art is examined from an aesthetic perspective, it will inspire architects to change their design concepts or develop an innovative and diverse awareness of one style and then integrate other elements into it. When talking about buildings, one is reminiscent of 2 spaces; one is the external space, and the other is the internal space. When enclosing the building space, people will have two purposes, and the first is to meet people's requirements for space needs (Zhang & Wang, 2023). The second is to meet people's aesthetic requirements. Therefore, the influence of the design of the Mogao cave paintings on Greek Revival architecture may be related to this, but we will further find that the value of the Mogao cave paintings is more aesthetic. Therefore, the influence of the Mogao Caves on the design of the Greek Revival architectural style may be combined with the aesthetics of the space. First, the space of Dunhuang Mogao Grottoes mainly has three styles, namely the central tower type, the back screen type, and the covered bucket type. In the front room, the exterior space is a transitional sense from the inner space, and here, the Mogao cave paintings present an effect that leads people to transform emotions. When people walk through the narrow inner passage, they will reach the grotto; the light of the grotto is relatively dark, and the 3 walls and the sense of closure at the top so that the Mogao Grottoes are reasonably arranged murals, among which, these murals will basically depict a thousand Buddhas or Buddha disciples, Bunsen, meridian, algae well, male and female providers, diamond patterns, etc., here, the role of the mural is visual, aesthetic, can make people feel that the cave building and the statue are integrated and connected. As a result, the world will enter a relatively closed but colorful, relatively wide space and a very strong Buddha-nature world, truly isolated from the external natural space. The world will be in such a space, and temporarily forget the troubles and various troubles of the external world, achieve spiritual peace and tranquility, reflect on the self, and realize the purification of the personal mind. From here, the Mogao cave architecture has the characteristics of a closed spatial structure and has a harmonious, mysterious, and religious way of thinking, which also forms a strong contrast with the natural spaces such as the Gobi, blue sky, white clouds, and long rivers in the world outside the caves.

### **Research Methodology**

The research methodology of this study aims at identifying the impacts that the Mogao Cave murals had on the Greek Revival architectural design tool using a combination of visible, tangible, and analytical methods. This approach offered an integrative view of the relation between these two different cultural works from different historical epochs and cultures.

### **Research Design and Data Collection**

The research starts with identifying certain Mogao Cave paintings and samples of the selected Greek revival samples. The examples include "Flying Sky" and "Xuanzang Westbound" from the Tang Dynasty murals at the Mogao Caves, which offer both visual and symbolic correspondence. However, as architectural elements, the selection of British Museum and Constantinople Cultural Center as case buildings is based on their signification and typicality of the Greek Revival style.

### **3D Scanning and Structural Analysis**

To identify the structural elements, a Panasonic 3D scanner (model E2022) was used to obtain a three-dimensional image of the chosen samples of murals and architectural ornamentation. The 3D scans enabled accurate measurement and assessment of the shapes, patterns, and other forms of structures. The last step is to perform a detailed structural analysis using SolidWorks 2006 software to compare the similar and different aspects of the Mogao Cave paintings and Greek Revival architecture. These include working with issues that are being associated with the composition of figures and the values of geometric shapes as well as balance between the parts of a picture and large structures.

### **Statistical Analysis**

Using statistical measures, the impact of the Mogao Cave murals on the development of the Greek Revival style of architecture was ascertained. SPSS 17.0 software was used for statistical analysis, comparing specific elements, like hues, lines, and composition patterns. This entails the comparison of



the frequency and importance of different geometric patterns, colour combinations and lines used in the paintings and the buildings. The findings of these statistical tests assist in the detection of patterns of influence and degrees to which the elements of the Mogao Cave murals have affected the Greek Revivalism architectural styles.

### **Comparative Visual Analysis**

At last, a comparative visual analysis was performed and pictures and data from the Mogao murals are compared with images and data from Greek Revival architecture. This comparison looked at the direct borrowings and adaptations such as the motifs, colours, and structures that are adopted in the buildings. Based on the structural comparison, statistical data, and the visual representation of the two styles, the research arrived at conclusions regarding the extent of the impact of Mogao Cave murals on the design process behind the Greek Revival style.

