

EARLY CHINESE FAIENCE AND GLASS BEADS AND PENDANTS¹

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The earliest Chinese beads and pendants were composed of faience and appeared during the early Western Zhou period, around the 11th Century B.C. True glass began to be made about the time of the Spring and Autumn period (771-467 B.C.). An amazing variety of beautiful “dragonfly-eye beads” appeared in China during the Warring States period (475-221 B.C.), but these were imported and not local products. The complex eye beads were replaced during the Han dynasty (206 B.C.-A.D. 220) by small, plain glass beads generally intended to be strung together. Perforated glass ear spools were also popular during this period and were sometimes adorned with bead strands. Small glass stringing beads as well as other forms continued in use in subsequent dynasties, as did various types of pendants. During the Ming dynasty (1368-1644), glass was used to produce beautiful imitation jade objects including fanciful compound pendants. These were often finely carved and exhibit a high level of craftsmanship.

INTRODUCTION

Glass becomes an inorganic liquid substance after quartz grains are fused at high temperatures. After cooling, it does not acquire a crystalline structure. Glass can be described as still being a type of liquid at room temperature, and some even feel glass is a fourth state that is neither solid, liquid, nor gas. The earliest glass appeared around the 30th century B.C. in the area encompassing Mesopotamia and Syria. This type of primitive glass is called “faience” by modern scholars. True glass appeared around the 15th century B.C. in the same area. Before the appearance of faience, the Badarian culture of pre-dynastic Egypt ca. 3200 B.C. already knew how to use similar faience materials to cover talc beads and fire them to create colored glaze. This faience coating can be said to be the earliest man-made glass substance. Ancient Western legends tell of sailors accidentally producing glass when cooking on a sand beach, but this story does not appear to be historically valid because glass was created after continual improvements in the quality of faience led to a composite man-made material; this process was not accidental.

Early glass is only found in objects such as simple beads and rods. During Egypt’s 18th dynasty, Pharaoh Tuthmosis III (1490-1437 B.C.) attacked Syria and his territory then extended to the border of Mesopotamia. This is when more complex shapes and glass containers entered Egypt. The Chinese discovered glass more than a thousand years after the West. The earliest Chinese faience-style glassware appeared in the early Western Zhou period or slightly earlier, around the 11th century B.C., and true glass was not created in China until much later.

Glass is a silicate whose main component is silicon dioxide (quartz). The melting point of quartz is 1,700°C, a temperature which cannot be reached using ancient kiln technology. Consequently, various fusing agents and combinations thereof were used to lower the melting point of the quartz. Ancient Egypt and most of Mesopotamia used pure natural bases such as soda (Na) and lime (Ca) which produced a soda-lime (Na-Ca) glass. Although there are exceptions, this was the main type of glass.

The earliest genuine Chinese glass appeared around the Spring and Autumn period (771-467 B.C.). It was produced from quartz granules mixed with minerals containing lead (Pb) and barium (Ba) which acted as the fusing agents. This glass is called lead-barium or Pb-Ba glass. Chinese glass from the Warring States and Han dynasties is mostly Pb-Ba glass, so its composition is entirely different from that of imported glass.

Ancient Chinese glass has always been seen as coming from outside of China. In the early 20th century, British scholars analyzed the composition of some ancient Chinese glasses and found that the materials used were entirely different from Western glass. This reveals that the Chinese knew how to make glass since ancient times and refutes the theory that Chinese glass was always imported from the West. This changed the history of Chinese glass.

Chinese archaeology has rapidly advanced in recent years and much Chinese glass has been excavated. Much of this has undergone energy dispersive x-ray fluorescence

spectrometry (EDX) which has provided a preliminary outline of the changes in the chemical composition of Chinese glass. Actually, Chinese glass, apart from the widespread use of Pb-Ba glass from the Spring and Autumn period to the Han dynasty, was continually changing. This may be the greatest difference between Chinese and Western glass and is the single most important characteristic of Chinese glass.

The principal use of Chinese glass was as decoration and it was used because of its bright colors and moldability. A large amount of jewelry and other objects were created, and even though these items were not usually highly valued, they have remained an important part of Chinese craftsmanship. Therefore, research into ancient Chinese glass has been related to the important topics of ancient dress, fashion, foreign trade, and cultural exchange.

GLASS AND FAIENCE

In ancient China, glass was called *biliuli* or *liuli* for short. *Liuli* came from a foreign language and its earliest use as a noun in ancient texts must be Heng Kuan's (Western Han dynasty; 206 B.C.-A.D. 25) *Discourses on Salt and Iron*: "Precious hides, colorful banners, and tapestries filled the mansions, and jade, coral, and glass were the state's most treasured objects" (Huan Kwan n.d., 1). The *Book of Han, Western Regions* (vol. 96) states that "glass... comes from... the state of Jibin" (present-day Kashmir). The *Book of Han, Geographical Records 2* (vol. 28, Xia) reveals, "From the state of Gandulu [near Myanmar] boats travel for around two months, and the state of Huangzhi [in India]... has made offerings since Emperor Wu's time. There were official interpreters who, along with recruits, sent in sea pearls, glass, precious stones, and strange objects." These writings reveal that glass was imported into China. Excavated materials indicate that the earliest Chinese glass appeared during the Western Zhou dynasty (1100-771 B.C.), and genuine, mature glass products began to appear around the transition from the Spring and Autumn period to the Warring States period (ca. 475 B.C.). Why was glass not mentioned in writings before the Western Han dynasty? Some believe that in this passage from the *Book of Shang, Yugong*, "Yongzhou, of Xihe, Heishui... offered *qiulin* and jade-like stones," *qiulin* is glass. The *Erya shidi*, vol. 9 of China's oldest-known encyclopedia, mentions that "*qiulin* and jade-like stones of Kunxu are the beauties of the Northwest." The following volume, *Erya shiqiu*, however, defines *qiulin* as jade, so whether or not *qiulin* meant glass in ancient writings is still a mystery. After this period, the number of alternative words for *liuli*, or glass, multiplied: *biliu*, *luli*, *lulin*, *poli*, *guanzyu*, *guanyu*, *yaoyu*, etc. Many scholars have examined these names in detail so I will not repeat their findings here.²

Most modern scholars think *liuli* or *biliuli* comes from the Sanskrit *vaidurya*, but to say that the words *biliuli* and *liuli* came from the pronunciation of *vaidurya* seems a little far-fetched. The 1st-century-B.C. Roman architect Vitruvius Pollio called glass *caeruleum* in his writings (Nicholson 1993:16), and this may be the origin of *biliuli*, *liuli*, *lulin*, or *luli*. Many glass objects were imported from Rome during the Han dynasty, and it would have been natural to call it *biliuli* or *liuli* for short in the local dialect. This name for glass seems to not have been used before the Western Han dynasty.³

"Faience" originally referred to a type of blue-glazed ceramic that came from Faenza, Italy, in the Middle Ages. Europeans discovered that the color of these ceramics was similar to that of a type of "primitive glass" that the ancient Egyptians made, so they called it faience. After this, faience became the name for the man-made "primitive glass" material found in Mesopotamia (Nicholson 1993:9). Even though the process of making faience is different from that of glass, their components are largely the same. There is only a small difference in the amount of fusing agents used and the temperature at which they are fired. This is why faience is rightly called the predecessor of glass, or "primitive glass."⁴

There is a long history of faience production in Mesopotamia and Egypt, which originated in the pre-dynastic period (5500-3050 B.C.) of ancient Egypt, nearly 2,000 years before the appearance of "primitive glass" in China. The appearance of both types of faience are extremely similar and their relationship is worth investigating.

The process of producing faience in ancient Egypt can be divided into three parts: making the body, applying the glaze, and firing. The core ingredients of faience are soda, lime, and quartz granules; i.e., $\text{Na}_2\text{CO}_3 + \text{CaO} + \text{SiO}_2$. According to Pamela Vandiver's research on ancient Egyptian faience, the amount of quartz (SiO_2) can reach 92-99%, CaO 1-5%, and Na_2O 0.5-3%, with trace amounts of other substances (Nicholson 1993:9). After the body is formed, it is dried, reworked, and then glazed. The glaze is also a soda+lime+quartz mixture (i.e., the components of Na-Ca glass), and copper ore is added as a colorant. Its chemical makeup is basically the same as that of the body, but the surface is smoother. After the glazing material is ground to a powder, it can be applied in several ways (Nicholson 1993:11-14) (Figure 1):

1. Efflorescence. The raw materials are mixed with water and after they are formed into the desired object, it is placed in a dark place to air dry. While drying, a part of the "salt" will crystallize on the surface. During firing this will combine with the quartz grains to form a shiny layer.

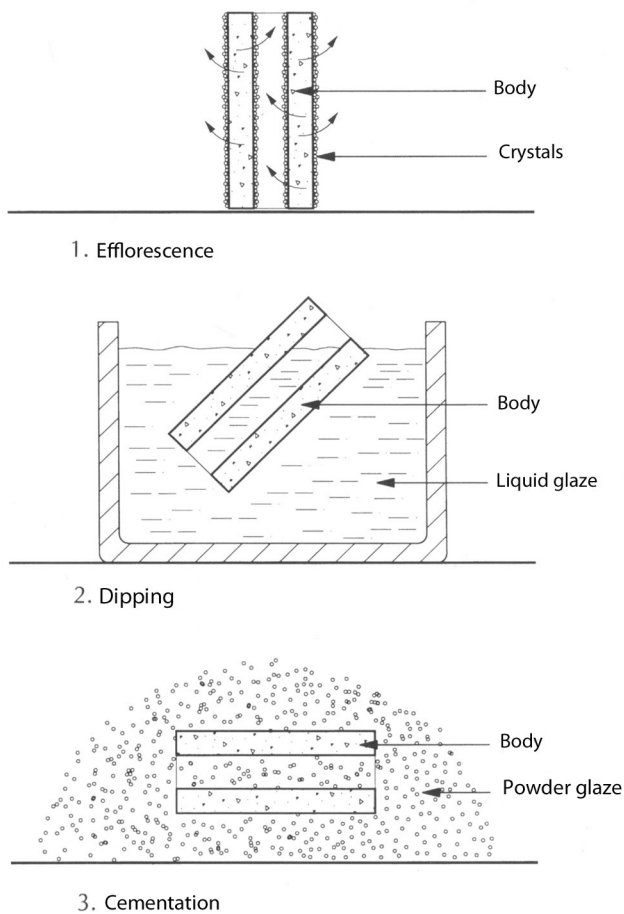


Figure 1. The techniques of applying glaze to faience.

2. Dipping. After the molded faience air dries, it is dipped in a pool of glaze (or it is painted on) in the same way that ceramics are dipped in glaze.

3. Cementation. After the faience air dries, it is embedded in finely ground powdered glaze and the whole thing is fired. The glaze adjacent to the object bonds to it while the rest does not and can be easily cleared away after firing.

