INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 13, Issue 9, (2023) E-ISSN: 2222-6990

Symmetry and Asymmetry Compositional Analysis in Dunhuang Caisson Patterns

Liu Hui, Haslinda Abd. Razak, Liza Marziana Binti Mohammad Noh

College of Creative Art, University Teknologi MARA, Malacca, MALAYSIA.

Email: 2021698734@student.uitm.edu.my, Haslinda802@uitm.edu.my, lizamarziana@uitm.edu.my

To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v13-i9/17665 DOI:10.6007/IJARBSS/v13-i9/17665

Published Date: *08* September 2023

Abstract

This article examines the compositional aspects of symmetry and asymmetry in the fresco patterns of Dunhuang, China, in order to investigate its artistic forms and importance. The empirical examination of a vast number of designs reveals that the Dunhuang fresco patterns display a variety of compositional symmetry properties, including axial symmetry, central symmetry, and rotational symmetry. These compositional characteristics have aesthetic consequences on visual perception, making patterns more harmonious, stable, and aesthetically appealing. Furthermore, the Dunhuang fresco patterns include asymmetrical compositional elements such as offsetting, misplacement, and deformation. This article examines the compositional aspects of symmetry and asymmetry in the fresco patterns of Dunhuang, China, in order to investigate its artistic forms and importance. The empirical examination of a vast number of designs reveals that the Dunhuang fresco patterns display a variety of compositional symmetry properties, including axial symmetry, central symmetry, and rotational symmetry. These compositional characteristics have aesthetic consequences on visual perception, making patterns more harmonious, stable, and aesthetically appealing. Furthermore, the Dunhuang fresco patterns include asymmetrical compositional elements such as offsetting, misplacement, and deformation.

Keywords: Dunhuang Fresco Patterns, Symmetry, Asymmetry, Compositional Features, Artistic Expression.

Introduction

The Dunhuang fresco patterns are an important component of ancient Chinese art. What is a "zaojing"? According to Zhe-wen (2002) in the book "Ancient Chinese Architecture," a zaojing refers to a concave structure resembling a dome on the ceiling, which is placed above the main deity in temples or above the throne in palaces. There are still 40,000 square meters of murals in Dunhuang, which are very rich in content and can be roughly divided into Buddha statues, Jataka stories, Sutra paintings, portraits of offering figures, and decorative patterns

(Xiaojun, 2017). The zaojing structure evolved from imitating the architectural design of ancient cave dwellings. Similar to the ceiling of a house, ancient craftsmen sought to decorate the ceiling, giving rise to the exquisite decorative form known as the zaojing. The decorative patterns found in Dunhuang fresco zaojing are rich in content, diverse in motifs, vibrant in colors, and structurally complete. The exquisite artistic techniques fully embody the charm of decorative symbolic art, making them one of the treasures in Chinese art history (Cao Jun, 2022). Among them, the compositional features of symmetry and asymmetry in the patterns are significant forms of artistic expression. They have been widely utilized not only in pattern design but also have had important influences on artistic aesthetics and cultural heritage. Therefore, studying the compositional features of symmetry and asymmetry in Dunhuang fresco patterns can provide insights into their compositional principles and aesthetic values, contributing to the research and inheritance of ancient Chinese art theories.

In the long process of modern Chinese pattern design development, distinctive and characteristic pattern motifs have been widely applied in various industries, gaining popularity and recognition (Lu Huina, 2022). The pattern motifs of Dunhuang fresco have been particularly widely employed in diverse design fields, such as architectural design, interior design, graphic design, product packaging design, and more. The purpose and relevance of this research are to investigate the principles and creative expression techniques of symmetry and asymmetry in Dunhuang fresco patterns. A greater knowledge of the artistic expression and significance of symmetry and asymmetry in Dunhuang fresco patterns may be gained by in-depth investigation and analysis from many angles, which can improve the level of pattern design and encourage designers' inventive thinking. Furthermore, developing analysis methods and evaluation criteria for symmetry and asymmetry compositional features can provide guidance and references for the preservation and transmission of Chinese traditional cultural heritage, as well as theoretical and practical support for the study and transmission of ancient Chinese art. It can also provide inspiration and direction for contemporary pattern design ideas.