## **THE INTRODUCTION OF THE MOGAO CAVE FRESCOAL ELEMENTS IN GREEK REVIVAL ARCHITECTURE**

### **History of the Development of Revival Architecture**

In the retro wave of the 18th and 19th centuries, neoclassicism and romanticism gradually changed the concept of architectural style for some people. Among them, the Imperial style became one of the more famous styles of neoclassical architecture, which can find a different inspiration from the majestic architecture of the Roman Empire and use it as a template. Especially in some large-scale architectural designs, the overall architectural style of the ancient Roman Empire is often directly transported. Therefore, it appears to be large in scale and very simple in appearance, but it pursues a kind of majesty and majesty and indifference in image. In contrast, Romantic style architecture developed in Britain and was initially influenced by the architectural styles of China, Arabia, India, and other countries, among which there were gradually more British buildings with Chinese style and many landscape gardens established in accordance with traditional Chinese gardening design methods were influenced by this. In the later period, the restoration of religious culture made Gothic church architecture begin to regain attention and gave birth to many English Gothic buildings, which appeared to be huge for a while. During this period, because of the gradual emergence of the European eclectic style. At the same time, many architects began to imitate different architectural design styles in history, or freely combined, or imitated in an infinitiated manner, one of the characteristics of which is to pay attention to the balance of proportions and the pure formalization of aesthetics. Therefore, Greek Revival architecture, Roman Revival architecture, and Oriental style architecture began to appear in many cities. Therefore, from this point of view, the basic characteristics of European architecture from 1751 to 1800 are retro, and they are keen to use various styles to present a relatively diverse characteristic. At the same time, all the various styles value formal beauty. During this period, British and American architecture mostly imitated ancient Greek architecture, so it formed the style of "Greek retro architecture", while French and German architecture was happy to imitate ancient Roman architecture, so it formed "Roman Revival architecture." Therefore, in this sense, the style design of Greek Revival architecture pursues formal beauty in space.

### **Mogao Cave Elements in Greek Revival Architecture**

Greek Revival architecture is influenced by ancient Greek architecture; because of the birth of neoclassical architecture and a retro architectural style, its essence is still with the help of the retro trend of the time and the trend of "ancient" to obtain an architectural style, retro thought makes architectural theory gain a new height, in which, the old and new buildings suddenly have an intertwined performance, and then, the theoretical community summarizes and summarizes the buildings around the world before the 18th century, so as to develop a retro thought, Systematic and innovative architectural style. The Frenchman Julian David Leroy believed that the imitation of the Greek column style should be found from the basic theory of Vitruvius's architectural laws, and finally, he believed that a certain connection could be formed between the two, under his research, the architectural site began to be divided by the difference of the column type and found many different stages of development of the architectural column type, so that modern architecture has a new understanding of the column type, and thus laid a theoretical basis for the continuation of the investigation of historical sites. In addition to him, Winckelmann also introduced classical art in his book "History of Ancient Art," which passed on classical Greek architectural art to future generations. At the same time, Lojel's book "Architecture Series" also became one of the theoretical foundations of romantic architecture and made neoclassical architecture, Greek Revival architecture, Romanesque Revival architecture, and Chinese style architecture further spread, and he also

put forward the view that "architecture is like a very simple hut," and believed that building a hut needs 4 growing trees as basic support. In short, Greek Revival architecture emerged as a result of the rise of neoclassicism, English romantic architecture, and architectural revivalism throughout the 18th and late 19th centuries.

### Representation in Greek Revival Architecture

During the Greek Revival, British, American, and French buildings were mainly of the following categories, as shown in Figure 4.

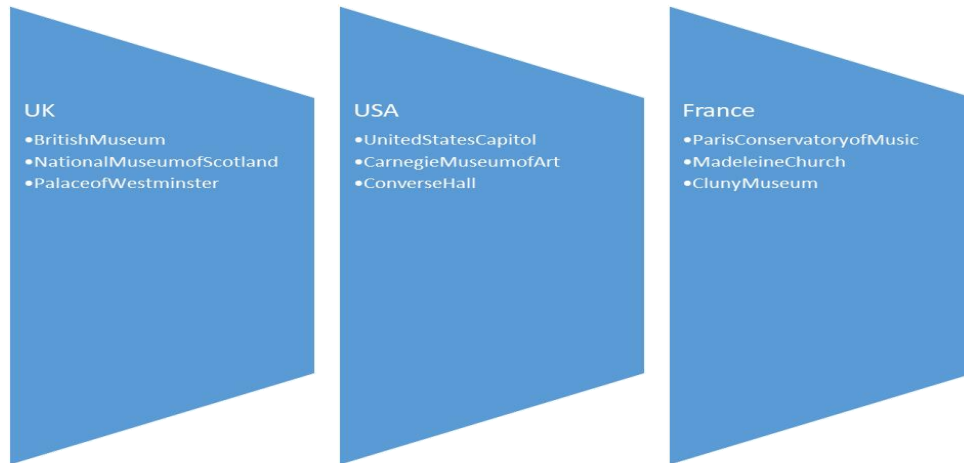


Figure 4. Representative Greek Revival Architecture in the UK, USA, and France

It can be seen from Figure 4 that Greek Revival architecture was well used when romantic architecture appeared in Britain, at that time, in order to promote the continuous change of architectural art, the world began to integrate romantic ideas into architecture, because Gothic architecture has been popular for a period of time, the diversity of architectural styles needs to be enriched, coupled with the influence of neoclassicism and revivalism, in the late stage of neoclassical development, eclecticism and romanticism began to rise. Therefore, Britain as the main position of romantic architecture, at that time to build many different styles of buildings, basically follow the retro ideas, and demand diversification, this period of British buildings in addition to a small number of Roman Revival architecture and some traditional European architecture, Chinese style architecture, the most important is Greek Revival architecture, which representatives are:

(1) British Museum. The British Museum is a very representative Greek Revival building, and the Mogao Grottoes were built in the 19th century. Mainly imitating the ancient Greek architectural style, is a pursuit and revival of ancient Greek architecture, which is mainly manifested in the retro appearance, the specific part includes the colonnade and column roof decoration on the front, the Greek classical decorative pattern, the specific column and structure, etc., as well as mythology, religious murals, various character murals, etc., all have a strong Greek Revival architectural style;

(2) Cultural Center of Constantinople. Located in the heart of London, it is a prestigious concert hall designed in the style of vintage Greek architecture. The overall layout is circular plan, referring to the colonnade design of Greek ancient architecture and related Greek decorative elements, as shown in Figure 5 and 6.