These three methods of glazing produce different effects. With efflorescence, the glazed surface is rather thin. In the case of dipping, the glazed surface is thicker and glaze trickles can be seen on the surface. With cementation, the glazed surface is uneven and the areas that were closer to the fire are thicker than those further away. Also, the division between the glaze and the body is apparent and there is no “transition” area. The glaze on Chinese faience is smooth and even, and seems to have been applied by dipping.

Ancient Egyptian faience was fired at 800-1,000°C, the quartz grains exposed to the heat fusing more than those in the core. Usually the glaze on faience is fine grained and,

with the addition of coloring agents, has a shiny appearance. The materials in the core are coarser, have a loose structure, and are greyish-white in color. From cross sections it can be seen that there is a clear division between the body and the glaze. In comparison, the cross sections of genuine glass objects are smooth, there is no division between the body and the glaze, and there are no grains.

Quartz melts at around 1,700°C which was unobtainable with ancient technology. With the right fusing agent, this can be lowered to 1,200°C, but the highest firing temperature achievable for ancient faience was 1,000°C, so only a small portion of the quartz granules could fuse to form glass, and most of the granules remained and can be seen with a microscope. Therefore, faience can only be called “primitive glass,” “half-glass,” or “crystalline quartz that used its glass phase as a bonding agent” (Zhang Fukang et al. 1983:75). Furthermore, the production of faience objects was basically done through firing, similar to ceramics, so it cannot be called “glass.”

Ancient Egyptians used faience to create many kinds of objects and used them for 1,500 years. Authentic glass did not appear until the New Kingdom period (1750-1070 B.C.), although the precise date has not yet been determined. Genuine glass uses heated glass materials to form objects so the raw materials must go through an intermediary process of production; in the West this is called “fritting.” In this process, the quartz grains and fluxing agent are melted at a temperature of around 700-850°C. The quartz (SiO_2) receives the fusing effect of plant ash (K_2O) or soda (Na_2CO_3) and the lime substances (CaO) in the granules, and begins to soften to form a sodium silicate substance. After cooling, the excess material at the base and the bubbles at the top are removed and the fritting is complete. After the fritted material is purified in an oven, and heated to over 1,000°C, the bubbles in the material disappear, and coloring agents and opacifiers or clarifiers are added to produce genuine glass. When the materials are placed in a mold and cooled, glass ingots, rods, and other shapes can be created, so that glass workshops can form them into objects; during the Qing dynasty these glass pieces were called “materials.”⁵

Modern glassmaking uses basically the same principles, but with slightly different fusing and coloring agents, and the firing temperature is higher (around 1,500°C). The major difference between faience and genuine glass is that with genuine glass objects, the glass materials are melted and worked while hot, whereas faience objects are made by shaping materials in a cool state and then firing them.

Primitive Chinese glass from the Western Zhou period was created by fusing quartz granules. This is basically the same technology used to produce faience and the external

appearance is very similar to that of faience beads from Western Asia. The author's collection includes a green-turquoise tube-shaped bead from China whose body and glaze layers have clear divisions. The body is greyish white, the glaze is light green, and it clearly has the characteristics of faience.

A large find of "primitive glass beads" from a Western Zhou Yu tomb was found to be "quartz crystals and glass, with the former in a majority" by the State Construction Commission Academy for Building Materials (Yang Boda 1980:17). The silicate laboratory at the Beijing University of Technology found that "the clay has silicon materials in it... that have been burnt" (Yang Boda 1980:17). These studies show that the early glass beads from the Western Zhou dynasty used faience technology for shaping objects from quartz granules, then firing them. This was not glass produced from bronze metallurgy or ceramic technology that took shape only after heating. Western Zhou faience technology could not have been suddenly discovered locally and must have had ties to Western Asia. The technology required to make faience did not require any special tools and the raw materials needed could be readily found. Based on the level of craftsmanship during the Western Zhou dynasty, there would be no problems posed by oven technology; they would only require someone to come and tell them the secret of how to do it. After simple testing, they could have found a suitable local fusing agent and begun producing large amounts of faience objects. So primitive Western Zhou glass beads derived from local faience that used foreign technology. Because of this, these objects must have held little value, and are found in great numbers in the tombs of ordinary people.

Thousands of faience beads have been excavated in China. The main discoveries include: Zhongzhou, Luoyang, Henan, 1954-1955;⁶ Shangcunling, Shan County, Henan, 1955-1977;⁷ Zhangjiapo, Fengxi, Shaanxi, 1955-1957;⁸ Pangjiagou, Luoyang, Henan, 1964;⁹ Qiejiazhuang, Baoxi city, Shaanxi, 1975;¹⁰ ancient Lu city Qufu, Shandong, 1978;¹¹ and Western Zhou or Former Zhou tombs in the Zhou plains area of Shaanxi (Yang Boda 1980:14). These

beads are from the Western or Former Zhou period to the late Western Zhou period – a span of around 500 years – and are dispersed throughout the narrow central plains corridor from west to east. The spread from west to east is in accordance with the movement of the Zhou peoples (Yang Boda 1980:14).

According to chemical analyses performed by Zhang Fukang and others from the Shanghai Silicate Research Institute, the Western Zhou glass beads from Luoyang, Henan, "mainly used K_2O as a fusing agent, occasionally contained small amounts of Na_2O , and mostly used CuO for coloring" (Zhang Fukang et al. 1983:71). This composition is different from that of Egyptian faience which mainly used CaO as a fusing agent and did not include K_2O . This shows that primitive Western Zhou glass beads were made from locally produced K_2O (Table 1). They can be seen as faience with Chinese characteristics, or "Na-K faience," to be more precise.

After the Spring and Autumn period, the chemical composition of "faience" tube beads underwent a major change with Na-K fusing agents being replaced by Pb-Ba agents. This change improved the function of the fusing agents and led to improved vitrification of the beads, but the production process remained the same as that for faience and the material may be called "Pb-Ba faience."

Ancient glass beads were made by winding molten glass around a rod and then rolling them on stone or metal surfaces to shape them. In the West these beads are referred to as "wound." Chinese glass beads made by winding were popular during the mid- to late Warring States period. Beads before this time was mostly "faience." Some feel that the use of barium (Ba) in the earliest Chinese Pb-Ba glass was intentional,¹² while others feel it was not, simply being an associate of the ancient Chinese lead ore, galena, that could not be isolated and removed (Li Xiaocen 1996:147). It has yet to be determined which of these viewpoints is correct, but barium is extremely rare in Western Zhou glass, and even though lead is occasionally found in some local products, it is also very rare. Western lead glass was not widely used until the 17th and 18th centuries, so there is no dispute that the Pb-Ba glass objects from China were locally produced.

Table 1. Comparison of Egyptian Faience and Chinese Glass.

	SiO_2	Na_2O	CaO	K_2O
Egyptian faience (Nicholson 1993:9)	92-99%	0.5-3%	1-5%	–
Western Zhou glass beads, Luoyang, Henan	>90%	1-2%	0.4%	3.4%
Western Zhou glass tube beads, Luoyang, Henan	Large amount	0.64%	0.35%	1.3%

CHINESE FAIENCE

Chinese faience beads are characterized by their uniform shape, dull color, and small size. They are predominately turquoise and deep green; other colors are rare.¹³ Western Zhou faience bead shapes commonly seen are tubes and round, abacus, and olive-shaped beads; only a small portion of the beads have shapes that are more complex. In terms of quantity, more than 20 faience tubes and beads were unearthed in three early Western Zhou or Former Zhou tombs (tomb numbers unknown) at Beilü village, Shangsongshe, Fufeng County, Shaanxi, and a thousand tubes and beads were unearthed in a Yu tomb from the earlier part of the mid-Western Zhou period. Here the basic tube, round, and abacus shapes are already present, and their craftsmanship is relatively complex. One type of faience bead from the Yu tomb has three to four nodes on it, and one oval bead has as many as 24. Each bead type in Figure 2 (Wang Shixiong 1986a:131-132) lasted until the Spring and Autumn period. Fifty-six faience tubes were unearthed at late Western Zhou tomb no. 5 in Yuntang, Fufeng County, Shaanxi, of which nine were faience tubes decorated with three to four nodes (Yang Boda 1980:21). Similar faience beads were unearthed in several Spring and Autumn tombs at Xiasi, Xichuan, Henan: 16 from tomb M1, 11 from tomb M2, and 5 from tomb M3 (Henan Sheng Wenwu 1991:23, 102, 203, 238).

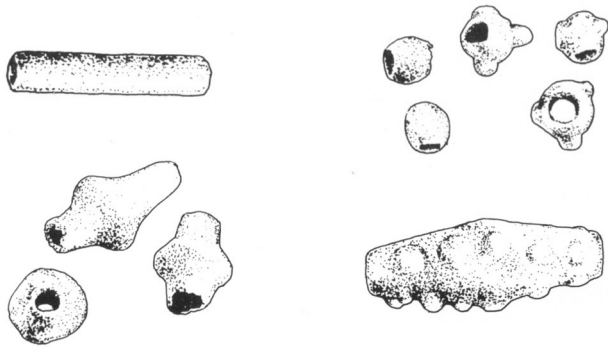


Figure 2. Western Zhou faience tube and beads from a Yu tomb (tube, round, rhomboid, and oval with nodes) (Gan Fuxi 1986).

Apart from tubes and beads, faience inlays were found in the tomb of the Earl of Yu's wife, Jingji, which had "different sizes, lengths, and thicknesses: 0.7-0.95 cm long, 0.17-0.2 cm wide, and 0.05-0.08 cm thick" (Yang Boda 1980:16). Like the faience tubes and beads, the inlay pieces are small in size. The longest faience tubes are only a little over 2.0 cm long, with diameters between 0.2 and 0.5 cm. Olive and abacus beads have diameters mostly between 1.0 and 1.6 cm and lengths of 1-2 cm. The 24-node faience beads from the Yu tomb are 3.0 cm long and 3.5 cm in diameter,

and have holes 0.5 cm in diameter with 0.8-cm-thick walls. The tools required to produce these small ornaments were very simple and the end products were very simple as well. Chinese people used faience for approximately 500 years, but it was only popular for about 300 years during the mid-Warring States period on the central plains, before it faded from the scene.

In archaeological contexts, Western Zhou faience beads are generally found with jade and agate tubes and beads associated with human skeletons. Combinations of the beads and tubes were used to form small decorative elements which were duplicated and then connected to form a larger beaded ornament. Many changes in chest and neck ornaments and accessories occurred throughout the Western Zhou period. Many types of materials were used and the beads were relatively large in size. One often-used and colorful combination included red agate tubes and beads along with blue and green Western Zhou faience. This type of combination has been found in an Early Zhou or Former Zhou tomb in Fufeng, Shaanxi, and many groups of similar beaded ornaments were found in the Yu tomb.