Literature Review

The Dunhuang Caves in China, commonly known as the Thousand-Buddha Caves, are known as the most valuable cultural discovery of the 20th century (Ji Weixi, 2013).Research by scholars in the field of modern mural art shows that Dunhuang murals are the essence of Chinese mural art, and caisson patterns are the main pattern content of Dunhuang murals carrying flower patterns and animal patterns, reflecting the wisdom of collective creation of traditional nations (Li Cheng, 2022) .The Dunhuang fresco patterns, as an important aesthetic style within the Dunhuang murals, have always piqued people's interest. However, scholarly attention has been focused on the compositional features of symmetry and asymmetry in Dunhuang fresco designs. Internal decorative motifs, for example, are generally placed symmetrically in Dunhuang fresco patterns, which are mostly rectangular, including squares. The symmetry line represents the zaojing pattern's core line, and the intersections of numerous structural lines produce the zaojing's centre points (Yue, 2017). In addition, some academics have examined other aspects of Dunhuang art, observing that whenever there is symmetry in Dunhuang paintings, there is nearly always an effort to explore asymmetry (Hu Zhaoyang, 2004). Researchers have also conducted preliminary investigations into the aesthetic characteristics of Dunhuang murals, including mural interfaces, practicality, imitation, exaggerated deformation, seeking asymmetry within symmetry, arrangement combinations, dynamics, and stability (Hu Tongqing, 2003). Taking the murals of Dunhuang

as an example, practically all of them have an artistic interest in seeking asymmetry within symmetry. This method fractures the extremely solid and rigid image created by rigorous symmetry, resulting in mural images that are both solemn and vivacious (Liu Jianfeng, 2014). As a result, experts from many perspectives conducted thorough investigations of the relationship between symmetry and asymmetry in the visual aspects of Dunhuang art, particularly murals. For example, the "Extraordinary Space" series of works by Dan et al (2022) is described as "created with Dunhuang, a traditional Chinese theme, extracting elements from Dunhuang and combining them with traditional patterns." The aesthetic composition is built on symmetrical Dunhuang forms, and conventional Dunhuang patterns are reinvented to give them fresh life."

In conclusion, this research has supplied great inspiration through the collecting and review of numerous literature from varied perspectives. Scholars both domestically and internationally have paid little attention to the compositional elements of symmetry and asymmetry in Dunhuang fresco patterns, signalling the need for more attention and investigation. The purpose of this essay is to refine the definition, types, and expressive forms of symmetry and asymmetry in pattern design by investigating the compositional features of symmetry and asymmetry in Dunhuang fresco patterns. It will examine artistic expression, aesthetic impacts, and influencing elements, as well as present examples via empirical photos and examine the compositional forms of symmetry and asymmetry in pattern motifs. The purpose of this article is to investigate the creative expression and meaning of symmetry and asymmetry in Dunhuang fresco patterns, as well as to summarise the artistic techniques and value reflected in Chinese zaojing patterns.