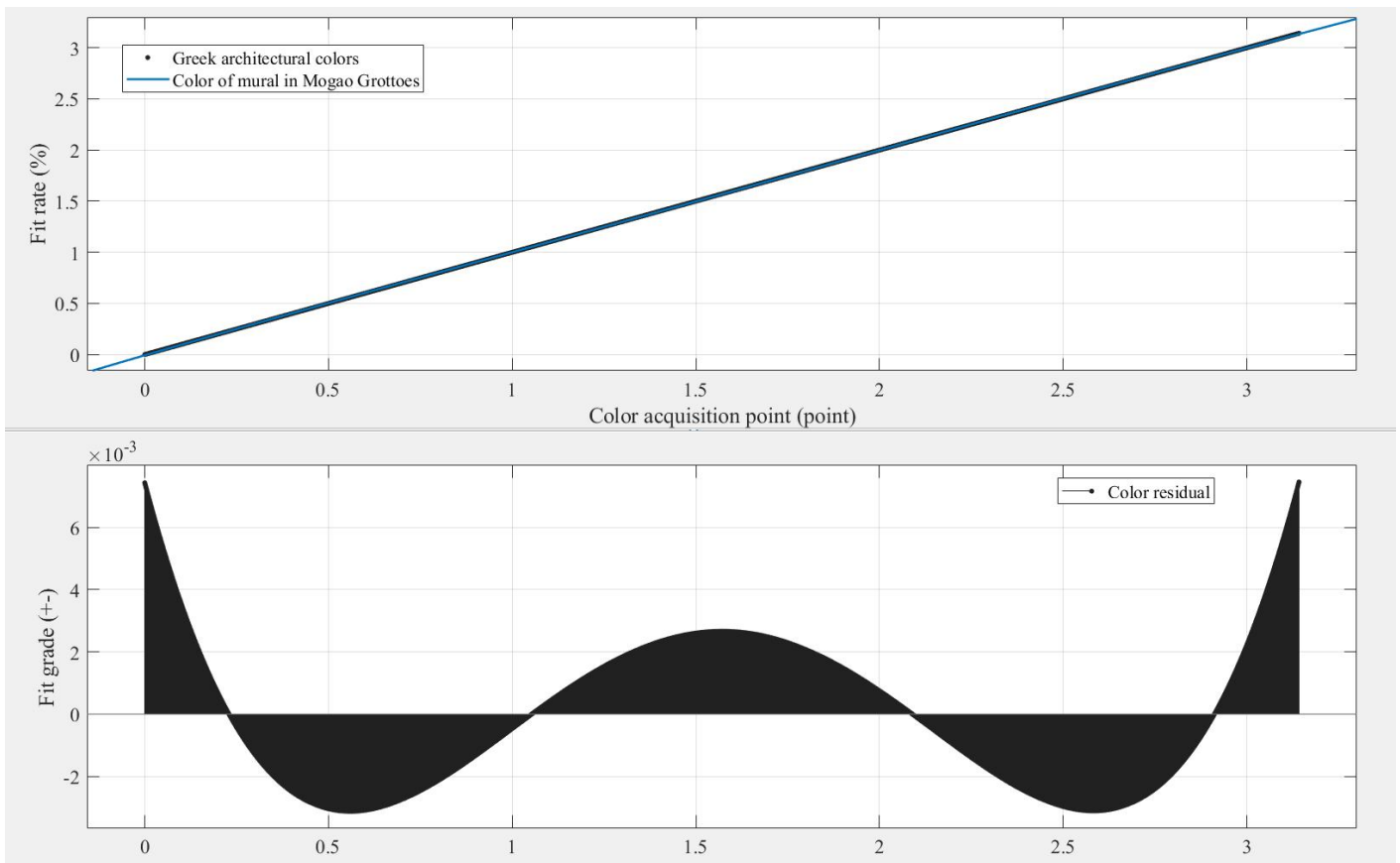


Figure 5. Comparison of Greek and Mogao Cave Paintings

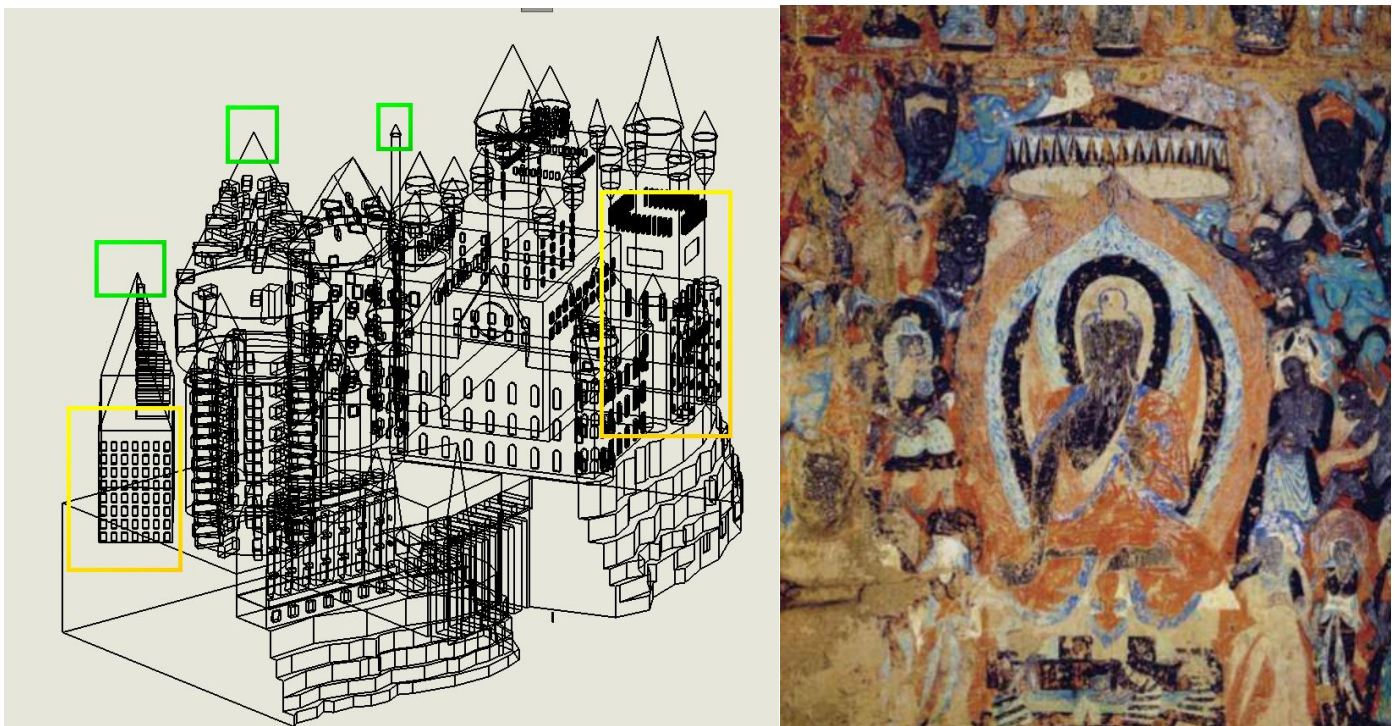


Figure 6. Structural Lines of Two Buildings

As can be seen from Figure 6, the Greek architectural design style is similar to the demonic transformation in the Mogao Caves, the structures are triangular structures, and occupy a large number of spatial positions.

(3) The Breton Museum, which is a museum building that exhibits excellent design concepts and has obvious Greek Revival architectural features. Its decoration, pattern and overall structural form, as well as colonnade



characteristics, all show certain characteristics of ancient Greek architecture, but they are in line with the modern aesthetics of the public;

(4) British Parliament Building. Located in London, the British Parliament Building is one of the landmarks of London, England, and its strong Greek retro style features are eye-catching. Following the façade design requirements of ancient Greek temple-like structures, and the decoration of the colonnade and colonnade is also very exquisite, its designers pay homage to the Greek Revival, and the building has become one of the symbols of British political culture. The exterior and internal structural features of the building, materials, etc., are able to show the characteristics of Greek Revival architecture. At the same time, it can also reflect the influence of the romantic style architectural trend in Britain at that time;

In addition to the United Kingdom, there are many different and famous buildings rich in Greek Revival style in other countries and regions around the world, such as the US Capitol and the New York City Library, Constwood Manor, and the Sedansky Museum. Although France is more keen to build Romanesque Revival buildings, it still builds some Greek Revival buildings, such as the Paris Conservatory and Notre Dame, Saint-Cyr Cemetery, Italian Abbey, Church of the Holy Good, etc., because this article has limited space, and will not list the characteristics or characteristics of the Mogao Grottoes one by one.

### **THE INFLUENCE OF THE MOGAO CAVE PAINTINGS ON THE GREEK REVIVAL ARCHITECTURAL DESIGN STYLE**

To understand the influence of the Mogao cave paintings on the Greek Revival architectural design style, it is necessary to be able to understand the characteristics of the Mogao cave paintings well, but the Mogao cave paintings are very complex, diverse, involving many different contents, and there are many interdisciplinary parts that the author is not enough to interpret. In order to determine the theme of this research, the author decided to connect this study with the interpretation of Mogao cave paintings from the perspective of visual art and analyze the influence of Mogao cave paintings on the Greek Revival architectural design style from this perspective.