Beadwork ornaments at Guo tomb no. 1647 in Shangcunling, Henan, were found around the wrists of a skeleton and included 23 bloodstone tubes, 3 stone tube-shaped beads, 1 jade bead, 9 faience tubes and rhomboid beads, and 1 jade silkworm-shaped decoration. Two ornaments at Guo tomb no. 1714 were found near the skeleton's legs, of which no. 1714:19 was composed of eight rhomboid faience beads and four stone tube-shaped beads. A piece of beadwork composed of three faience abacus beads was found next to each ear of the Guo tomb skeleton. A more complete composition was found in the Marquis of Jin's Tomb, Beizhao village, Quwo County, Shanxi. The upper portion consists of a trapezoidal jade pendant which has six small holes at the top to which six strands of beads are tied. The bottom of the pendant has 10 holes from which hang long beaded strands. The entire piece consists of a jade pendant, 375 agate tube beads, 108 faience tubes, and 16 oblong black amber beads – 500 pieces in total (Zhongguo Wenwu Jinaghua 1997: Figure 31) (Plate IA).

Over 1,000 faience tubes and beads were found in the Earl of Yu's Tomb and the tomb of his wife, Jingji, and that number is clearly linked to their personal status. Nevertheless, during the Western Zhou period, those who possessed faience were not necessarily of high status and faience beads are also frequently found in the tombs of ordinary citizens. In the Zhou tomb at Beilü, Shangsong, Fufeng, Shaanxi, which dates to between the Former Zhou and the mid- to late Western Zhou periods, 400 of 500 graves contained faience beads, including beadwork made from red agate and faience (Wang Shixiong 1986a:131-

137). Furthermore, late Western Zhou tomb no. 5 at Yuntang, Fufeng County, Shaanxi, was also a commoner's tomb and it contained 56 Western Zhou faience beads and tubes, including 9 faience tubes with nodes (Yang Boda 1980:21). There is a good chance that Western Zhou faience was produced in the area around Fufeng County, Shaanxi.

Faience tubes may have been cut from longer ones. Olive and abacus beads were made individually. While olive beads were first found in the Yu tomb, abacus beads were discovered in slightly later contexts; they were found in late Western Zhou or early Spring and Autumn Guo tombs in Shangcunling, Shan County, Henan, and in mid-Spring and Autumn contexts at Xiasi, Xichuan, Henan. Faience beads with nodes were developed based on round beads and olive beads. As the technology was not yet fully developed, the sizes of the tubes and beads are not uniform, their thicknesses are uneven, the diameters of their holes are not uniform and off-center, the holes do not align perfectly, and the angles of their ends are not uniform. These factors reveal that the beads were not made in molds.

Chinese glass is characterized by the use of lead (Pb) and barium (Ba) as fusing agents, and this kind of Pb-Ba glass was not discovered until around the late Spring and Autumn and Warring States periods. Before this, during the Western Zhou period, different faience fusing agents were used. For the primitive-glass beads found at Luoyang, Henan (Western Zhou); Fengxi, Shaanxi (Western Zhou); and the Xiasi, Xichuan, Henan (mid-Spring and Autumn) Chu tomb, their "glass phase compositions belong to K_2O-SiO_2 or $K_2O-Na_2O-SiO_2$ systems, and are estimated to account for 10-15% of the total" (Zhang Fukang et al. 1983:70; *see also* Wang Shixiong 1986a:131-137). After chemical testing, the Yu tomb glass bead samples were found to contain the elements Si, Al, Fe, Mg, K, Na, Ca, Cu, P, S, Cl, Ge, Sr, and Hg. Only one sample showed small amounts of Ba and no Pb was found. Aluminum oxide and calcium oxide were the main binding components in the Yu glass. These substances originated from local or nearby clay and the Yu glass was made using a small amount of such clay (i.e., raw soil and sediment) mixed with a large amount of pure quartz (Peng Zicheng et al. 1988:647-648). Early Chinese Pb-Ba glass still continued to use the "Pb and Ba faience" (Plate IB) created by faience technology, and it wasn't until the late Spring and Autumn to early Warring States period that real Pb-Ba glass was produced.

The precise date, location, and reasons behind the emergence of Pb-Ba glass still await further research. During the Warring States period, real hot-glass beads (called "dragonfly-eye beads") composed of K-Na-Ca glass were produced in the Hubei region and their chemical composition may be related to Western Zhou faience. China

in the early Warring States period could already produce dragonfly-eye beads and other authentic glass products with Chinese characteristics but, unfortunately, without chemical analysis of the recovered objects, it cannot be confirmed that they contain Pb and Ba.¹⁴ Faience beads may have existed at the same time as dragonfly-eye beads, but due to the lack of conclusive evidence, the period when faience beads disappeared cannot be determined. Faience craftsmanship likely died out in the central plains during the 3rd century B.C. (i.e., mid- to late Warring States period) (Zhang Fukang et al. 1983:70). The reason for its disappearance must be related to the discovery of new fusing agents. The introduction of Pb and Ba effectively lowered the firing temperature, and improved the quality of the faience and produced authentic glass.

A storage cellar of the late Spring and Autumn period belonging to the king of Wu was found 20 km west of Suzhou, Jiangsu, at the eastern foot of Yanshan. A large number of jade objects, as well as 48 light-blue faience abacus beads were found inside. Although the original report describes them as "turquoise beads" (Yao Qinde 1996:71), the author's investigations have shown that they are extremely similar to faience abacus beads often found in the late Western Zhou period and should be classified as faience beads, rather than turquoise. Their shape is also very similar to beads found at the Marquis of Jin's tomb in Beizhao, Wo County, Shanxi, and they represent a rather large find of Spring and Autumn faience beads.

Faience craftsmanship is different from bronze smelting and the production of ceramics. Faience objects from the Western Zhou to the Spring and Autumn periods all show a high level of skill and, by the early Western Zhou period, faience making must have developed into an independent craft. It was only the lack of new technology that kept this craft at the same level, and it wasn't until the application of Pb and Ba fusing agents in the mid-Spring and Autumn period and the introduction of dragonfly-eye beads from western Asia that spurred Chinese glass to take the next step in development. After the Spring and Autumn period the use of faience waned and it is rarely found in Warring States tombs. Replacing it were the brightly colored, intricately patterned, glass dragonfly-eye beads.

Faience technology was still used in the central plains region during the early Warring States period and other types of objects besides tube beads were produced. At early Warring States tomb no. 1 in Ye County, Henan, two human-shaped ornaments were found (Fu Juyou 2000:44, Figure 13) (Figure 3), and two Warring States latticed beads were found in Zhengzhou, Henan,¹⁵ and Banpo, Shaanxi¹⁶ – all of which were faience. This reveals that the use of faience was not completely replaced by authentic glass during the early



Figure 3. Faience kneeling figure, early Warring States period (height: 1.4 cm) (author's collection).

Warring States period. There are, however, very few faience tube beads from the mid- to late Warring States period which indicates that by the mid-Warring States period, such beads were no longer popular. Faience tube beads from the late Warring States have been found scattered throughout remote Bashu tombs in Sichuan. Among them, three come from the M2 Ba tomb in Fuling Xiaotianxi, Sichuan;¹⁷ two are from the Sichuan Dongsunba boat-coffins;¹⁸ and three are from the Bashu earth-pit tomb in Qianwei, Sichuan. Of the latter, one still has a pattern of round nodes¹⁹ (Figure 4, right) which has not been found outside of Sichuan.



Figure 4. Faience tube beads, late Warring States period (*Zhongguo Meishu Quanji* 1987).

WARRING STATES BEADS (475-221 B.C.)

A new type of glass appeared in China during the late Spring and Autumn period. “Goujian’s sword,” belonging to the King of Yue, was found in tomb no. 1 at Wangshan, Jiangling, Hubei. Goujian was a ruler of the state of Yue during the late Spring and Autumn period and reigned from 496-464 B.C. The sword was made during this period and

on it is engraved “sword used by the King of Yue Jiu Jian.” The sword guard is inlaid with two small, light blue, semi-transparent glass pieces. One is spherical and the other is irregular in shape. Both have diameters of less than 1.0 cm. Also from this period is the King of Wu’s “Gouyu Fuchai’s sword” which was collected in Hui County, Henan. Fuchai ruled from 495-473 B.C., and this sword guard is inlaid with three relatively transparent glass pieces. The glass inlays on these two swords are completely different from the less-transparent light green faience of the Western Zhou period. Even though the swords are clearly local Chinese objects, this does not mean that their inlays were produced locally. The inlays await harmless x-ray fluorescence spectrometry. While detailed component data have not been obtained, it can be confirmed that they do not contain Pb and Ba, which does not eliminate the possibility that they were imported. The color, purity, and transparency of the glass of the two swords are completely different from that of faience and it can be called authentic glass. Furthermore, many examples of glass products imported from Western Asia have been found at sites of this period, the most important of which are dragonfly-eye beads. This is their name in contemporary Chinese cultural circles; in the West they are simply called “eye beads.”

Dragonfly-Eye Beads

The name “dragonfly eye” comes from the patterns found on the beads. They consist of a series of multi-colored rings, some of which protrude from the surface and look just like dragonfly eyes. This is only a general description and in actuality there are many types of dragonfly-eye beads (Figure 5; Plate IC, ID top). Apart from those that protrude from the bead surface, some eyes are flush with the surface, while some are in the form of pyramids. The eye decorations may be in concentric or non-concentric circles. Early eye beads from the late Spring and Autumn period found in Hougudui, Gushi County, Henan (Figure 5, no. 5), “use blue and white glass along with the green glass of the bead body to make a ‘nipple-nail’ pattern, and if the pattern were to be laid flat, it would not make a complete circle” (Zhang Fukang et al. 1983:69). The tomb occupant was the younger sister of Duke Jing of Song (516-451 B.C.) and the wife of King Fuchai of Wu. She was about 30 years old. Analysis has shown the components of the eye beads to include Fe_2O_3 (0.65%), CaO (9.42%), MgO (0.39%), K_2O (0.52%), and Na_2O (10.94%), which is a composition typical of Western Na-Ca glass (Zhang Fukang et al. 1983:71). The similarity of the composition of these early eye beads to Western ones, coupled with the fact that the so-called dragonfly-eye pattern is not intrinsic to China and is not seen on other Chinese objects, suggests that they may be imports.