Research Methodology

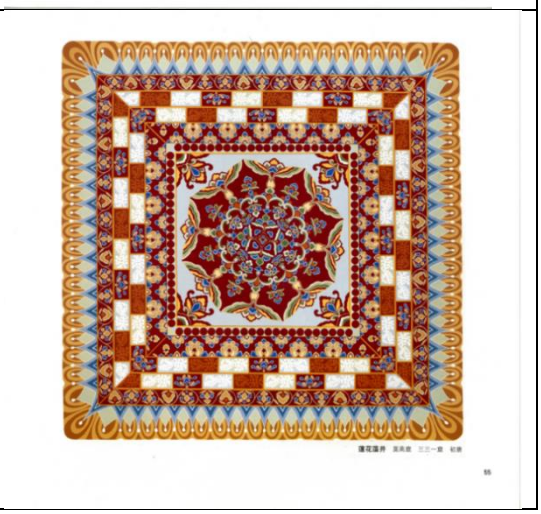
To perform a thorough and in-depth analysis into the compositional elements of symmetry and asymmetry in Dunhuang fresco patterns, this study employs a variety of data sources and gathering methods, including field surveys, literature research, and image processing. It cites historical sources and research findings, such as "Dunhuang Mogao Caves Art" and "Research on Dunhuang Patterns" (Guimin, 1989). These sources offer detailed study and interpretation of the historical context, artistic traits, and stylistic features of Dunhuang fresco patterns, as well as key references and support for this research. The foundation for identifying and organising the compositional qualities of symmetry and asymmetry in Dunhuang fresco patterns is formed through data analysis and processing. It entails categorising and statistically analysing Dunhuang fresco patterns, as well as undertaking in-depth examinations of their forms, colours, and lines. These approaches produce conclusions on the compositional properties of symmetry and asymmetry. Image processing and analysis software such as Adobe Photoshop and ImageJ are used to assist the examination and comparison of these aspects. These tools aid in numerous picture manipulations and analysis, giving solid research support.

Findings

1.Analysis of Symmetrical Compositional Patterns

Symmetrical compositional patterns are distinguished by element balance and mirroring. They are commonly employed in numerous art forms and are particularly noticeable at Dunhuang's Mogao Grottoes. Based on their symmetrical composition, the designs can be classified into several categories.

Table 1
Various Types of Symmetrical Compositional Features in Dunhuang Mogao Cave Zaojing Patterns

TYPE	FEATURE	LEGEND
AxialSymmetry	This refers to the existence of one or more axis lines in the pattern, with symmetrical graphic components on both sides of the axis line in terms of shape, size, position, and so on, resulting in a mirror symmetry effect.	
Central symmetry	The term "central symmetry" refers to a pattern in which a point serves as the centre and the numerous graphic elements display a symmetrical distribution effect.	
Translation symmetry	The term "translation symmetry" refers to the phenomenon in which some visual elements in a design exhibit a symmetrical distribution after being translated.	

Rotational symmetry	The term "rotational symmetry" refers to the phenomenon in which some visual elements in a pattern exhibit a symmetrical distribution after being rotated.	

These composition symmetry features are commonly used in caisson ceiling patterns. They are more than just composition skills; they represent a cultural legacy and aesthetic expression. We may better comprehend the composition principles and aesthetic qualities of Dunhuang caisson patterns by studying these symmetrical composition characteristics, which will serve as a reference and inspiration for future artistic production.

Form of Expression

The expressions of symmetry composition qualities in Dunhuang caisson patterns primarily comprise the following factors.

To begin, the symmetry composition characteristics show as axial and central symmetry. Axial symmetry refers to patterns that are symmetrical to the central axis line, either left and right or top and bottom; central symmetry refers to patterns that are symmetrical to the centre point. Many floral, animal, and human designs in Dunhuang caisson patterns, for example, are built using axial and central symmetry (see Figures 1 and 2).

Figure 1. Axisymmetric Characteristics

Figure 2. Centrosymmetric Characteristics

Second, mirror symmetry is one of the form of symmetry composition features. Mirror symmetry describes a pattern that has the same shape and size on both sides of the symmetry axis, but their left and right positions are reversed. For example, the dragon pattern in Dunhuang caisson is generated by mirror symmetry (see Figure 3).

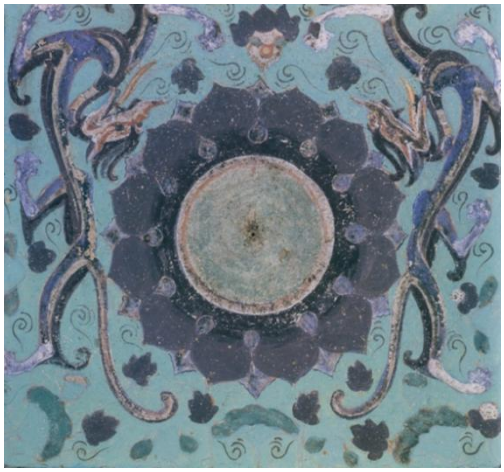


Figure 3. Mirror Symmetry Characteristics (Cave 392, Early Tang Dynasty)

Furthermore, symmetry composition properties show as repeating symmetry. A pattern with repeating symmetry has several identical shapes that are distributed symmetrically or repetitively in the pattern. The dragon and phoenix designs in the Dunhuang caisson, for example, are generated through repeating symmetry (see Figure 4).

