



Design Gene Extraction and Research on the Patterns of Yin Shang Bronzes

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Abstract. As the essence of traditional craftsmanship, Yinshang Bronze Ware Patterns contain profound historical, cultural and aesthetic values. Based on the design gene theory, we systematically analyze its elements, composition and symbolic meanings, refine the design genes and construct a database. We will explore the inheritance and innovation path in contemporary context, summarize the application methodology to meet modern needs, excavate culturally recognizable design factors, and incorporate them into modern design through innovative practice, so as to provide assistance for the revitalization and inheritance of traditional culture.

Keywords: Yin Shang Bronze Patterns; Design Genes; Traditional Culture

1 Introduction

The design factors of traditional culture are the symbols of cultural heritage with strong recognizability and can evoke perceptual imagination, and the relevant concepts in China are still in the initial stage. Through gene extraction and evolution research, the essence of traditional culture can be preserved, and the integration of inheritance and innovative design can be solved. As an important traditional pattern, Yinshang bronze pattern runs through thousands of years of decorative history and carries profound historical and cultural values. By combing its origin and evolution, establishing genetic data based on design gene theory, and integrating modern elements into innovative transformation with design practice, we can find a way of inheritance and innovation for it in contemporary design, and design works that can keep the origin and meet the trend of the times.

2 The Style and Characteristics of Yin Shang Bronze Patterns

The Yin-Shang period (ca. 1600 BC to 1046 BC) was an important stage in the development of bronze civilization in Chinese history. During this period, a highly developed agricultural society and a centralized state system were formed in the Central Plains, and the archaeological sites represented by the Anyang Yin Ruins reveal the prosperity

and splendor of the Shang Dynasty. Bronze culture reached unprecedented heights during the Yin-Shang period, with the variety and number of Yin-Shang bronzes increasing significantly and the craftsmanship becoming more and more exquisite. Yin and Shang bronzes were not only used in daily life, but more importantly, as ceremonial and sacrificial vessels, they were widely used in important ceremonies such as rituals, banquets and feasts, and became symbols of kingship and aristocratic status. The exquisite decorations on Yin and Shang bronzes, such as animal, geometric and mythological motifs, not only demonstrated a high level of artistry, but also reflected the Shang people's reverence for nature and worship of the gods [1]. The flourishing of bronze culture not only promoted the development of handicrafts, but also laid a solid foundation for the inheritance of Chinese civilization in later generations.

The style and characteristics of Yinshang bronze patterns integrate various elements such as realism and abstraction, nature and myth, showing the unique artistic style of this period. For example, animal patterns are a very important part of them, including realistic bird patterns, deer patterns, frog patterns, etc., which come from daily life and reflect the ancient people's observation of the world around them; there are also mythological animal patterns, such as taotie patterns, dragon patterns, phoenix patterns, etc., which are often surrealistic in nature, combining the characteristics of many kinds of animals and expressing the reverence and fear of mysterious power [2]. The Houmuwuding tripod is an important representative work of this period, with an elaborate taotie pattern cast on the tripod body, which is magnificent and gives people a sense of might and gravity. In addition, geometric patterns were especially popular in the Zhou Dynasty, such as the stealing curve pattern, the breast nail pattern, the ring belt pattern, string pattern, etc., which showed a kind of abstract beauty with simple and clear lines, and at the same time played a very good decorative role in the artifacts. For example, the ring band pattern of the animal-faced tripod collected by the Shanghai Museum breaks the characteristic of Yinshang bronze pattern which is mainly straight line, and forms the "S" shape, forming the characteristic of having a circle in the straight line and a square in the round line, which shows the innovation and development of Yinshang bronze pattern. Natural weather patterns, such as cloud and thunder patterns and water swirl patterns, simulate natural phenomena through smooth lines, adding a sense of vividness to Yinshang bronzes. The bronze patterns of the Yin and Shang period not only pay attention to the beauty of form, but also emphasize the close integration with the structure of the artifacts. Through the division of different decorative surfaces and multi-level decorative techniques, such as shading and relief carving, a rich visual effect is formed, reflecting the high level of craftsmanship and profound cultural connotations. These patterns are not only decorative, but also carry the cultural information, religious beliefs and aesthetic ideals of the society at that time.

3 Establishment of Genetic Information on the Design of Yin Shang Bronze Vessel Patterns

Richard Dawkins, in *The Selfish Gene*, introduced the concept of “cultural gene” (Meme) as a counterpart to biological genes (Gene) to elucidate the mechanism of social transmission of cultural elements. [3]. The figurative presentation of cultural genes must rely on material carriers as media. [4], Yin and Shang bronze vessel patterns contain many cultural genes such as patterns, concepts, and spirits.