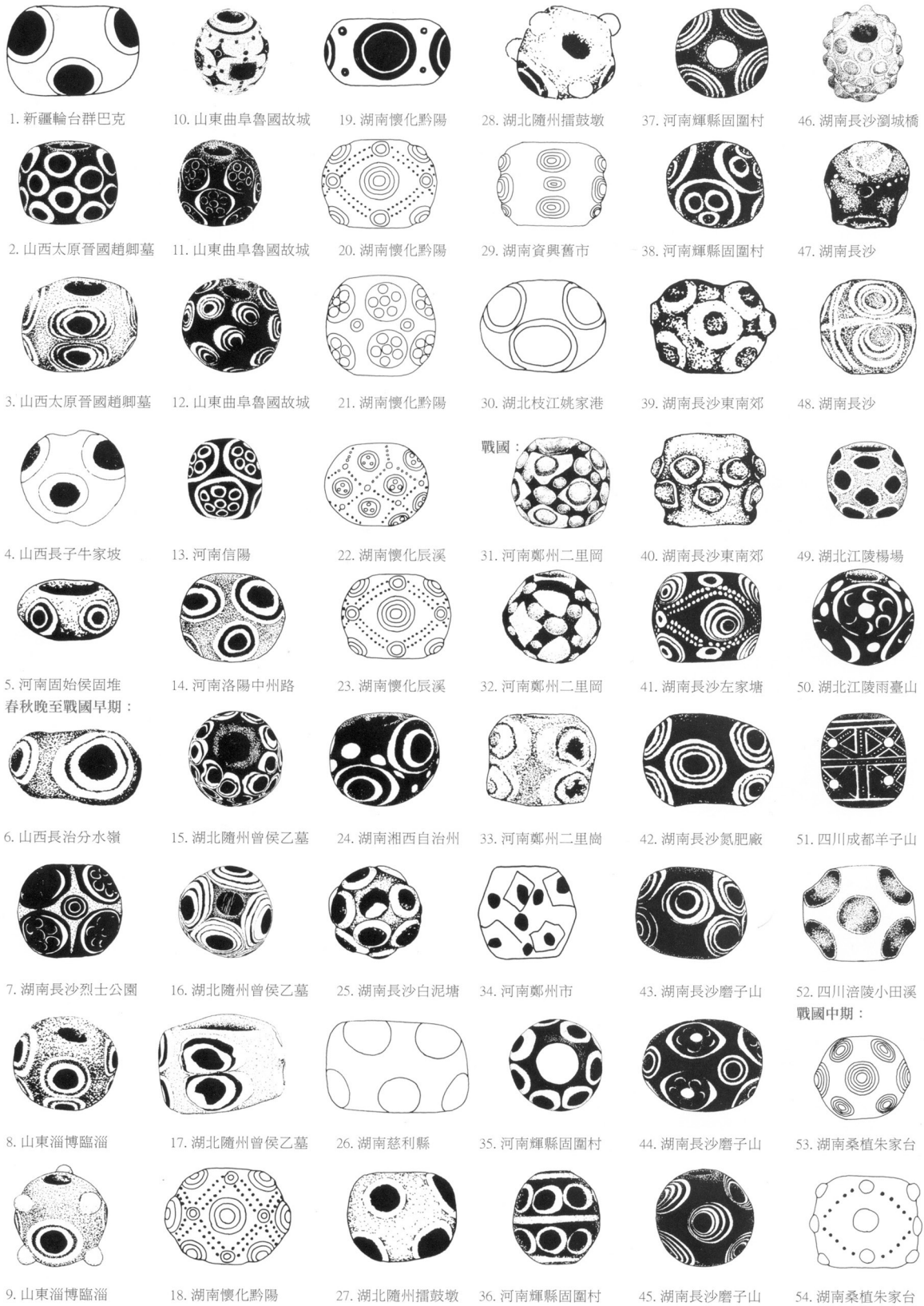


Figure 5. Variations of Chinese eye beads.

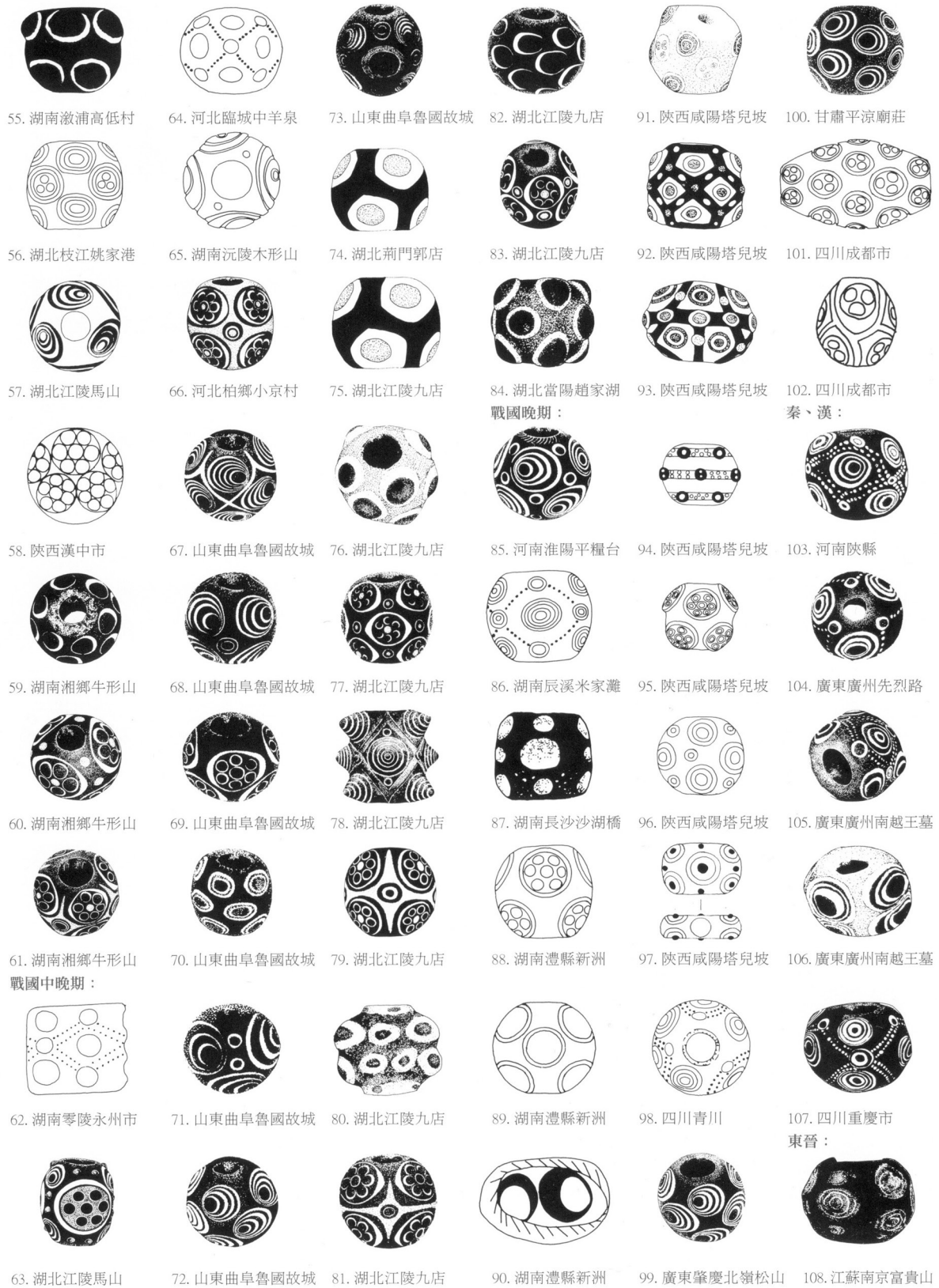


Figure 5. Variations of Chinese eye beads, continued.

Many of these types of eye beads have been found in the Mediterranean region and Western Asia, and there are many variations. As well as the eye beads found in Hougudui, Gushi County, the type of eye beads found in the late Spring and Autumn period Zhao official tomb in Taiyuan, Shanxi (Figure 5, nos. 2-3); tomb M7 at Niujiapo, Changzi County, Shanxi (Figure 5, no. 4); and tomb M270 at Fenshuiling, Changzhi, Shanxi (Figure 5, no. 6), have also been found at Gilan, Iran (Shinji Fukai 1977: Figures 40, 45). It is not difficult to see the close relationship between late Spring and Autumn eye beads and those from Western Asia, and there is a high probability that they were imported from other countries.

Eye beads originated in Egypt during the 14th century B.C., and the eye decorations on these beads are portrayed extremely clearly. There is a sharp contrast between black and white, and they only have two to three layers, with the innermost layer being black – a precise depiction of the pupil and the white of the eye, and a symbol of the eyes of the gods. The beads are not spherical, and many are in the shape of barrels or ovals. The eyes are nearly as large as the beads themselves. At the time, Egyptian images of gods all used glass and precious stone inlays for their eyes and eye beads originated from these ancient Egyptian eyes of the gods. Eventually, the custom of wearing eye beads was transmitted to Western Asia and Europe. The inhabitants of Western Asia saw these eyes as having unmatched power, able to repel evil spirits and bring peace.

An eye bead from the 8th century B.C. found in Greece represents a break from the early period model of a pair of gods' eyes, and simplifies it into an eye bead model that has a longitudinal hole and one eye with several layers (Fitzwilliam Museum 1978: Figure 39). The British Museum in London holds a small eye bead found in Eastbourne, England, that dates to 605-600 B.C. It is oblong and has four eyes that are evenly placed around the bead. The eyes are composed of two layers of deep blue and white glass, and are clearly in the shape of gods' eyes (Dubin 1987: Figure 55).

Eye beads gradually became more popular in Western Asia and the types became more diversified. Their significance as the eyes of gods also weakened significantly. Taking those from Gilan, Iran, as an example, the bodies of the beads are white, yellow, blue, green, and reddish-brown. There are many types of eye decoration and some of the eyes protrude from the surface. Most of the eyes still consist of layered rings of white and a darker color, but the eyes are no longer regular, lack clarity, and are not properly aligned.

Apart from the common eye beads, the Phoenicians developed a type of bead in the form of human or animal heads. The eyes are either human or animal and bring the

deified eyes down to the level of everyday life. Along with the development of western Asian government and the movement of nomadic peoples, eye beads and the technology used to make them continually spread outward. The great Assyrian empire was founded in the mid-8th century B.C. in central Asia. Babylon flourished in the late 7th century B.C. and the Persian Empire ruled during the 6th century B.C. Throughout these centuries, the territories of the central Asian empires continually expanded and even reached India in the East. As travelling merchants and craftsmen moved to India and even more remote areas to settle and engage in trade, they brought with them eye beads and the technology used to make them.

The earliest appearance of eye beads in China is in the 5th century B.C. or the late Spring and Autumn period, which is several centuries later than their appearance in Egypt and Central Asia. Few eye beads have been found in contexts preceding the Warring States period and it was not until this period that they became popular. Based on archaeological evidence, the earliest eye beads found in China may be those found in Qunbake tomb IM27 in Luntai County, Xinjiang (Figure 5, no. 1). The entire group of tombs is dated to 955-585 B.C., which equates to the Western Zhou period. The other items found in tomb IM27 are in the style of the Spring and Autumn and Warring States periods. Comparing the IM27 specimens with eye beads found in other parts of China, they may be post-Western Zhou and probably date from the late Spring and Autumn to early Warring States periods (Kaogu 1992, 8:692).