#### **Shift the Design Center of Gravity to the Center**

Greek Revival architecture in neoclassicism pays attention to the structural center, symmetry, and advocates a three-dimensional space, showing unique cultural significance from the aspects of structural layout, symmetry, hierarchy, axis and internal decoration, formal connotation. In addition, Greek Revival architecture also adheres to certain requirements for innovative design. Therefore, the style of Mogao Grottoes also emphasizes the use of new processes and new materials, integrating the concept of structural innovation. In modern society, the world has a lot of research and innovation, understanding and application of the design style of Greek Revival architecture in neoclassicism. Therefore, from the perspective of Greek Revival architecture, it pays attention to the grasp of details, and structurally, Mogao Caves pays attention to the use of various different column styles of Greek style architecture. At the same time, it also pays attention to the effective identification of group forms, emphasizing the use of group space combinations to show the beauty of shapes, as shown in [Figure 7](#).





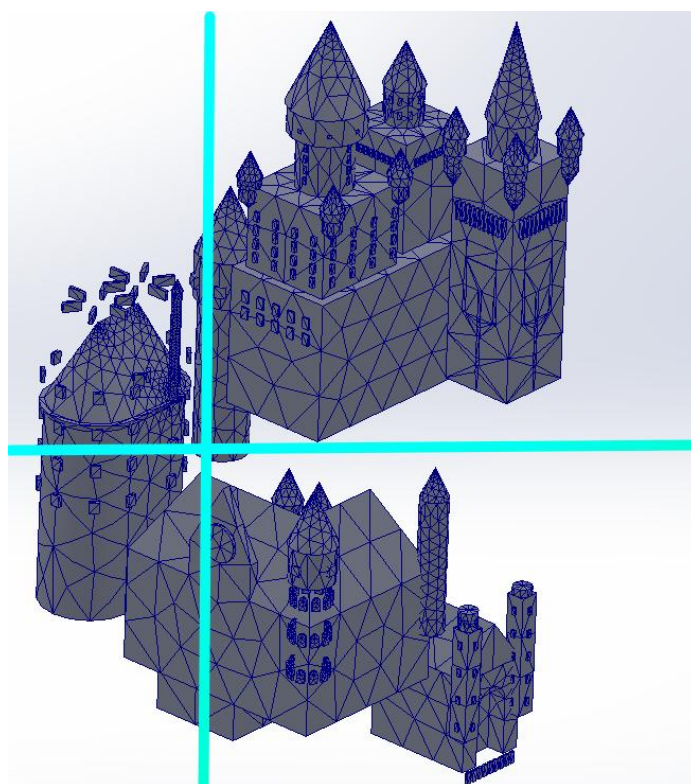


Figure 7. Comparison of Dunhuang Murals with Greek Revival Design Styles

From the structural analysis in Figure 7, the structure of the Mogao Cave paintings is examined from the perspective of nonlinear compositional categories from the perspective of visual art, and it is recognized that there is a certain relationship between the positions and directions of its various elements. Moreover, after considering the setting of the position of colors and lines, their composition, illustrations, and other aspects, the author found that the unique composition technique of the Mogao cave paintings is characterized by the aesthetic balance of "up-down" and "center-edge." In some Mogao cave paintings, some compositions have scattered features. Therefore, there is a wonderful feeling. Take the "Tiger Feeding Figure" in Cave 253 of the Mogao Grottoes as an example (Figure 4), which uses a special isomorphic way to present the picture, and the entire painting structure is narrative and "centripetal," in which the "tiger feeding" is the center of the structure of the picture, and the 7 different storylines in the painting, although very complex, in a certain order of development, and a clockwise direction to depict the arrangement, so that it shows a good layout, although there are 7 different storylines in the painting, but does not make people feel cumbersome, complex, dazzling, but presents a clear relationship between primary and secondary, and shows a strict setting of the sequence, the overall aesthetic is very harmonious. A comparison of the structure of Greece architecture and the drawings in the Mogao Grottoes shows the results in Table 2.

Table 2. Comparison of Geometric Figures in Greece Architecture and the Murals of the Mogao Grottoes

| Commonly used indicators | X <sup>2</sup> | df    | p     | $\chi^2/df$ | triangle | rectangle | rotundity | lozenge | hexagon | trapezium |
|--------------------------|----------------|-------|-------|-------------|----------|-----------|-----------|---------|---------|-----------|
| Greece architecture      | -              | -     | >0.05 | <3          | >0.9     | <0.10     | <0.05     | >0.9    | >0.9    | >0.9      |
| value                    | 1.118          | 4     | 0.891 | 0.280       | 0.986    | 0.000     | 0.045     | 1.891   | 0.939   | 4.340     |
| Other indicators         | TLI            | AGFI  | YOUTH | PGFI        | PNFI     | PCFI      | SRMR      |         |         |           |
| Mogao Grottoes murals    | >0.9           | >0.9  | >0.9  | >0.5        | >0.5     | >0.5      | <0.1      |         |         |           |
| value                    | 4.340          | 0.929 | 1.202 | 0.188       | 0.250    | 0.504     | 0.023     |         |         |           |

NOTE: Default Model  $\chi^2(15) = 18.235, p = 0.750$

As can be seen from Table 1, the common use of figures in Greece architecture and Mogao Grotto murals is high, with triangles, rectangles and circles, while diamonds, hexagons and trapezoids are used at a low rate. The small geometric differences between the two indicate that the two are similar, and the emergence of Greece Renaissance architecture is later than that of the Tang Dynasty, which shows that the Mogao Grotto murals had an influence on the shape of Greece architecture.