Through the systematic analysis of Yin Shang bronze vessel patterns, its core cultural genes are extracted and structured, providing systematic support for related innovative design practices. Specifically, the gene extraction is divided into two dimensions: explicit and implicit. Explicit genes mainly refer to visual elements that can be perceived intuitively, such as pattern shape and skeleton, and the key elements that play a decisive role in pattern style should be screened through multi-sample comparison and incorporated into the gene pool [5]; while implicit genes cover abstract elements such as emotional appeals, symbolic semantics, and cultural connotations embedded in the design, which need to be deconstructed and integrated with the help of design thinking. The extraction of explicit genes can provide intuitive reference for the design of cultural and creative products, while the mining of implicit genes can give the design a deeper cultural narrative and emotional resonance, prompting the users to form a spiritual connection with the work.

3.1 Dominant Gene Extraction

The way of composition determines the overall visual effect of Yinshang bronzes, and several typical ways have their own characteristics[6]. Symmetrical compositions create a balanced and harmonious visual effect through left-right or top-down symmetry, which is widely used in the cover, abdomen, feet and other parts of Yinshang bronzes. For example, the animal-face pattern on the abdomen of the tripod is arranged symmetrically on the left and right, giving people a sense of solemnity and stability. Continuous composition is to repeat the pattern unit, forming a continuous visual effect, mostly seen in the neck, abdomen and the bottom of the artifacts, such as the common cloud thunder pattern, ring belt pattern, etc., so that the pattern is full of rhythm and sense of flow.

Hierarchical composition relies on the superposition of multiple layers of patterns to create a rich visual hierarchy, often applied to complex animal patterns and mythological patterns. Take the taotie pattern and dragon pattern as an example, the pattern is more three-dimensional and vivid through the technique of separating the main and the secondary, the real and the imaginary. Combination composition combines different types of patterns together to produce a composite decorative effect, commonly used in large ceremonial and sacrificial vessels, such as combining animal patterns with geometric patterns and natural patterns, presenting a rich and diversified decorative hierarchy [7].

The central radial composition spreads from the center to the surrounding area, forming a radial visual effect, mostly appearing at the bottom or top of the artifacts, which highlights the central pattern. Axis composition is based on one or more axes, and the patterns are arranged in an orderly manner, which is often used on the front or side of large artifacts to create a solemn atmosphere. The combination of points, lines and surfaces creates variable visual effects through the comprehensive use of points, lines and surfaces, and is commonly used in complex geometric and natural patterns. Theme highlighting composition is to place a specific pattern as the core in the prominent position of the object to form a visual focus, and in ritual and sacrificial vessels, taotie and dragon patterns are often used to highlight their symbolic significance.

3.2 Research on Hidden Genes

Through the research on the hidden genes of Yinshang bronze patterns, i.e. the emotional expression, symbolism and cultural connotations embedded in the design construction[8], the spiritual connotations can be reasonably grasped during the design process, so as to truly realize the “revitalization” of the traditional patterns.

The religious beliefs of the Yinshang period were extremely rich, and many patterns of Yinshang bronzes were closely related to religious activities and beliefs. These patterns not only have decorative functions, but also carry deep spiritual and cultural connotations. Taotie motifs appeared frequently in ritual activities, reflecting the Shang people's worship of ancestors and gods. The dragon motif symbolizes the authority of the emperor and supernatural power, and is considered to be a deity that communicates with heaven and earth. Dragon motifs were used in rituals and important ceremonies to express reverence for natural deities and respect for the authority of the emperor. The phoenix motif represents good fortune and nobility and is often used on female objects to symbolize female virtue and honor. Phoenix motifs are also often found in rituals, reflecting the worship of female deities and the desire for a better life.

Yinshang society was a highly stratified society, and the use and combination of Yinshang bronze patterns reflected the strict social hierarchy. Nobles of different ranks used different patterns to show their status and position. When distinguishing social classes by the level of tattoos, the high-ranking nobles used complicated animal and mythological tattoos, such as taotie tattoos, dragon tattoos, phoenix tattoos, etc. These tattoos symbolized the highest power and status; the middle-ranking nobles used simple geometric tattoos and natural meteorological tattoos such as cloud and thunder tattoos, ring and belt tattoos, etc. These tattoos, although exquisite, were not as complicated as the tattoos of the high-ranking nobles; the tattoos that could be used by commoners were relatively simple and mostly reflections of daily life. Relatively simple, mostly realistic patterns of daily life, such as bird patterns, deer patterns. When distinguishing social classes by the combination of patterns, high-level artifacts usually adopt multi-level and multi-element combination composition, such as combining animal patterns with geometric patterns and natural weather patterns to form complex decorative effects; the combination of patterns on intermediate artifacts is relatively simple, mostly a single type of pattern or a small number of combinations; and the combination of patterns on common artifacts is even simpler, or even without complex decorations.

Yinshang bronze vessel patterns are not only decorative, but also a sign of cultural identity, which strengthens the cohesion of the community. These patterns were passed down from generation to generation and became a symbol of Yin Shang culture. The artisans passed on the techniques and cultural connotations of the patterns to the next generation through oral transmission. The patterns of Yin Shang bronzes from different regions have unique styles and characteristics, reflecting local cultural traditions and craftsmanship levels. Certain patterns became the symbols of specific communities, such as specific animal patterns or geometric patterns, which were widely used within the communities and enhanced the cohesion of the communities. Yinshang bronze patterns not only represented the identity of an individual or family, but also symbolized the entire Yinshang culture, through which people expressed their cultural identity and pride.