In the central plains, the earliest eye beads are from Shandong, Shanxi, Henan, and Hunan, and date to the late Spring and Autumn to early Warring States periods. Concentrated in Shanxi, they were found in three locations, including the late Spring and Autumn Jin Zhao official tomb in Taiyuan, the late Spring and Autumn Niujiapo M7 tomb in Changzi County, and the late Spring and Autumn or early Warring States Fenshuiling M270 tomb in Changzhi.

The original report dates tomb M270 to the late Spring and Autumn or early Warring States period (Kaogu Xuebao 1974, 2:81), but Tao Zhenggang (1996), when discussing the date of the Zhao official tomb, states that it is attributable to the mid-Spring and Autumn period. No matter which date is correct, the earliest eye bead from the central plains is still from the Fenshuiling M270 tomb. The tomb with the most eye beads (13 specimens) is the Taiyuan Jin Zhao official tomb. The latest period from which eye beads have been found appears to be the Southern Dynasties (A.D. 420-589) and is represented by beads from the De'an tomb, Jiangxi. The site report does not include illustrations, but mentions "corroded enamel beads" decorated with "blue and white circle [i.e., eye] patterns."²⁰ An earlier find is from

the early Eastern Jin dynasty (A.D. 317-420), at Fuguishan, Nanjing, Jiangsu. The archaeological report mentions “dragonfly-eye glass rings,” and glass eye beads can clearly be identified from the images, despite evidence of rather severe weathering (*Kaogu* 1998, 8:43) (Figure 5, no. 108). Most eye beads come from Warring States tombs. Only a few scattered eye beads have been found from the Han to the Eastern and Western Jin dynasties and these must be relics from earlier periods. Eye beads were popular for only about 300 years and died out after the Eastern Jin dynasty.

Eye beads are not evenly distributed. In terms of their age, they are mainly concentrated in the Warring States period. In terms of their distribution, from the Spring and Autumn to the early Warring States periods, they have only been found in Shanxi, Henan, Hunan, and Shandong, and the concentration is in Shanxi. The eye beads from this period are rather small and mostly green or light green. By the mid-Warring States period, they had spread to areas including Hubei, Hunan, Shandong, Shanxi, Henan, and Shaanxi. That is to say, eye beads spread to the southwest, and were concentrated and found in greater numbers in Hunan and Hubei tombs. During this period, eye beads not only increased in number but in size as well. The site where the most eye beads have been found is the early Warring States Marquis Yi of Zeng tomb in Leigudun, Suizhou, Hubei, which yielded 173 specimens (Hubei Sheng Bowuguan 1989:9) (Figure 5, nos. 15-17). The next largest find is the early mid-Warring States no. 2 tomb in Leigudun, whose occupant has been determined to be the Marquis Yi of Zeng’s (Sui) wife. Even though this tomb had been robbed, 24 dragonfly-eye beads were still present (*Wenwu* 1985, 1:27) (Figure 5, nos. 27-28). After this is the late early-Warring States Zhaojiahu JM37 tomb in Dangyang, Hubei, where 15 eye beads were found (Hubei Sheng Yichang 1992:155) (Figure 5, no. 84). Even though many eye beads have been found in Hunan, which neighbors Hubei, no tombs have yet been found there that contain as many eye beads. Few tombs with eye beads have been found in Shandong. One of them is the early Warring States ancient Lu city M52 tomb in Qufu which contained 13 glass eye beads (Figure 5, nos. 10-12).

Eye beads of the mid- to late Warring States period have been found mostly in Hunan and Hubei. While these beads have been found in other areas, there is a clear move towards the west during this period, including Pingliang, Gansu²¹ (Figure 5, no. 100); Xianyang, Shaanxi (including beads found in the Ta’erpo tomb)²² (Figure 5, nos. 91-97); Qingchuan, Sichuan²³ (Figure 5, no. 98); and Qianwei.²⁴ This is an area encompassing the Qin state of the Warring States period. Expansion to the south only included Zhaoqing, Guangdong²⁵ (Figure 5, no. 99). After the Warring States period, from the Qin to the Han dynasties,

the number of eye beads dropped dramatically, and eye beads were no longer found where they previously had been in late Spring and Autumn Shandong and Shanxi and mid- to late Warring States Hebei. From Western Han Henan, only five eye beads came from Shan County tombs M2001 and M2019²⁶ (Figure 5, no. 103). Eye beads have been found in greater numbers in the west, including Qin’an, Gansu;²⁷ Mianyang, Sichuan;²⁸ and Chongqing²⁹ (Figure 5, no. 107). In the southwest they extended to Jinning, Yunnan,³⁰ and Guangzhou, Guangdong³¹ (Figure 5, nos. 104-106). Hunan and Hubei, which saw high concentrations of eye beads during the Warring States period, no longer held such a position in the Han dynasty. The only eye bead to come from an Eastern Han tomb is a “color glazed pottery bead” from the late Eastern Han tomb M3 in Zhuanwachang, Yun County, Hubei.³² There is no evidence to show that this bead is from that era and it can only be interpreted as an ancient relic.

Evidence reveals that even though eye beads were introduced from Western Asia, their movement within China did not go from west to east. During the Western Zhou and Spring and Autumn periods, China’s transportation was already quite developed, and when merchants and glass craftsmen brought their goods and technology to China from Western Asia, they had already directly entered the economic and cultural hub of that time; i.e., Shanxi, Shandong, and Henan on the lower reaches of the Yellow River. Eye beads were initially concentrated in the north and south at Changsha, Hunan, before they spread south and west. Their transmission was definitely closely linked with economic and cultural developments. Hunan and Hubei were at the heart of the Warring States state of Chu. During the Western Zhou period, Chu was a small state that was very remote and difficult to access, but throughout the Spring and Autumn period it made use of its rich natural resources to become an economic powerhouse. The state of Qin expanded its territory westward in the mid-Warring States period. Eye beads that come from present-day Gansu, Sichuan, and Shaanxi all came from Qin. No eye beads have been found in the eastern provinces of Anhui, Jiangxi, Jiangsu, Zhejiang, and Fujian, nor have they been found in Guangxi or Guangzhou. It is worth noting that eye beads flourished during the Warring States period, and before and afterwards are only found sparsely scattered about. The rise and fall of the popularity of eye beads was relatively sudden.

Early Chinese eye beads are extremely simple, all have single dots for eyes, and they are very similar to those from Western Asia. The Gushi County, Henan, glass bead composition analysis report shows the presence of Na₂O (10.94%) and CaO (9.42%). The glass does not contain Pb or Ba, but belongs to the Na-Ca glass series. Ca and Na

are characteristics of West Asian glass which shows that these earliest Chinese eye beads, or the materials they were made from, came from Western Asia. China only started making eye beads with Chinese characteristics around the late Spring and Autumn or early Warring States period. In terms of chemical composition and style, Chinese eye beads may be divided into four categories: composite-eye beads, latticed eye beads, square eye beads, and glazed pottery eye beads.

Composite-Eye Beads

Eye beads became more complex beginning with those found in the late Spring and Autumn to early Warring States no. 3 wooden-outer-coffin tomb at Martyr's Park, Changsha, Hunan (Figure 5, no. 7), and the early Warring States ancient Lu city tomb M52 in Qufu, Shandong (Figure 5, no. 11). Similar eye beads have not been found in Western Asia. The beads from these two tombs are composite in style: the Hunan beads have seven eyes (six eyes surrounding one) and the Shandong ones have six (five eyes surrounding one). Composite-eye beads have also been found in Western Asia, but they have simpler patterns and mostly exhibit single eyes. In China, when composite-eye beads are found, they are found in great numbers. Furthermore, one from tomb M52 in Qufu, Shandong, has extremely complex decoration. This bead does not simply have eye decoration, but uses different colored glass to create geometric patterns (Figure 5, no. 10). Similar beads are not seen in Western Asia, suggesting that this eye bead may very well have been made in China. That is to say, not only did one type of eye bead enter China in the late Spring and Autumn and early Warring States periods, but the methods and technology used in its creation may have arrived at the same time. After a brief learning period, the production of eye beads became localized.

One characteristic of Chinese eye beads is a fine, well-proportioned design. The decoration is rich and full and, even though the meaning of "gods' eyes" had diminished, the eyes on the beads are carefully positioned (Plate ID bottom). The composite-eye decoration found in the Warring States Yutaishan tomb group in Jiangling, Hubei (Hubei Sheng Jingzhou 1984:115, Figure 93:5, Plate 76:1) (Figure 5, no. 50) and the later period tombs in the Jiangling Jiudian tomb group (Hubei Sheng Wenwu 1995:332) (Figure 5, no. 83) is the same type as that found in the mid-Warring States Niuxingshan tomb M1 in Xiangxiang, Hunan (*Wenwu Ziliao Congkan* 3:105, Figure 41; *Zhongguo Wenwu Shijie* 1995, 10:55, Figure 5) (Figure 5, no. 60) and the mid-Warring States period or later ancient Lu city tomb M58 in Qufu, Shandong (Shandong 1982:178, Figure 112:1) (Figure 5, no. 69). These beads have composite eyes composed of one

eye surrounded by six eyes with round dots or eyes in the spaces between the composite eyes (Plate IIA).

Latticed Eye Beads

Another kind of eye bead found only in China has the eyes arranged in a checkered pattern with small white dots arranged in lines forming a lattice pattern between them (Plate IIB). Some of them have eyes where the lines of dots intersect. The empty spaces in the lattice are filled with larger eyes, making the entire pattern more balanced. The earliest latticed eye bead was found in the early Warring States Qian city M14 tomb in Qianyang County, Huaihua, Hunan (*Hunan Kaogu Jikan* 1989:71) (Figure 5, no. 18). The latest such beads are from the Western Han dynasty and were found in the Xianlie Road Huanghuagang M1048 tomb in Guangzhou, Guangdong (Guangzhou 1981:165) (Figure 5, no. 104); the Guangzhou Southern Yue King tomb (Guangzhou 1991:133-134) (Figure 5, no. 105); and the Nan'an District, Chongqing, Sichuan (*Wenwu* 1982, 7:29) (Figure 5, no. 107). Eye beads have been found in the Chinese provinces of Hunan, Hubei, Henan, Hebei, Shanxi, Shandong, Shaanxi, Sichuan, Guangdong, Yunnan, Gansu, Xinjiang, Jiangsu, and Jiangxi. The provinces in which the most tombs containing eye beads have been found include Hunan, Hubei, and Henan, all of which were situated within the ancient state of Chu. Spotted eye beads and composite-eye beads have been found in these areas that are not seen in Western Asia.