Figure 4. Repetitive Symmetry Characteristics

Finally, perspective symmetry manifests symmetry composition properties. The shapes in the pattern that present a symmetrical form during perspective transformation are referred to as perspective symmetry. The architectural motifs in Dunhuang caisson, for example, are constructed by perspective symmetry (see Figure 5).

Figure 5. Mogao Cave 268, Northern Liang Dynasty

The display of symmetry composition qualities in Chinese Dunhuang caisson designs is varied in general. We may better understand and appreciate these patterns by analysing their manifestations, while also giving a variety of artistic materials for future aesthetic compositions.

Artistic Expression and Significance

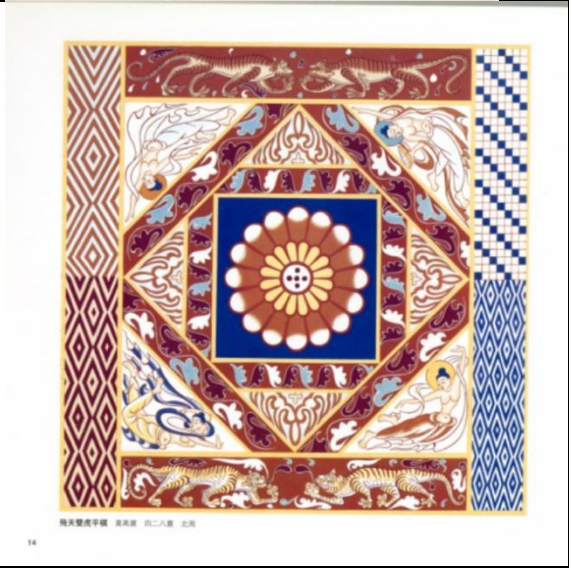
In terms of aesthetic expression and significance, the symmetry composition qualities in Dunhuang caisson patterns demonstrate its distinctive value and appeal. These symmetry elements give the overall pattern a sense of harmony and balance, boosting the visual effect's beauty and refinement. The use of symmetry composition qualities in Dunhuang caisson patterns not only makes the layout and structure of the pattern more stable and harmonious,

but it also illustrates the Tang Dynasty's pursuit of aesthetic values such as harmony, stability, and balance.

Analysis of Asymmetrical Composition Patterns

Most Dunhuang caisson designs have a feeling of order and symmetry as a whole, yet upon closer inspection, some constituent elements in the pattern have an uneven shape, colour, and spatial distribution. One of the major composition approaches in Dunhuang caisson patterns is the asymmetrical pattern element composition feature. It conforms to the element symmetry composition characteristic, and it defies the standard symmetry aesthetics by arranging asymmetrical elements, providing more variation and liveliness to the Dunhuang caisson designs. The following are the most common types of asymmetrical composition characteristics:

Table 2
Several Types of Asymmetric Composition in Ceiling Patterns of Dunhuang Mogao Grottoes.

TYPE	FEATURE	LEGEND
Spatial asymmetry	Asymmetry in the quantity, size, shape, and position of pieces on the left and right or top and bottom sides of a pattern is referred to as spatial asymmetry. It adds depth and three-dimensional to the picture by creating a visual feeling of imbalance and dynamism.	
Formal asymmetry	Formal asymmetry is the unequal distribution of features such as forms, lines, and patterns in a pattern. With modifications, this form of asymmetry generates a distinct visual effect, making the pattern more dynamic and energetic.	