4 Application Methods of Gene Data Bank

Cultural gene data bank condenses the core elements of traditional culture, and the utilization of the genes therein can be based on the innovative path of gene recombination [9]. This kind of reorganization is not a simple patchwork, but based on the design gene theory, the visible elements such as explicit patterns, colors, bones and other visual elements, as well as implicit emotions, symbols, cultural connotations and other abstract elements are deconstructed and reconstructed, so as to give new vitality to the traditional cultural elements. After establishing the genetic data of Yinshang bronze pattern design, it is crucial to study in depth its excellent practice cases in contemporary design. By analyzing the successful applications of these patterns in cultural and creative products, architectural decoration, graphic design and other fields, we can systematically sort out the effective paths of gene transformation, and dig out the diversified possibilities of applying the Yinshang bronze pattern design gene in modern contexts. The results will summarize the application modes suitable for different design scenarios, and then provide ideas and suggestions with both theoretical depth and practical value for the innovative design of Yin Shang bronze ware patterns.

4.1 Deconstruction and Reconstruction of Elements Driven by Gene Recombination

After completing the systematic combing of dominant and recessive genes in Yin Shang bronze patterns, the core application strategy of the Gene Data Bank focuses on gene recombination. This process is not a simple collage of elements, but a modernization and translation of traditional elements through deconstruction and reconstruction based on the in-depth analysis of explicit genes such as patterns, colors and bone structures, as well as implicit genes such as cultural meanings and emotional symbols. For example, the symmetrical bone structure of Taotie pattern is extracted and combined with modern minimalist lines, while retaining its majestic and solemn cultural connotation; or the curved form of Yunlei pattern is abstracted and integrated into the dynamic effect of digital art, so that the traditional pattern meets the contemporary aesthetic demand

while maintaining cultural recognition[10]. Genetic reorganization emphasizes the organic fusion between elements, and allows traditional cultural genes to be revitalized in new carriers by adjusting proportions, changing materials, and innovating combination methods.

4.2 Multi-Case-Driven Exploration of the Application Path

In order to explore the application potential of Yinshang bronze pattern genes, its successful cases in contemporary design need to be systematically studied. Through extensive collection of practical achievements in the fields of cultural and creative products, graphic design, architectural decoration, digital media, etc., we analyze how the pattern gene is transformed in different scenarios. In cultural and creative product design, it is common to simplify the outline of the pattern, extract the iconic symbols such as the horns and eyes of the animal face pattern, and combine them with modern materials such as metal and resin to realize small and portable product forms[11]; in the field of architectural decoration, it is common to use the symmetrical composition and hierarchical relationship of the pattern, and to use the techniques of light and shadow projection and hollowing and carving to create a spatial atmosphere rich in historical heritage. By comparing the design ideas, technical means and market feedback of different cases, the general application path of “symbol refinement - functional adaptation - morphological innovation” is summarized, which provides practical experience for subsequent designs.

4.3 Practical Verification and Systematic Application Expansion

Putting the application methods formed by theoretical research and case summarization into actual design projects for verification is the key link to improve the application system of gene database. Through carrying out cultural and creative product development, brand visual design and other practices, user evaluation, market data and professional feedback are collected to optimize the gene recombination strategy and application mode. For example, if the cost of a cultural and creative product is too high due to the complexity of the pattern, it will be adjusted to simplify the design by extracting the core elements[12]; if there is a bias in the users' understanding of the cultural symbolism of the pattern, it will be strengthened to visualize the expression of the hidden genes. Based on the feedback from practice, we continue to iterate and optimize, and gradually build a complete application system of “gene extraction - restructuring design - practical verification - optimization and upgrading”. In addition, the research method and experience will be extended to other traditional patterns to provide universal solutions for the diversified application of traditional culture in modern design and promote the innovative development and sustainable inheritance of traditional culture.

5 Conclusions

Yinshang Bronze Patterns are the iconic cultural symbols of traditional Chinese arts and crafts, which record the historical process, carry cultural deposits and aesthetic values, and provide inspiration and innovation possibilities for modern design. In order to realize the combination of its artistic essence and contemporary aesthetics, designers need to deeply explore the classification and cultural connotation of patterns, not only to have a deep understanding of traditional Chinese culture, but also to integrate the traditional visual elements with modern design thinking, and to take the road of creation that respects the history and faces the future. During the process, designers should make use of the traditional cultural treasures, through decomposition, refinement, reorganization and other means of creative transformation, on the basis of inheriting the tradition, deconstructing and recreating patterns according to the modern aesthetics and personal creativity, to meet the needs of the current design. This can give new life to ancient patterns in modern design, promote the dialogue between traditional culture and modern society, produce works with characteristics of the times, enrich the public's visual experience, contribute to the inheritance and development of excellent traditional cultural heritage, and inject new vitality into modern design.

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