Another type similar to latticed eye beads has only been found in Shandong, Henan, and Xianyang, Shaanxi. Only three tombs with eye beads have been found in Shandong and two of them are in the ancient Lu city of Qufu. Of these, the mid-Warring States or later tomb M58 has a type of eye bead with several off-center layers in each eye. The eyes comprise three intersecting rows and are separated by solid white lines. The eyes maintain the contrast between deep blue and white (Figure 5, no. 67). Compared to latticed beads from Hunan and other areas, the M58 eyes are fuller and arranged closer together. Unfortunately, similar latticed beads have not been found elsewhere so this cannot be confirmed to be a characteristic of Shandong eye beads.

Square Eye Beads

Square eye beads, a form not found in the West, were uncovered at Erligang, Zhengzhou, Henan. Tombs no. 11 and no. 420 each contained one bead which was "somewhat cube-shaped with rounded corners. Each of the eight corners is painted a drab green, with brown circles. Between the

circles are little brown spots. Between the circles and spots white coloring is added” (Henan Sheng Wenhua 1959:78). Two square beads were found in a late Warring States Qin tomb in Ta’erpo, Xianyang, Shaanxi. The report indicates that the background color is purple and the sides are 1.4-1.5 cm wide (Xianyang 1998:178, Figure 135, 3, Plate 60, 2) (Figure 5, no. 91).

Many square eye beads have been preserved and they are mainly made of white glass inlaid with drab green eyes (Plate IIC). These types of square beads were utilized briefly in Henan and Shaanxi. As mentioned above, Ta’erpo is an area of Qin where outsiders came to live, so the square beads may have been created elsewhere. We cannot eliminate the possibility that they are a specialty of Henan, but this must await further archaeological evidence to be confirmed.

Glazed Pottery Eye Beads

A type of glazed pottery bead unearthed in Erligang, Zhengzhou, Henan (Figure 5, nos. 31-32), and Ta’erpo, Xianyang, Shaanxi (Figure 5, nos. 92-93), has solid reddish-brown lattice lines painted on it. Colored dots are present at the intersections of the lattice pattern and the lattice lines and the eyes consist of applied brown, yellow, and sky-blue glass coatings. White is used for the background but not the eyes so the overall effect is that of bright colors. The eyes protrude slightly from the surface and are located within the lattice pattern lines (Plate IID upper left). No eyes are located within the lattice pattern. This type of glazed pottery eye bead has only been reported in Erligang, Henan, and the Ta’erpo District of Xianyang, Shaanxi. It is relatively easy to produce and its price may have been low. Many of them may be found in the same tomb: eight in Erligang tomb M48 and seven in the M272 tomb (Henan Sheng Wenhua 1959:78). According to the archaeological report, the Ta’erpo tomb is that of a commoner, and the time period of the tomb group is very short: from around the late Warring States period to the Qin unification. Even though glass beads and other glass objects have been found in great numbers here, there is still no evidence for a glass workshop in the area. According to the report, Ta’erpo is an area which was settled by outsiders, or non-Qin peoples, so the possibility that the beads were brought in from other states cannot be eliminated. Similar glazed pottery beads have only been found in Erligang, Henan, so it is possible that they were brought from Henan to Ta’erpo.

The style of the composite-eye decorations from Erligang, Henan; Ta’erpo, Xianyang, Shaanxi; and Shandong are not identical to those from Hunan and Hubei, indicating that the production and spread of Warring States eye beads had a certain amount of commonality and locality.

Local transportation was quite developed and it was not uncommon for glass beads imported from Western Asia to be found in all the provinces. Nevertheless, some particular styles only appear in certain areas. These beads were likely produced in smaller workshops with a small market turnover. Their technology was not easily passed along, leading to the phenomenon of eye bead forms particular to certain areas.

Henan seems to have produced many glazed pottery beads and unique forms. Apart from the above-mentioned latticed beads, one bead from tomb no. 48 in Erligang, Zhengzhou, Henan, is “tied onto a white object, uses sky-blue coloring applied to form crossed, slanting S shapes. Brown spots of different sizes are added in the spaces. Little yellow spots are applied on top of the brown spots....” This type of S-patterned pottery bead is seldom seen in other areas (Henan Sheng Wenhua 1959:78) (Plate IID bottom). Various other forms of glazed pottery beads are shown in Plates IID and IIIA-D.

The Uses of Eye Beads

Late Spring and Autumn eye beads were imported from Western Asia. As the road was long and the precious objects hard to obtain, their price was very high. For this reason, only people of the rank of *shi* (the lowest noble rank in the pre-Qin period) and above could possess them. Thirteen eye beads were found in the Jin Zhao official tomb in Taiyuan, Shanxi, which contained the remains of a first-rank *qing* official. The Hougudui tomb in Gushi County, Henan, belonged to the wife of King Fuchai of Wu; i.e., the younger sister of Duke Jing of Song. The excavation report does not mention the number of eye beads and only states that “upon opening the inner coffin we found beads scattered around the entire corpse. It was evident that they were tied all around the body at the time of burial. The thread decayed, so they scattered all around. The small ones have diameters of only 0.2 cm, and the grinding was done very neatly” (*Wenwu* 1981, 1:7; see also Zhao Qingyun 1996:482). Similarly, the seven late Spring and Autumn to early Warring States beads and adornments found in the Langjiazhuang M1 tomb in Linzi, Zibo, Shandong, belonged to a first-rank *qing* nobleman. The report on the late Spring and Autumn or early Warring States Fenshuiling M270 tomb in Changzhi, Shanxi, does not identify the occupant, but notes that the burial artifacts were arranged in the same way as in tomb M269, with an inner and an outer coffin, indicating that the occupant was a *shi*. In the earliest Hunan wooden-outer-coffin tomb at Martyr’s Park in Changsha, the occupant was a first-rank *shi* accompanied by a single eye bead.

Even though Chinese-made eye beads occur from the Warring States period onward, due to the limitations

of early technology and low production amounts, along with governance by the feudal lords, eye beads retained their status as objects of the highest levels of society. The inner and outer coffins of early Warring States ancient Lu city tomb M52 in Qufu, Shandong, had decayed, but the remnants revealed that there had been one inner and two outer coffins; 13 eye beads were found in this tomb. The feudal lord Marquis Yi of Zeng's (Sui) tomb contained 173 eye beads. His wife's tomb (no. 2) at Leigudun had been robbed, but 24 eye beads remained. The number of beads in these two tombs far surpasses the number of those found elsewhere. Probably around the mid-Warring States period, the quantity of locally produced eye beads increased and their value noticeably decreased. Many were found in Hunan and Hubei tombs, some of which belonged to lower ranking *shi* and commoners. Of the 38 eye beads unearthed in the Jiudian area of Jiangling, Hubei, some belonged to the late Warring States lower-rank *shi* tombs M703, M1274, and M51, and commoner's tomb M421.

The use of eye beads in the Spring and Autumn and Warring States periods seems to be unrelated to gender and, from the above list, it can be seen that tombs of both men and women contained them and this did not change throughout the period. Fenshuiling tombs M271 and M269 in Changzhi, Shanxi, must have been for husband and wife, but tomb M269 did not contain any eye beads. The tombs of this couple had the characteristic that the wife's tomb contained much clothing and no weapons, while the husband's tomb contained some weapons but less clothing. This means that the eye beads were attached to the woman's clothing.

Western Asian eye beads represented gods' eyes and the gods had the power to repel evil spirits. In the early periods only one may have been worn at a time. Egyptian eye beads of the 14th century B.C. had holes at their tops which was not conducive to stringing many together. Later, beads changed to having holes through the body so they could be strung in a row. The most common method may have been tying strung eye beads around one's neck. Many of the eye beads created by Phoenicians in the 8th century B.C. were used in necklaces and in the center of the necklaces were glass head-shaped beads particular to the Phoenicians, while the other beads were ordinary eye beads.

Chinese eye beads have all been found in tombs and to understand their uses one must first look at their position within the tombs. The earliest Chinese eye beads are from the late Spring and Autumn to early Warring States periods, and the eye beads in the Martyr's Park no. 3 outer-coffin tomb in Changsha, Hunan, were "located in the space between the... inner and outer coffins" (Wenwu 1959, 10:70). Twelve eye beads were uncovered in the Eastern

Zhou Jiudian M410 tomb in Jiangling, Hubei, one of which "was found with a silk ribbon through it located at the center of the southern dividing wall of the outer coffin" (Hubei Sheng Wenwu 1995:332). The reports lack details and only the one on Mashan tomb no. 1 in Jiangling, Hubei, provides clearer information. Two glass eye beads were encountered in this tomb, that of a woman between 40 and 50 years of age with a rank of a high *shi*. One eye bead was found by the woman's waist. The other was between the outer and inner coffins. The coffin chamber was divided into a head chamber, side chamber, and coffin chamber by the headboard, dividing beams, and dividing boards. The burial objects were mostly placed in the head and side chambers. The coffin chamber utilized a coffin cover (*huangwei*) on top of which was a silk painting, a bamboo stalk, and a coffin ornament. The coffin ornament "is vertically placed against the coffin cover beneath the *huangwei* and is made of a strip of gauze threaded through a glass tube and a glass bead" (Hubei Sheng Jingzhou 1985:17) (Figure 6). Even though the tomb is from the mid- to late Warring States period, the glass bead and tube were clearly seen as having mystical powers that could protect the deceased. This concept must have originated from the Western belief in the power of "gods' eyes" to repel evil spirits.

This tomb is rather unique in that the corpse was wrapped in 13 layers of clothing and blankets. After unwrapping these

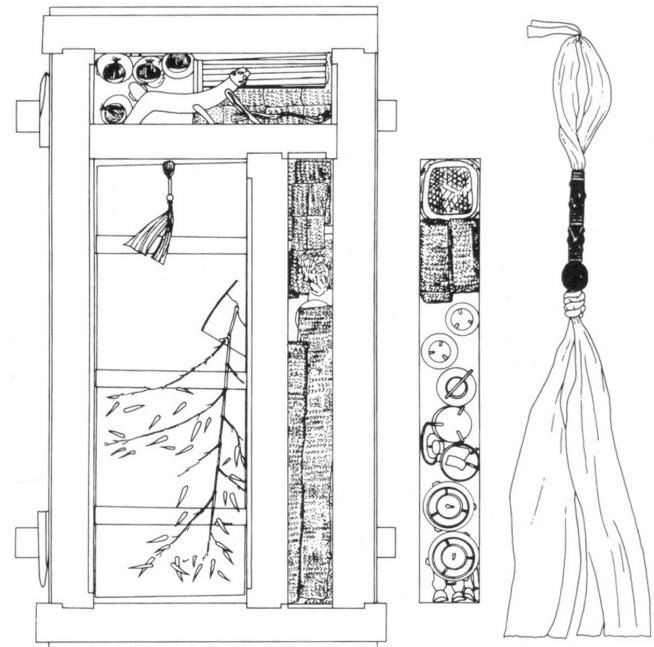


Figure 6. The coffin ornament (right) and its location within Warring States Mashan tomb no. 1 (left), Jiangling, Hubei (Hubei Sheng Jingzhou 1985).

layers, the deceased was found to be wearing a cotton dress. Her eyes were closed, and a silk ribbon bound her hands and feet. Both hands were in a silk “handshake.” Because of this, the eye bead next to the waist may have been a burial object intended to repel evil spirits. There is another possibility, however, considering the placement of the eye bead. A yellow silk ribbon encircled the corpse’s waist and was tied in a slipknot in front with a silk ribbon hanging down on the left side tied to a jade tube. “When looking at the entire article, the jade tube is placed above the glass bead and both are in the center of the silk ribbon. Because each is threaded onto two sections of ribbon, they can move freely” (Hubei Sheng Jingzhou 1985:17). The jade tube and glass eye bead would only have been able to move freely when the wearer was walking, and this decoration must have been used in this way by the deceased during her life. This style of decoration reflects to a large degree the way in which eye beads were worn at the time (Figure 7).