### Comparison of Decorative Dyes

The appearance of Greek Revival architecture pays attention to the harmony of colors and is white architecture. White can present a clear sense of simplicity to people at a glance, and white also has the connotation of "holy" in Greek culture and is in line with the aesthetic value emphasized by neoclassical architecture. Inside, Greek Revival architecture tended to use a lot of frescoes and attached great importance to the harmony between colors, emphasizing a kind of "uniformity." At the same time, some of them also pay attention to the variety of colors because their mural works are rich in cultural connotation, symbolism, religious characteristics, and ancient Greek style. Therefore, the colors of the Mogao Grottoes are very particular when blending, and pay attention to the relationship between colors and colors, emphasizing a retro, solemn, simple, and beautiful character. The color expression of Mogao cave murals, as mentioned earlier in this article, its color expression often has a certain sense of rhythm and rhythm, a sense of density, which is a kind of aesthetic examination in the process of color assignment of the painter; it attaches importance to the use of contrasting colors but also pays attention to the use of complementary colors. At the same time, I like to use a large area of base color to form the main tone (such as the use of cinnabar) and then use very little stone green and stone cyan to decorate other parts of the picture to form warm colors. For example, in the "Deer King Bunsen Diagram," 3 different colors, namely white, black, and gray, are integrated. The colors are harmonious and unified, paying attention to aesthetic meaning, comparing the materials of architectural decoration in the Greek period with the materials of the Mogao cave paintings, and the result is shown in Figure 8.

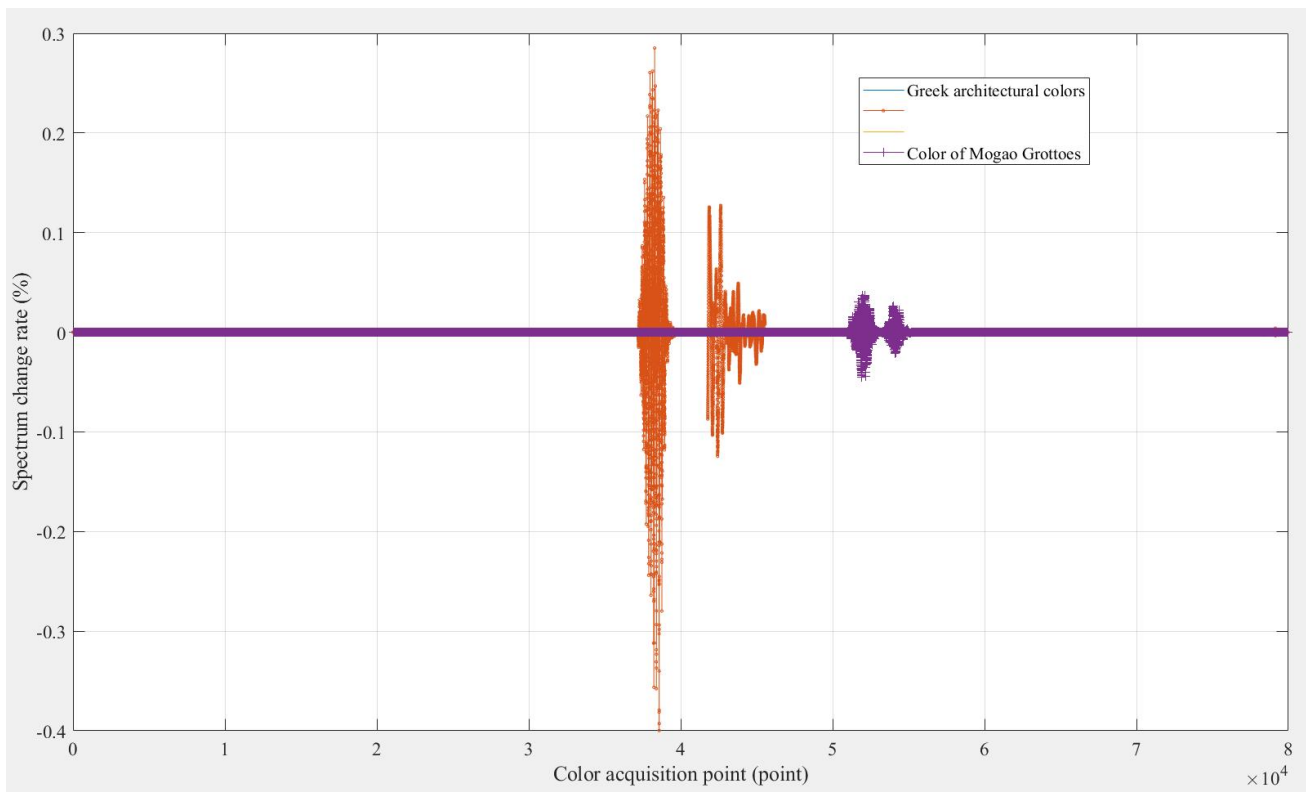


Figure 8. Dye Spectroscopic Analysis of Mogao Caves and Greek Architecture

From the spectral changes in Figure 8, it can be seen that the "view of color harmony" of the Mogao cave paintings also had a certain influence on the design style of Greek Revival architecture. Modern designers need to understand that Greek Revival architecture is a style in this design, can be referenced, uses some artistic structural ideas or color ideas, and line treatment; after all, the current Greek Revival architecture emphasizes the embodiment of the "column style" and the appearance of the "image," rather than necessarily emphasizing complete copying, so innovation is very important. The color layout design in the Dunhuang Mogao Grottoes murals is very exquisite, paying attention to aesthetic harmony and rhythm, etc., which is worth referring to. In

