

Exploration the use of digital technology in the revitalisation design of Ming Dynasty's Yingluo jewellery

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Abstract. Buddhist art originated with the emergence of Buddhism and has experienced continual innovation and development throughout history. Yingluo jewellery was introduced to China from India, with its form continuously incorporating ancient Chinese aesthetics in its inheritance and development. The designs of Ming Dynasty's Yingluo jewellery exhibited a more secular and everyday trend. This article centres on the design of Ming Dynasty necklaces, using the Fahai Temple mural and the Yongxuan court statues as representative examples. The article summarises the distinct artistic features of Ming Dynasty necklaces and explores their aesthetics, focusing on three aspects: shape structure, colour matching, and pattern design. Additionally, 3D digital modelling is employed to revitalise and restore the necklaces' beauty. Technical abbreviations will be explained upon first usage, and the text adheres to standard academic formatting and language conventions. The objective is to enhance national cultural confidence, bridge the gap between cultural heritage, appreciate the allure of traditional art treasures, and revive cultural artifacts. The infusion of rich cultural nuances into contemporary jewellery design, integration of traditional artistic components into modern aesthetics, and merging exceptional Ming Dynasty necklace works with contemporary aesthetic context, facilitates the seamless integration of outstanding culture into contemporary society.

1 Introduction

1.1 Definition and Classification of Yingluo

The word "Yingluo" is translated from the Sanskrit word "Keyura", meaning jewellery worn on a string, and originated in ancient India as a type of jewellery used by the nobility to adorn their bodies. In the first volume of the "Sutra of the Buddha's Walk", it is mentioned that before Sakyamuni shaved his head to become a monk, he used Yingluo to decorate his body, so Yingluo all over the body" became popular in early India.

In the Han Dynasty, the necklace was introduced to China along with Buddhism, and with the secularisation of Buddhist art in ancient society, it developed into an ornament worn by secular women. There is a reference in the Buddhist scriptures: "It is made of seven precious materials: pearl, agate, coral, amber, gold, silver and glass." This suggests that the main materials used in the necklace are precious gems from around the world. The Dharma Sutra of the Great Collection of the Moon records: "Necklaces, natural treasure hairpins, celestial necklaces, finger rings, treasure cover flags, hand bracelets, foot chains, arm chains, and other magnificent items are hung from the sky above the Buddha's head, and even various songs and dances are offered to the Buddha." It can be concluded from this that Yingluo does not just refer to neck jewellery, but

also includes accessories for decorating the head, arms, feet and wrists, all of which fall under the category of Yingluo and are intended to be worn as a set.

1.2 Origin and Development of Yingluo

In the early days in India, the necklace was specifically referred to as a circular necklace. In the 6th century BC, Buddhism was born in India. From the birth of Buddhism to the Gupta era, the necklace can be divided into several shapes, such as sitting, intertwined, disc, oblique and hanging. In the early Buddhist statues, the necklace was relatively rough and unrestrained, with a relatively robust shape. In the Yungang Caves of the Three Kingdoms, Jin Dynasty, Northern and Southern Dynasties, the style of the necklace developed into two new forms: the collar and the pearl string. Influenced by the style of the Xianbei ethnic group, the style of the necklace also had a rough and heavy overall characteristic. During the Sui and Tang dynasties, ancient Chinese feudal society flourished, and Buddhist art also reached its peak, gradually merging with local styles. In the late Tang Dynasty, the deep influence of Buddhist culture made the necklace an important female accessory. Under the strong promotion of Tibetan Buddhism in the centralised power of the Yuan Dynasty, Tibetan Buddhism spread further, and there was a collision and blending with the aesthetics of local

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Buddhist statues, making the necklace of this period a fusion style of Han and Tibetan. This style was relatively well preserved until the Ming dynasty, with the most typical example being the necklace shape in the Yongxuan court statues and Fahai temple murals.