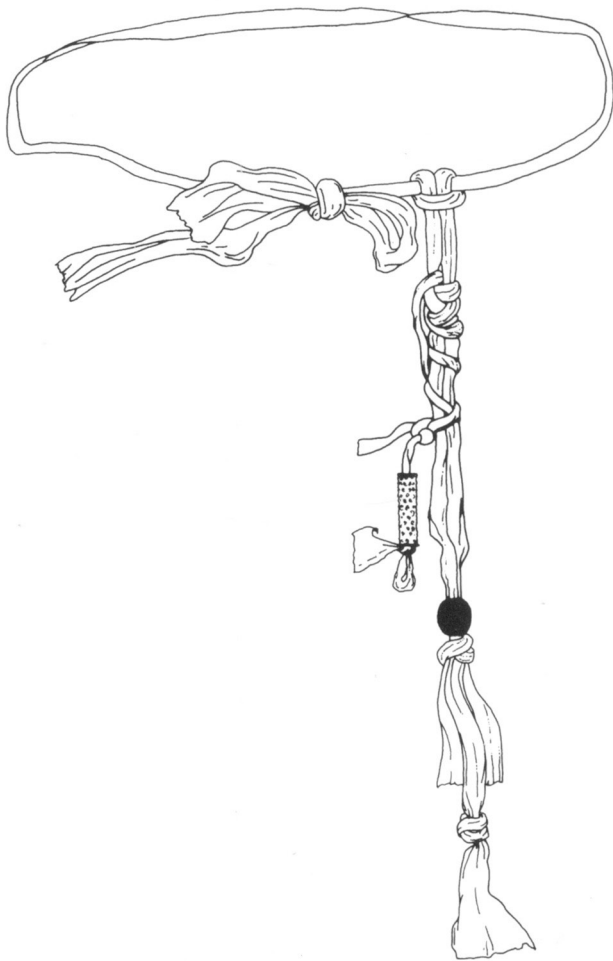


Figure 7. Ornament from Warring States Mashan no. 1 tomb, Jiangling, Hubei (Hubei Sheng Jingzhou 1985).

An eye bead found at Yangchang, Jiangling, Hubei, “forms a decoration along with a bone archer’s ring and the silk ribbon it is tied with is in excellent condition” (Peng Hao 1996:198). Even though this is in the same Jiangling area, the way in which it is tied is different from Mashan tomb no. 1, indicating that there were many ways of using strung eye beads. Eye beads have also been found in the area of the head. Those from late Warring States Huangjiagou in Xianyang city, Shaanxi, were found by the “skeleton’s head and chest” (*Kaogu yu Wenwu* 1982, 6:12), while in boat-coffin tomb M49 in Dongsunba, Sichuan, “one [was] by the head and one by the stomach” (*Kaogu Xuebao* 1958, 2:93). Furthermore, “many have been found in Warring States tombs in Changsha, all of which were located near the head” (*Kaogu Xuebao* 1957, 4:47).

The eye beads found in Mashan tomb no. 1 and at Yangchang are both single-bead decorations. A more composite beaded decoration was found in Erligang, Zhengzhou, Henan, in which the “beads excavated were mostly found together with copper pendants, agate rings, bone tubes, copper rings, pearls, and crystal beads.” Especially in Erligang tomb M272, seven alternating beads and bone tubes were found with their holes facing one another indicating that they had all been strung together (Henan Sheng Wenhua 1959:78).

The archaeological evidence reveals that Warring States glass beads were used as personal adornment in two principal ways. The first was as components of larger hanging ornaments. From the Western Zhou to the Warring States periods, hanging jade ornaments (*yuzupei*) were very popular. Written during the Han dynasty, the *Zhouli* (an ancient ritual text) states, “without good reason, jade should not leave the side of a gentleman.” This was the main function of the glass beads found in the late Western Zhou period Marquis of Jin’s tomb, Tianmaqu village, Northern Zhao, and the eye beads from the tomb of the Marquis Yi of Zeng. The glass eye beads found in the tomb of the Western Han King of Southern Yue, Guangzhou, were also part of a hanging ornament.

The other personal use of eye beads was as belt decoration. The beads from Chu tomb no. 1 in Mashan, Jiangling, Hubei, and the Jiangling Yangchang Chu tomb were used singly and threaded on silk ribbons that served as belts. A similar ribbon was found in tomb no. 1 in Mashan, Jiangling, on which was threaded an eye bead as a coffin ornament. The above three tombs are all in the ancient state of Chu and this type of decoration may have been a style exclusive to the Chu people.

Eye beads and eyed glass inlays were also set into objects. Five eye beads found in Qin to early Han tombs

M2001 and M2019 in Shan County, Henan, “came from lacquer makeup boxes” (Zhongguo Shehui 1994:153). Two eye beads in the late Warring States Pingliangtai M16 tomb in Huaiyang, Henan, “were found by copper mirrors” (*Wenwu* 1984, 10:27). Another copper mirror excavated at Warring States tomb CIM3923 in the Xigong District, Luoyang, Henan, is inlaid with 18 six-eyed (one eye surrounded by five), bubble-shaped glass beads. This tomb belonged to a late Warring States noblewoman,³³ revealing that inlaid eye beads were still highly valued during this period. Clearly, there were many uses for eye beads and they were used in great numbers during the Warring States period.

The Composition of Eye Beads

The fusing agents and colorants used in the production of glass determine its chemical composition. Of the late Spring and Autumn glass that has undergone compositional analysis, that from Hougudui, Gushi County, Henan, includes 10.94% Na, 9.42% Ca, and trace amounts of K, but no Pb or Ba. Its elements belong to those used in the composition of Western Na-Ca glass. Eye beads from Hougudui with this composition show that the earliest Chinese eye beads may have been imported from the West. The impurities in different raw materials will often be different. Even though Pb-Ba glass was already present by the late Spring and Autumn and early Warring States periods, all batches were not the same. Analysis of some of the 173 eye beads found in the early Warring States Marquis Yi of Zeng tomb in Hubei revealed that they contained “56.1% SiO₂, 4.07% CaO, 6.99% Na₂O, and negligible amounts of Ba and Pb... It can be concluded that they are products from Arabia” (Hubei Sheng Bowuguan 1980:658). Hou Dejun (1986:60, 62), however, cites similar data but also presents the results of x-ray fluorescence spectrometry testing of objects from the same tomb. He found that CaO and K₂O were rather high, PbO and BaO were either very low or absent, and Na₂O could not be detected at all. Based on this data, he concluded that the glass belonged to the K-Ca system, and that “among ancient Western glass from the same period, it is very rare to find glass with high amounts of potassium oxide, and over 100 pieces of this type of glass were found in the Marquis Yi of Zeng’s tomb, which means that they must have been independently made within China.” Hou Dejun believes that the differences in the two data sets may have been caused by differences in the samples. More conclusive results await further analysis.³⁴

There are also historical references that provide support for local beadmaking. Wang Chong of the Eastern Han dynasty writes in his *Lunheng* (vol. 2, “*Shuaixingpian*”) of a “Marquis of Sui (Zeng) making beads from medicine.”³⁵

This Marquis of Sui is the Marquis Yi of Zeng and the “medicine” referred to must have been used to make the kind of high K and Ca glass mentioned above. The Marquis of Sui’s beads can be used as a reference, and scholars often cite this record as showing that China produced glass in the early Warring States period. If the beads uncovered in the tomb of the Marquis Yi of Zeng’s wife (Leigudun tomb no. 2) are combined with those from the tomb of the marquis, altogether some 200 eye beads were recovered, a number which cannot be matched by any other Spring and Autumn or Warring States tomb. Imported eye beads are extremely valuable treasures and to collect such a large number would have required a considerable expenditure of time and money, so it is more likely that they were made locally. Nevertheless, the eye beads from the Marquis Yi of Zeng tomb are completely in a Western Asian style and identical eye beads were found in Gilan, Iran, in 1964. The body of these beads is blue, inlaid with blue and white eyes (Shinji Fukai 1977: Figure 45). Furthermore, one of the eye beads from Leigudun tomb no. 2 is also in a style exclusive to Western Asia. We can take this to mean that Marquis Yi of Zeng did not only obtain glass beads from Western Asia, but also procured Western Asian glassmakers and even refined materials.

The Marquis’ eye beads introduced Western Asian technology to Chinese glass. We know that the first glass of the Western Zhou period did not achieve true vitrification throughout the many centuries from the early Former Zhou to the Spring and Autumn periods. Imported Western Asian glass started to appear in the mid-Spring and Autumn period and by the late Spring and Autumn period, Chinese glassmaking included the K-Ca glass ornamentation on the swords of King Fuchai of Wu and King Goujian of Yue. Even though the sword inlays are of Chinese manufacture, they reveal that by the end of the Spring and Autumn period, local glass production could only make pieces the size of beans. Yet, by the early Warring States period, larger glass beads were already becoming common and their craftsmanship was exquisite. They were more beautiful than those from the Western Zhou period. The advance of glassmaking technology relied upon foreign techniques and the eye beads from the tomb of Marquis Yi of Zeng are examples of this. Taking another look at the chemical composition of these, CaO and Na₂O only comprise 4-7% which is far lower than in Western Asian glass, and trace amounts of Pb (2.80%) and Ba (0.05%) were detected, which are substances rarely found in Western glass. Thus, it can also be said that the Marquis of Sui’s composition had already started to use Pb and Ba as fusing agents.