view of the above analysis, the colors of Greece architecture and Mogao Grottoes are compared, and the results of Table 3 are obtained.

**Table 3.** Comparison of Color Differences Between Greece Architecture and Mogao Grottoes

| Greece architecture | → | Mogao Grottoes | Coefficient of difference | Color adjustment rate | Temporal variability | Topic similarity |
|---------------------|---|----------------|---------------------------|-----------------------|----------------------|------------------|
| red                 | → | Crimson        | 0.212                     | 0.115                 | 0.065                | 80.202           |
| Yellow              | → | Orange         | -0.193                    | 0.109                 | 0.077                | 90.190           |
| blue                | → | Cyan           | 0.071                     | 0.114                 | 0.533                | 80.067           |
| brown               | → | Reddish brown  | -0.300                    | 0.119                 | 0.061                | 80.271           |
| green               | → | Dark green     | -0.106                    | 0.109                 | 0.334                | 90.103           |

From Table 3, it can be seen that the difference between the color of Greece architecture and the color of Mogao Grottoes is small, and the conditions and themes of color application are similar, and the time difference of color application is large. Searching for information found that red and brown-red were the main colors used in the Mogao Grottoes in the Tang Dynasty, and blue was frequently used for depiction. This shows that color gradually passed from the Mogao Grottoes in the Tang Dynasty to Greece and had an impact on the use of color. At the same time, blue and green are the main color dyes in Afghanistan, which were transmitted to Greece through the Silk Road, enriching its architectural color. This study shows that the color of Greece architecture is influenced by the Mogao Grottoes, which is not only rich in content, but also has little color difference, and the similarity of theme application is high, all at 80~90%.

### Contrast of Design Lines

The lines of Greek Revival architecture are clean, elegant, and fluid, often specially designed to blend with the style of architecture, focusing on a harmonious beauty. First, Greek Revival architecture has a clear display of geometric shapes. The lines of the Mogao Grottoes are often intertwined, and there are also some straight lines, curves, arcs, etc., and the relationship between lines and lines is harmonious and natural. At the same time, paying attention to the balance of proportions, these lines are not only powerful and stable, but also can be integrated into the architectural design concept, fully showing its harmonious beauty. Second, the colonnades in Greek Revival architecture also embody the beauty of harmonious lines, and its line combination includes vertical lines, and the beauty of horizontal measurement composition, bringing a contrast. Moreover, between the pillars and the pillars, the arc corridor reflects a continuous and elegant beauty with a good visual effect. It can be seen that the line combination of Greek Revival architecture can be combined to create harmonious, repeatable and orderly patterns, thus bringing the harmonious aesthetic effect of architectural art, simple and powerful. In Greek Revival architecture, decorative carvings can also be seen everywhere. These carvings also highlight a delicate, precise feeling, and its display on the surface of the building, there is a sense of "combination," able to present elegant, simple line patterns. In addition, Greek Revival architecture often uses geometric shapes and pays attention to proportions, thus creating a smooth, precise, and harmonious line aesthetic value, and its style is widely praised. The mural lines of the Mogao Grottoes are like the skeleton of the Mogao Grottoes, which has a high generalization power. With the continuous evolution of the times and painting styles, the line techniques of the Dunhuang Mogao Grottoes murals have also undergone great changes, and the painters are very particular about the lines of the Mogao Grottoes in the process of painting. Therefore, the lines presented are highly artistic, and their lines are flexible and changeable, showing the excellence and ultimate line drawing techniques of ancient Chinese painting technicians. From the perspective of each line has a good tension, and it is "possessed by the shape of God" and "written in the form," exuding a strong charm of Chinese aesthetic thought. From the perspective of image patterns, the Mogao cave murals also have a feature; that is, if they are the same curve in each picture, then they can also show very different picture intentions and characteristics. For example, in Figure 5, the line of the dancing towel below the waist of the dancer is naturally wavy, and when combined with the smooth line above the waist, it reflects a sense of rapid left and right rotation of the whirlwind dance; It can be seen that the lines in the Greek Revival architectural design style are influenced by the lines of the Mogao cave murals, which can use different expressions of lines to show a different sense of the picture, and the strength, tension, simplicity, and smoothness of the lines can be expressed in the combination of different lines, or the same lines in different picture combinations. In order to better show the connection between the structural design of Greek Revival architecture and the mural structure of the Mogao Caves, the author makes a comparative table of the characteristics of the two; Table 4 for details.