1.3 Status of research at home and abroad

The development of Yingluo cannot be separated from the cultural soil of ancient society. Its stylistic changes reflect to some extent the development and changes of Buddhism in Chinese society, as well as the aesthetic changes of the people. In the Ming Dynasty, Buddhist art showed a more secularised and localised trend, and a large number of outstanding artistic relics were created during this period.

At present, there are many articles and materials on Yingluo at home and abroad, but most of the research topics focus on the form, pattern, source and classification of ancient Yingluo, and few articles on the activation of Yingluo. For example, Bai Huawen's "Yingluo, Huaman and Zhu Zhu" is the earliest article to study Yingluo [1]. Xu Xiaodong and Zhou Lin focused on the Liao Dynasty to study the shape and composition of ancient jewellery found in the Liao and Mongol regions. Rennai Maimaiti conducted a brief study of the patterns in the original Buddha's action scripture transformation map in the 20th cave of Baizekeli [2]. Through "the analysis of the case of the Buddha's Original Scripture Variation in Cave 20", the cultural heritage contained in the material and pattern of the necklace is briefly described. Xu Yanyan's M.A. thesis and Ph.D. dissertation both focus on the Bodhisattva necklace in the Mogao Grottoes during the Middle Ages [3].

There is little international research on traditional Chinese Buddhist garlands. Japanese researcher Masae Tanoshita's 1969 study of the X-shaped garments and central ring decorations of bodhisattva statues was the earliest foreign research on Chinese garlands. In the 1990s, Hatsuharu Hachimitsu explored the topic in greater depth [4]. Later, Seiichiro Matsuda of the University of Tokyo compared Japanese Heian-era bodhisattva jade necklaces with those of the Sui and Tang dynasties of the same period, and explored the development of jade necklaces in the early Tang dynasty [5].

Jia Xiaoxuan's paper "Research on the Application of Dazu Rock Carvings in Jewellery Design" discussed the wreaths in Dazu rock carvings from the perspective of jewellery design [6]. Han Lingzhi's paper "The Pearl and the Lace with Wind and Falling - A Study of the Lace in the Frescoes of Fahai Temple" focuses on the localisation characteristics of the lace in the Fahai Temple frescoes, analyses the types and materials of the laces worn by the characters in the Fahai Temple frescoes, and explores the localisation of Buddhism and the reasons beyond Buddhism [7]. The Role of the Production of Yingluo in the Fahai Temple Frescoes. For the author, the activation of the Ming Dynasty's Yingluo has a certain reference significance.

2 Figures and tables Research and Revival of the Yingluo in the Fahai Temple of the Ming Dynasty

2.1 Formatting the text The shape of the necklace in the Fahai Temple fresco

Fahai Temple, formerly known as Longquan Temple, is located at the southern foot of Cuiwei Mountain, 20 kilometres outside of Beijing. The murals in the temple were painted by 15 painters in 1443, and their artistic achievements represent the peak of Buddhist art in the Ming Dynasty. They occupy an important place in Chinese mural art.

The clothing of the Buddhas and gods in the frescoes of Fahai Temple integrates Indian style and Chinese secular aristocratic clothing style. The shape of the garland they wear is meant to reflect this feature, which is highly humanistic and a typical manifestation of the secularisation of Buddhist art in the Ming Dynasty. The most outstanding of the frescoes are the three Buddha statues of Manjusri, Samantabhadra and Avalokitesvara, all of which are located behind the fan-shaped wall of the main hall. The statue of Avalokitesvara wears a set of ornaments consisting of a crown, necklace, earrings, bracelets, a garland worn on the chest, an ankle bracelet and a belt. The ornamentation on the bodies of Samantabhadra and Manjusri, similar to the accessories of Avalokitesvara, weakens the original regulations in the Buddhist scriptures and presents a harmonious and unified aesthetic concept. Reflecting the style of the Ming Dynasty, it allows more people to understand the exquisite cultural heritage.