Color asymmetry	The unequal distribution of colours in a design is referred to as colour asymmetry. It is possible to establish an asymmetrical impression by contrasting light and dark colours, warm and cool tones, or other techniques. This asymmetry gives the pattern life, interest, and emotional depth.	
Combination asymmetry	Combination asymmetry refers to the asymmetric arrangement of elements in a pattern that results in varied visual effects when alternative combinations are used. This method enhances the composition's depth and vitality.	

Form of Expression

Asymmetrical composition qualities are characteristics of Dunhuang caisson patterns in which diverse pattern pieces have no symmetry relationship in the composition but can nevertheless produce a form of artistic effect. Different pattern pieces in asymmetrical compositions have evident disparities in shape, size, position, and so on, but they can be blended harmoniously to generate a unique aesthetic feeling.

The following aspects can be used to explain the manifestations of asymmetrical composition characteristics:

For starters, the shape of pattern elements reflects asymmetrical composition properties. diverse pattern parts in Dunhuang caisson designs have diverse forms. Some are round, some are square, triangular, and so on, and their shape, size, angle, and so on vary. This asymmetrical shape combination has a one-of-a-kind style and visual impact.

Figure 6. Asymmetric Shape Characteristics of Pattern Elements

Second, the pattern elements' positions represent the asymmetrical composition characteristics. Different pattern elements are distributed in different positions in Dunhuang caisson patterns. Their positional relationships are not symmetrical, yet they can be mixed harmoniously to create a distinct aesthetic feeling. Through contrast, this type of asymmetrical positional relationship can produce a sense of visual dynamics.

Figure 7. Asymmetric Spatial Characteristics of Pattern Elements

Furthermore, the colours of the pattern elements reflect the asymmetrical composition qualities (see Figure 7). Different design parts in Dunhuang caisson patterns employ different colours. These colours have no symmetry relationship, yet they can be beautifully blended to generate a distinct colour style.This asymmetrical colour combination can produce an eye-catching visual impression.

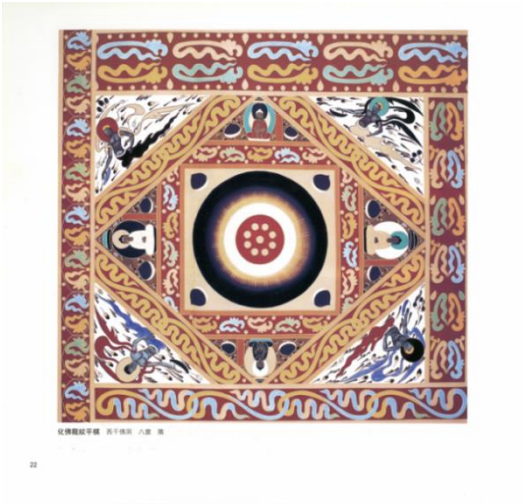


Figure 8. Asymmetric Color Symmetry of Pattern Elements

Finally, the asymmetrical composition qualities of Dunhuang caisson patterns represent a distinct kind of artistic expression. They achieve a distinct aesthetic and visual effect by combining asymmetrical pattern elements in terms of shape, location, colour, and so on.

Artistic Expression and Significance

Asymmetrical composition qualities are particularly essential in terms of aesthetic expression and significance in the Mogao Caves of Dunhuang. The creative representation of asymmetrical composition qualities can be realised through composition asymmetry, such as asymmetry in the size, form, position, and so on. These traits can improve the pattern's visual effect, making it more colourful, rich, and three-dimensional.

The artistic value of asymmetrical composition qualities is also significant. Asymmetry can show the pattern's distinctiveness, individuality, and artistic appeal. Asymmetrical composition features can enhance the pattern's colour and creative appeal, delivering aesthetic satisfaction and experience.

Furthermore, asymmetrical composition qualities in art can reflect the pattern's theme and meaning. Some asymmetrical patterns, for example, in the Mogao Caves of Dunhuang, might communicate topics such as festivals, myths, and tales, making the pattern more culturally and historically meaningful.