**Table 4.** Table of Structure, Color, Line Characteristics of Mogao Cave Paintings and Greek Revival Architecture

| <b>Object</b>                   | <b>Structure</b>  | <b>Color</b>  | <b>Lines</b>  |
|---------------------------------|---|---|---|
| <b>Mogao cave painting</b>      | <p>Pay attention to the relationship between elements, such as the harmony of colors and lines.</p> <p>Pay attention to the "upper and lower relationship" and "primary and secondary characteristics of the center and edge" in the structure.</p> <p>The sense of picture pays attention to the "center" and edge, the picture has the characteristics of narrative, the center is prominent and clear, and the secondary elements are presented in a centripetal distribution, integrated into the picture to show a sense of harmony.</p> | <p>It reflects the harmonious relationship between colors and colors, and expresses the sense of rhythm, rhythm and density of color fusion. The sense of rhythm symbolizes a certain harmonious relationship.</p> <p>Both contrasting and complementary colors are used, and the two are distinguished. Among them, the combination of complementary colors is more harmonious. Complementary colors like to use one main color as the base tone, other colors as a supplement, and constitute a "warm tone", relatively simple and uniform.</p> | <p>The lines are like skeletons and have a high degree of generalization.</p> <p>The lines are flexible and delicate, and the tracing technique is exquisite.</p> <p>Each line has "tension", pays attention to the embodiment of the charm after the combination, "writes God in shape", pays attention to the expression of Shen Yun, and has high aesthetic value.</p> <p>The picture is different, the same line has different intentions, different expressions, can be free, smooth, can be simple and elegant, etc., pay attention to the beauty of lines.</p> |
| <b>Greek retro architecture</b> | <p>Follow the symmetrical, golden ratio of classical Greek architecture.</p> <p>Pay attention to the center, the main and secondary are separated.</p> <p>Advocate in a three-dimensional space, from the structural layout, symmetry, hierarchy, axis of the space expression.</p> <p>4. Pay attention to the effective identification of group forms, and emphasize the use of group space combinations to show the beauty of shapes.</p>   | <p>Appearance: white, showing a sense of harmony, basically from the spiritual connotation of "divinity", the symbolism of white in ancient Greek culture to integrate it, and design selection.</p> <p>Interior decoration or others:</p> <p>Pay attention to the harmonious relationship between colors and colors, giving a solemn, minimalist impression.</p> <p>Vintage, emphasizing the uniformity after fusing different colors, and paying attention to the embodiment of connotation culture.</p>  | <p>Simple, elegant and smooth.</p> <p>Use different lines to show the harmonious beauty after combination, like to use geometric figures, emphasize uniformity, balance, harmony, power, etc.</p> <p>Lines are reflected in contrast, combination, connection, etc., and the processing between lines pays attention to harmony, and pays attention to order, simplicity and sense of force.</p> <p>Pay attention to combination, pay attention to proportional relationships, and use lines to form constructive elements, which has high aesthetic value.</p>       |

It can be seen from [Table 4](#) that the influence of the Mogao cave paintings on the design style of Greek Revival architecture is mainly reflected in three aspects: the structure, design color, aesthetics, and lines, and the most critical is reflected in the aesthetic influence of the first China. First, from a structural point of view, the structural design of the Mogao cave paintings pays attention to the center, and pays attention to the harmony of the picture through the construction of the relationship between elements, and the design of Greek Revival architecture also needs to grasp the aesthetic requirements of this "center" and "element combination construction". Second, the color design of the Mogao cave murals pays attention to the sense of harmony and simplicity, and the requirement for the relationship between colors and colors is to be "harmonious" enough. At the same time, the distinction between primary and secondary has influenced the design style of Greek Revival architecture. Third, the lines of the Mogao cave murals can be used as the skeleton of the whole, and its value is reflected in the construction and presentation of the final picture, and each line has a sense of power, the



depiction of the line is full of different intentions, and it needs to be combined with the different presentation needs of the picture to show, the lines are smooth and changeable. In the design of the Greek Revival architectural style, the design of the lines also pays attention to smoothness, uniformity and balance, and is also influenced by the Mogao cave paintings, with different pictures (needs), combination and display of rich and diverse and changing characteristics. At the same time, it also emphasizes the harmony of the height after the line is constructed.

### CONCLUSION

The murals of Dunhuang Mogao Grottoes have the characteristics of rich diversity, high artistic value, and high cultural value. Therefore, it is of certain practical significance to carry out in-depth research on it. The Dunhuang Mogao Grottoes murals are a good embodiment of the cultural exchanges between ancient China and Central Asian countries and other countries. Therefore, many of the murals have stylistic elements from India, Greece, and other aspects, plus their cultural value, artistic value, modern architectural design enlightenment value, archaeological value, political research value, etc., are very rich. So it's well worth looking into. With the title of "The Influence of Mogao Cave Murals on the Design Style of Greek Revival Architecture," this paper discusses in detail the various connections between Mogao Grotto murals and Greek Revival architecture, aiming to improve the world's attention and reference to the architectural, cultural value of Mogao Grottoes murals, hoping that the publication of the article can play a certain role and provide a certain reference for relevant people.

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