2.2 The Activation Thought and Process of the Yingluo Accessories of Shuiyue Guanyin of Fahai Temple

The activation object is selected as the necklace attached to the body of the Water Moon Guanyin, and the activation method is to make the necklace in the mural into a physical object, which achieves a high degree of form restoration. The Fahai Temple Mural is well preserved and the image data is also complete, which is of great significance for research. The fine workmanship of the painter, many details are vividly depicted, and the expression of texture in the restoration process makes it easy to assess the material. At the same time, the logic of physical production is different from that of painting, and painting does not need to take into account all the physical properties, such as the load-bearing capacity of the parts, because the force changes the shape of the necklace in its natural state. It is also necessary to consider whether many exquisite designs are feasible for technical reasons.

The entire Yingluo group can be divided into two parts according to the process:

The first is the part that requires metalworking to complete. For the production effects, it is necessary to use digital modelling and printing to achieve a unified

and harmonious colour and texture, and to maximise the restoration of the style of the water moon film Ying Luo.

The author divided the whole set of earrings into 42 groups, and carried out two steps of hand painting and modelling, as shown in Figure 1. Based on their connection with the surrounding beads, the shape was adjusted to restore the appearance as much as possible while ensuring functionality. At the same time, the proportions of the components to the body were compared and the specific dimensions of each part were calculated. The agate inlaid on the metal was chosen as the ring shape, and the flower-shaped connector was made with UV glue on the metal base to create the appropriate shapes and colours.



Fig. 1. Schematic diagram of hand drawn part numbering and connection and Modeling rendering diagram

The greatest difficulty during the production process is the repeated adjustment and trial and error of the dimensions. On the one hand, it is necessary to consider the restoration of the original proportions of the garland on the mural, and on the other hand, it is necessary to consider the wearability of the final product in terms of weight and size. It is necessary to modify and print several times in 3D modelling software before finalising the design. The specific modelling is shown in Figure 2.

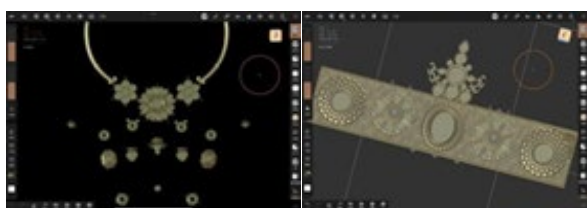


Fig. 2. 3D Modeling of Partial Metal Components

The second part is the series, consisting mainly of red and black gemstone beads and gold beads. The choice of materials was based on the colours presented in the mural and related records in the literature. Firstly, the seven treasures mentioned in the Buddhist scriptures were considered, followed by the bead decoration combinations commonly used in the secular world at the time. After conducting a purchase survey of some of the bead decoration materials available on the market, the red and black beads were determined to be agate, with through-holes and half-holes of 8, 10 and 12mm in size.

The gold beads are copper plated with 18k gold and have a matt finish. The size is between 4-5mm and the necklace is over the necklace. The necklace uses 6mm turquoise beads. The final modelling and printing part consists of 37 groups, which are the main body connected by gold beads. The earrings, bracelets and anklets are replaced by similar finished or semi-finished products, which are used only as props for the shoot and not for exhibition. The finished product is shown in Figure 3.

In the process of trying to restore the physical object, the author gained a deeper understanding of the exquisite details of the murals in the Fahai Temple. More than 1,400 beads of the whole body of Water and Moon Guanyin were meticulously depicted, with a patchwork of sizes and colours. In addition to beads and metal pieces, there were also silk fabrics, showing the elegant feeling of the garland. This combination of gemstones, precious metals and cloth is beautiful and dynamic, combining "garland" and "silk". In addition, the form of the knee-length necklace also began in the late Tang dynasty, which is also a manifestation of the localisation of the ornamental art of the necklace [8].