Finally, asymmetrical composition qualities play a vital role in the aesthetic expression and significance of the Mogao Caves in Dunhuang. They not only increase the pattern's visual impact and enrich the form of expression, but they also represent the pattern's theme, cultural meaning, and historical significance, bringing aesthetic satisfaction and experience.

Comparative analysis of symmetrical patterns and asymmetrical patterns

The composition of Dunhuang caisson patterns is characterised by symmetry and asymmetry, which contribute to its artistic appeal. Symmetry and asymmetry are two distinct composition methods, each with its own set of qualities, yet they both share and differ.

To begin, symmetrical composition refers to pattern elements that exhibit left-right, up-down, and centre symmetry according to particular standards. Symmetrical compositions have the qualities of stability, balance, and harmony, and are frequently employed to express serious, religious, noble, and other themes. Asymmetrical composition, on the other hand,

refers to pattern elements that lack symmetry and have diverse shapes and placements. Asymmetrical compositions are distinguished by their originality, change, and irregularity, and they are frequently used to portray energetic, vivid, natural, and other topics.

Second, symmetrical composition and asymmetrical composition have various expression forms. The arrangement of elements, such as left-right symmetry, up-down symmetry, centre symmetry, and so on, primarily reflects the expressive form of symmetrical composition. The size, shape, colour, position, and other qualities of the elements primarily indicate the expressive form of asymmetrical composition. Asymmetrical composition elements frequently present a range of variations and combinations, making the pattern more vibrant and intriguing.

Finally, the aesthetic consequences of symmetrical and asymmetrical composition are distinct. The aesthetic effect of symmetrical composition is primarily represented in the sense of balance, stability, and harmony, which conveys a sense of solemnity, sanctity, and nobility to the viewer. The aesthetic effect of asymmetrical composition is mostly represented in the sensation of variation, richness, and vividness, which provides individuals with a sense of vibrancy, naturalness, and interest.

In conclusion, symmetrical and asymmetrical compositions have distinct qualities, but in Tang Dynasty Dunhuang caisson patterns, the two frequently merge to generate the artistic beauty of the picture. The contrasts between symmetrical and asymmetrical composition are expressed not only in composition methods, expression forms, and aesthetic impacts, but their combined application can provide greater artistic aspects to the pattern.

The combination application of symmetry and asymmetry in composition

Both symmetry and asymmetry composition qualities are frequently utilised in the caisson patterns of Dunhuang Mogao Caves. Asymmetry composition qualities can offer energy and vigour to a pattern whereas symmetrical composition characteristics can add balance and stability. In practise, combining symmetry and asymmetry composition properties can result in more diversified pattern effects.

One popular strategy to combine them is to have symmetry composition qualities dominate the overall pattern while asymmetry composition characteristics reveal themselves in local details. For example, in some caisson designs, the main pattern has a symmetrical structure, while asymmetrical composition traits are present in the pattern's edges or specific details. This combination maintains the pattern's overall stability while adding variation and intrigue(see Figure 8).

Picture 8: Honeysuckle Lotus Ceiling in Cave 405, Mogao Grottoes, Sui Dynasty

Another way of combining them is to employ symmetry and asymmetry composition characteristics in a balanced and coordinated manner throughout the entire pattern. This approach can create a more diverse range of pattern effects while also requiring advanced composition skills and aesthetic abilities. For instance, in certain caisson patterns, the symmetrical and asymmetrical composition characteristics appear alternately, maintaining the overall sense of stability while adding variation and interest to the pattern.

Picture 9: Flying Rabbits Ceiling in Cave 407, Mogao Grottoes, Sui Dynasty.

Finally, the combination of symmetry and asymmetry composition qualities can produce a wider range of pattern effects while also necessitating higher composition skills and aesthetic abilities. The combined application of symmetry and asymmetry composition characteristics is a prominent creative expression in the caisson patterns of Dunhuang Mogao Caves, indicating a harmonic and complimentary artistic form between symmetry and asymmetry composition characteristics.

Conclusion

This study compares and analyzes the symmetric and asymmetric compositional features in the Dunhuang caisson model. The study found that there is no absolute difference between the shape design of symmetrical patterns and asymmetrical patterns. Designers should rely

on the actual conditions to choose the best design when designing and choosing applications. A comparative analysis is carried out from the perspective of the symmetry and asymmetry of the patterns. According to the research results, it shows that there is no absolute superiority or inferiority relationship between them, on the contrary, their selection and use should depend on individual conditions. Asymmetrical compositional qualities tend to suggest a more spontaneous and informal atmosphere, but symmetrical compositional features can provide a sense of solidity and dignity. Therefore, in pattern design, these features must be selected and used according to the intended theme and emotion to produce the best aesthetic effect.

In terms of aesthetic expression and relevance, the comparative analysis of symmetry and asymmetry composition characteristics in Dunhuang caisson patterns illustrates their distinct advantages and limitations. In practise, designers must apply these composition features flexibly, taking into account individual conditions and constraints, in order to produce the finest artistic and expressive results.

Finally, in order to get the highest creative outcome, the logical application of Dunhuang caisson pattern elements in pattern decorating design necessitates careful evaluation of their application scope, aesthetic impacts, and influencing factors.

References

Cao, J. (2022). Artistic characteristics and application value of caisson decoration symbols in the Sui and Tang dynasties. *Yanhuang Geography*, 2022(6), 72-74.

Chen, X., & Liang, Z. Simplification in the Complexity——Analysis of Dunhuang Caisson Pattern. *Journal of Xi'an Institute of Engineering Science and Technology,* 2004(1), 44-47.

Du, J. (2022). Analysis of Symmetry Aesthetics in William Morris Pattern Design. *Fashion Color*, 2022(2), 147-149.

Ji, W. The relationship between the artistic expression of Dunhuang murals in the Tang Dynasty and the modern plane composition. *Art Education Research*, 2013(4), 60-60.

Hu, T., & Hu, C. (2003). Aesthetic characteristics of Dunhuang mural art. *Dunhuang Research,* 2003(2), 1-7.

Hu, C., & Hu, T. (2004). On the aesthetic characteristics of seeking asymmetry in Dunhuang murals. *Ethnic Arts*, 2004(3), 80-87.

Ling, D., Zhang, Q., & Qian, X. (2022). "Otherworldly Space". *Shanghai Textile Science and Technology*, 2022(7), -I0044.

Liu, J. (2014). Application of asymmetric design techniques in Dunhuang mural composition. *Big Stage*, 2014(7), 15-16.

Lu, H. (2022). Research on the application of traditional patterns in cultural and creative product design. *New Silk Road: First Ten Days*, 2022(6), 0158-0160.

Li, B. (2008). Axisymmetric in Pattern Design. *Mathematics, Physics and Chemistry for Middle School Students: Seventh Grade Mathematics (Beijing Normal University Edition)*, 2008(5), 68-72120.

Ling, G. (2014). Patterns in Symmetrical Figures. *Primary School Mathematics Teachers,* 2014(5), 78-79.

Shen, Y., Luo, J., & Chang, Q. (2010). A Preliminary Study on the Symmetry and Transformation of Two-Dimensional Continuous Patterns. *Decoration,* 2010(4), 118-119.

Wang, G. (1989). Dunhuang pattern research. *Northwest Fine Arts*, 1989(00), 103-116+147. DOI: 10.13772/j.cnki.61-1042/j.1989.00.014.

Wang, Y. (2017). The influence of color and pattern layout in Dunhuang caisson on painting. *Mountains and Seas Classics: Stories* (Part 1), 2017(8), 76-76.

Wu, D. (2008). Happy Meeting——The Beauty of Symmetry in Traditional Patterns. *Heilongjiang Science and Technology Information*, 2008(10), 137-137.

Yang, H. (2015). Application of Symmetry in Traditional Auspicious Patterns in Modern Graphic Design——Taking the Emblem of Shanghai World Expo as an Example. *Beauty and Times: Creativity* (Part 1), 2015(11), 68-69.