Fig. 3. Finished Picture of the Restoration of Accessories for the Shuiyue Guanyin Yingluo Group in Fahai Temple

3 Research and Activation of the Ming Dynasty Yongxuan Court Statues

3.1 The Design of the Garland in the Ming Yongxuan Court Statues

The Ming Yongxuan court statues are a general term for a group of court Buddhist statues made during the Yongle and Xuande periods. During this period, there was frequent communication between the Central Plains and Tibet, and the central government's emphasis on the Tibetan region made these court statues, which were given as gifts to Tibetan Buddhist leaders who had submitted to the central government, each of precious materials and exquisite craftsmanship, with a style that combines Han and Tibetan styles. They can fully reflect the aesthetics and casting techniques of the time and are of great importance for the study of traditional Buddhist statues in the Ming Dynasty. By studying the style of the garland on the statue of the Bodhisattva Avalokitesvara in the Ming Dynasty, we can see that the stylised garland

pattern does not completely follow the style template of either the Han or Tibetan regions, but rather combines the strengths of both regions, integrating the subtle and gentle style unique to Chinese Buddhism with Tibetan Buddhism to create an innovative and inclusive style.

The beads of the Yongxuan statue in the Ming Dynasty maintained a symmetrical structure throughout the entire form, giving the beads a solemn and dignified appearance. The shape remained a unified structure, with only subtle changes in detail. This symmetrical shape can be visually perceived in the diagram of the beads of the Yongxuan statue compiled by the author (Figure 4). This feature gives a stable tone to the necklace, allowing the beads to retain their shape even during changes. It is enough to show the rhythmic sense of the combination of harmonious movement and stillness. From the perspective of the shape of the local part of the net structure, the bead chain is usually composed of two layers of parallel bead patterns stacked and combined, with a group of small U-shaped beads repeatedly arranged in four groups, forming a net structure like a flower petal in full bloom. This layered combination and repeated arrangement of shapes creates a visually complex, ordered, solemn, austere and rhythmically dynamic feeling. This combination of mesh structure and line form was continued and developed in later bead design.



Fig. 4. Standing Statue of Guanyin Bodhisattva in Qinghai Museum Collection

3.2 The Idea and Process of Activating the Ming Dynasty Guanyin Statue and the Ornament of the Yingluo

In this activation attempt, the author chose as a prototype the typical pattern of the garland worn by the standing statue of Guanyin Bodhisattva in the Qinghai Museum (see Figure 5). As the Yongxuan court statues are basically gilded bronze statues with no colour painting, only modelling, this adds a certain difficulty to the restoration. In terms of colour and the material reflected by colour, the author refers to the style of the garland in the Fahai Temple of the same period.



Fig. 5. Diagram of the Yingluo Formation of Yongxuan StatueYingluo Group in Fahai Temple

3.2.1 The Colour Reference of the Standing Statue of Guanyin Bodhisattva in the Ming Dynasty

The murals in the temples of the Ming Dynasty are mainly red and green, while the murals in the Fahai Temple are based on the greenish-blue tone of the murals of the Yuan Dynasty, using contrasting colours such as vermilion, lapis lazuli and golden yellow, which were favoured by the royal family. The garlands worn by the Bodhisattvas are enhanced by the techniques of powder coating and gold embossing, giving a sense of richness and three-dimensionality to the overall colour, presenting a sumptuous and oriental aesthetic style. The colour used in the Fahai Temple murals is inextricably linked to the traditional Chinese concept of the five colours[9]. In the traditional Chinese colour concept, pure colours represent noble colours, while vermilion, lapis lazuli and golden yellow represent base colours. The use of pure colours is precisely to emphasise the noble status of Buddha and Bodhisattva.

3.2.2 The Design of the Activation of the Standing Statue of Guanyin Bodhisattva in the Ming Dynasty

In the process of this activation, the author selected the typical patterns of the garlands worn by the standing statue of Avalokitesvara Bodhisattva in the Qinghai Museum, continued the red and green colour matching in the murals of the Fahai Temple, and selected not only the seven Buddhist treasures in materials, but also hotan jade and fritillaria with stronger luster. For the beads used for decoration, the size design was more biased towards the needs of the wearer, choosing smaller red agate, striving to restore the style and charm of Ming Dynasty necklaces while combining them with contemporary aesthetics, making them lighter in texture. The whole process is divided into: drawn design sketch (see Figure 6), 3D modelling of the metal piece and repeated adjustment of size and length (see Figure7), Cutting and embedding of the inlay, beading and integration. Finally, after a two-month production process, the work was completed. This work continues the style of the Ming Dynasty Yingluo composite inlay, combining pearls, gilded copper lotus components, red

agate, green jade, mother-of-pearl materials, solemn and magnificent yet agile(Figure8).

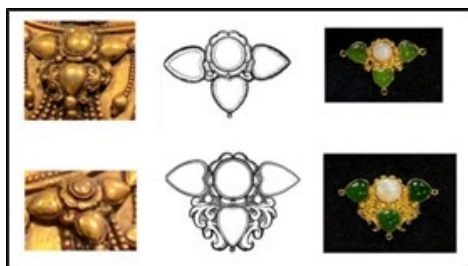


Fig. 6. Statue of Guanyin Bodhisattva (Qinghai Museum Collection) with Yingluo Patterns

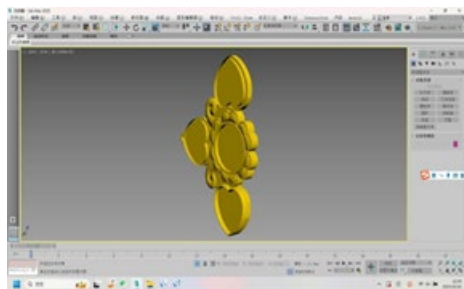


Fig. 7. 3D Modeling of Lotus Pattern Metal Partss

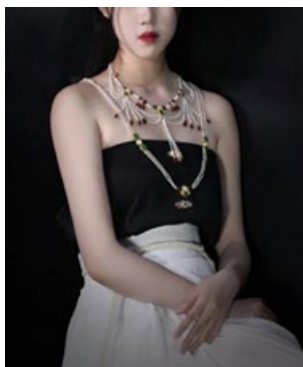


Fig. 8. Wearing Picture of the Ming Dynasty Avalokitesvara Bodhisattva Statue with a Restored Yingluo Object

4 Conclusion

Yingluo was originally an Indian decorative art, and since its introduction to China, it has been deeply influenced by traditional Chinese customs and culture. The Ming Dynasty Yingluo expressed its own charm through a unique artistic language with diverse characteristics, integrating the local art and culture of the Central Plains, ancient India, and foreign influences from western regions. It became an important decoration with rich ethnic cultural connotations in China, showing historical customs and the style of the time. It can better reflect the aesthetic trends of the society at that time and is of great significance for archaeology, art, sociology and religious studies.

As early as the mid to late Tang dynasty, there was a trend towards simplification and secularisation in the form of Yingluo. At that time, artisans combined the

aesthetics of Tang Dynasty society to innovate and design the style of Yingluo in Buddhism, improving it into a style suitable for women's everyday wear. By the Ming Dynasty, the popular form of the collar had become simpler. The continuous simplification of the form of the wreath is aimed at making it more suitable for the needs of secular life. This change reflects the activation of the Buddhist wreaths by the craftsmen of the time, which maintained a balance between their religious significance and their everyday wearability.

Today, our revitalization and research on Ming Dynasty Yingluo jewelry, on the one hand, is to establish sufficient national cultural confidence, deeply understand the characteristics and deep cultural connotations of the highest standard of Ming Dynasty Yingluo, narrow the distance with cultural heritage, understand the charm of traditional art treasures, and truly "live" cultural relics. On the other hand, it is possible to infuse rich cultural connotations into modern jewellery design, integrate traditional artistic elements into modern aesthetics, and combine the outstanding works of Ming Dynasty Yingluo with the contemporary aesthetic context to create Yingluo jewellery in line with the trend of the times, allowing excellent culture to flow like blood in contemporary culture.

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