The state of Zeng (also called Sui) was small during the Warring States period and located within present-day Hubei

province. Many eye beads were found in the mid- to late Warring States Jiudian, Jiangling, tombs which are also in Hubei, and they are of the same composition as those that belonged to Marquis Yi of Zeng. Of the three samples of eye beads from Jiudian M286 tomb that were analyzed, two did not contain Pb, contained only trace amounts of Ba, and had 4-5% Na₂O and CaO. The remaining eye bead contained 13.4% Na₂O and 0.11% PbO (Hubei Sheng Wenwu 1995:533). M286 is a lower-*shi* tomb so the occupant was of a low status and it would have been difficult for him to obtain high-priced Western Asian items. This suggests that the beads accompanying the Marquis of Sui were produced locally in Hubei and that their composition remained about the same until the mid- to late Warring States period.

Further south, many eye beads have been recovered from tombs in Hunan. Among these, the composition of the glass beads found in Changsha was 43.69% SiO₂, 25.68% PbO, and 5.92% BaO, according to a report by Gao Zhixi (1995:54-63) of the Hunan Provincial Museum. This is typical of Chinese Pb-Ba glass. Eye beads unearthed in Erligang, Zhengzhou, Henan, and Guwei village M1, Hui County, were also tested. Those from Erligang were all glazed pottery. One of these had brownish-black glass on its surface. It did not contain Pb or Ba, and the amounts of Na₂O and CaO were lower than those of the beads found in the Marquis Yi of Zeng and the Jiangling Jiudian tombs.³⁶ The “inlaid glass bead” from the M1 tomb in Guwei village, Hui County, underwent x-ray fluorescence spectrometry and was found to contain larger amounts of Pb and Ba.³⁷ Erligang, Zhengzhou, and Hui County both lie within Henan, but the compositions of the samples from these two places differ greatly. This reflects the diversity of glassmaking materials at the time.

Although no remains of glass workshops from the Warring States period have been discovered as yet, we know from the differences in the composition of the eye beads discussed above that there was much variation in eye beads during that period. The compositions of glass from Henan and Hunan also differ. As glass containing Ba is not found in the West, Pb-Ba glass has attracted scholars such as Zhao Kuanghua who has the following view on the source of Pb-Ba glass. He feels that the Ba in Pb-Ba glass from the Warring States period comes from the barite found in lead ore. Barite (BaSO₄) is the only mineral that contains Ba and “galena, especially that found in igneous mineral deposits, is often found together with barite or, to put it another way, barite is often produced together with galena in warm liquid mineral lodes. If these two types of minerals were oxidized and calcined, then the calx PbO produced would naturally contain BaO” (Zhao Kuanghua 1991:147). The area around Changsha has barite minerals that are associated with galena

and the lead ore from Changsha and Xinhua also has barite components, so the Hunan Pb-Ba glass should be local. Yet, Dr. Robert H. Brill’s analysis of a large amount of ancient Pb-Ba glass has shown that the proportion of Pb to Ba in such glass is not consistent. Actually, the percentage of Ba is relatively stable, while the percentage of Pb varies greatly. This suggests that the Ba in ancient Chinese glass did not necessarily come from lead ore.

Tubular Glass Eye Beads

Warring States glass eye beads include those that are tube shaped. Most are around 5 cm long and 0.8 cm in diameter. The body color is mostly dark blue or dark brown and they are decorated with eyes (Plates IVA-D) and lattice patterns. These types of tubes are not found in other countries and are genuine Chinese products. They were used in the same way as the popular jade tubes of the period. Two were found in tomb no. 1 in Mashan, Jiangling County, Hubei (Figure 8 top),³⁸ one was found at tomb M12 in Mashan (Figure 8 center),³⁹ and one was found at tomb no. 1 at Niuxingshan, Xiangxiang County, Hunan (Figure 8 bottom).⁴⁰ This form of tube-shaped eye bead seems to have been a popular ornament in the state of Chu. They were not popular for long and not many of them have been found. They are only found in extremely small numbers after the Warring States period.

The method of producing tubular glass eye beads is mostly the same as for other eye beads, and they are mostly decorated with a combination of crescent and “persimmon

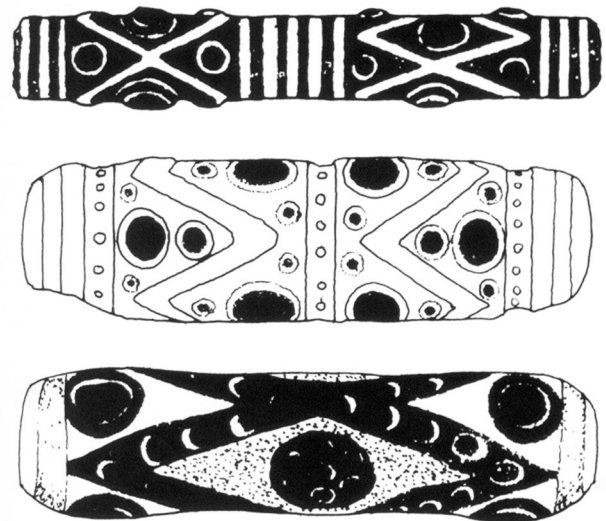


Figure 8. Tubular glass eye beads, Warring States period. **Top:** Mashan tomb no. 1, Jiangling County, Hubei. **Center:** Mashan tomb M12, Jiangling County, Hubei. **Bottom:** Niuxingshan tomb no. 1, Xiangxiang County, Hunan.

calyx” patterns (Plates IVB-C). This type of pattern is not seen on round eye beads. The spotted lattice patterns found on round eye beads are also present on many of the tube beads as well (Plate IVD). The tubular eye beads can be divided into two groups – long and short – with the long ones measuring around 4 cm and the short ones around 2 cm.

HAN DYNASTY ADORNMENTS (206 B.C.-A.D. 220)

After the Qin unified China, cultural interaction and trade developed throughout the land and the local characteristics of Han glass gradually disappeared. Han glassware mostly comprises ornaments and funerary objects, and their composition is mostly Pb-Ba glass which developed from Warring States molding technology. Common glass objects from the Han dynasty include beads (Plates VA-VB) and pendants (Figure 9), as well as ear spoons, garment components, plugs, belt hooks, bi-discs, and little animals.

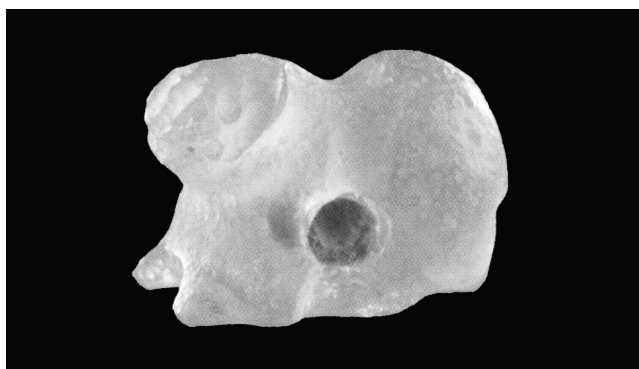


Figure 9. Animal pendant of yellow glass, mid-Western Han to Eastern Han dynasties (Length: 1.8 cm) (author’s collection).

Bead Adornment

Glass eye beads had already disappeared by the Han dynasty and another form of small glass bead became common in Han tombs (Figure 10). These are green, blue, yellow, and white, and a large number of them have been found in Guangxi, Guangdong, and Hunan. A scattering has been found in tombs in other areas. Tombs in which large numbers of Han glass bead ornaments have been found in recent years include:

1. Early Western Han dynasty, Dengfeng Road, Guangzhou, Guangdong; 111 glass stringing beads.⁴¹

2. Early to mid-Western Han dynasty, King of Southern Yue tomb, Guangzhou, Guangdong; 2,110 glass stringing beads.⁴²



Figure 10. Strand of lobed beads, yellow glass, Eastern Han dynasty (Diameter: 0.6-0.7 cm) (author’s collection).

3. Late Western Han dynasty, Dayong city area, Xiangxi, Hunan; 1,183 glass stringing beads.⁴³

4. Late Western Han dynasty, Youyugang, Dengfeng Road, Guangzhou, Guangdong; 2,629 glass stringing beads.⁴⁴

5. Late Western Han dynasty, Hepu, Guangxi; three strings of blue glass beads, ca. 5-6 mm in diameter (*Kaogu* 1972, 5:29).

6. Eastern Han dynasty, tomb group in Jianxi District, Luoyang, Henan; 142 glass beads.⁴⁵

7. Eastern Han, Gui County, Guangxi; 1,504 glass beads.⁴⁶

8. Eastern Han, Zixing, Hunan; 125 glass beads.⁴⁷

9. Eastern Han, Mount He Temple, Yiyang, Hunan; 169 glass beads (*Kaogu Xuebao* 1981, 4:547).

10. Eastern Han, Longshenggang, Xianlie Road, Guangzhou, Guangdong; 1,965 glass stringing beads.⁴⁸

11. Eastern Han, Fengmenling, Hepu, Guangxi; 149 glass beads.⁴⁹

12. Eastern Han, Huizhou cemetery, Xianlie Road, Guangzhou, Guangdong; 101 glass beads.⁵⁰

Nearly one thousand glass beads were recovered from the main inner coffin chamber in the Western Han King of Southern Yue tomb in Guangzhou. These beads served as accessories to jade garments along with gold, copper, and silver ornaments:

The glass beads were on the breast of the jade garment and had scattered. A small number of them are strung on a string. There is serious decay and they break immediately upon touch. A thousand have been collected as samples. Most are yellow/white or greyish yellow, and a few are green. After washing, they become light blue. They are in the shape of flat rings and were formed by winding glass filaments in a circle at high temperatures. They are all roughly the same size, with body diameters of 0.3-0.4 cm and hole diameters of 0.2 cm.⁵¹

A total of 1,500 glass beads were also excavated at other tombs in Guangzhou. Guangdong, Guangxi, and Hunan were very likely the production centers for Han glass beads (Figure 11). The Han glass excavated in Guangdong and Guangxi belongs to the K-Si series which is different from the Pb-Ba composition popular in the central plains area. Wang Junxin and others have studied the Pb isotopes of Western Han K glass tubes, beads, and fragments excavated in Hepu, Guangxi. The samples were light blue and blue with a composition of SiO₂ 75.8-79%, K₂O 10.4-14.5%, CaO 1.3-2.1%, Al₂O₃ 1.9-2.7%, MgO and Na₂O less than 1%, and trace amounts of PbO and BaO. Copper was the coloring agent and no cobalt was detected. The high ratio characteristics of Chinese lead isotopes found in the small amounts of lead that were tested confirmed that the beads “were made from local Chinese minerals” (Wang Junxin et al. 1994:499-501). This study seems to have solved the problem of the origin of Guangdong and Guangxi glass, but taking into account that this area was an important commercial area during the Han dynasty, we cannot eliminate the possibility that this large quantity of small glass beads was imported from Southeast Asia.

During the Han dynasty, glass beads were called *suizhu* (“following beads” [likely beads intended to be strung]). The *Book of Han, Traditions of the Western Regions* (vol. 96) mentions beads:

Ode: During the Xiaowu reign [156-87 B.C.], the emperor planned on conquering the barbarians as

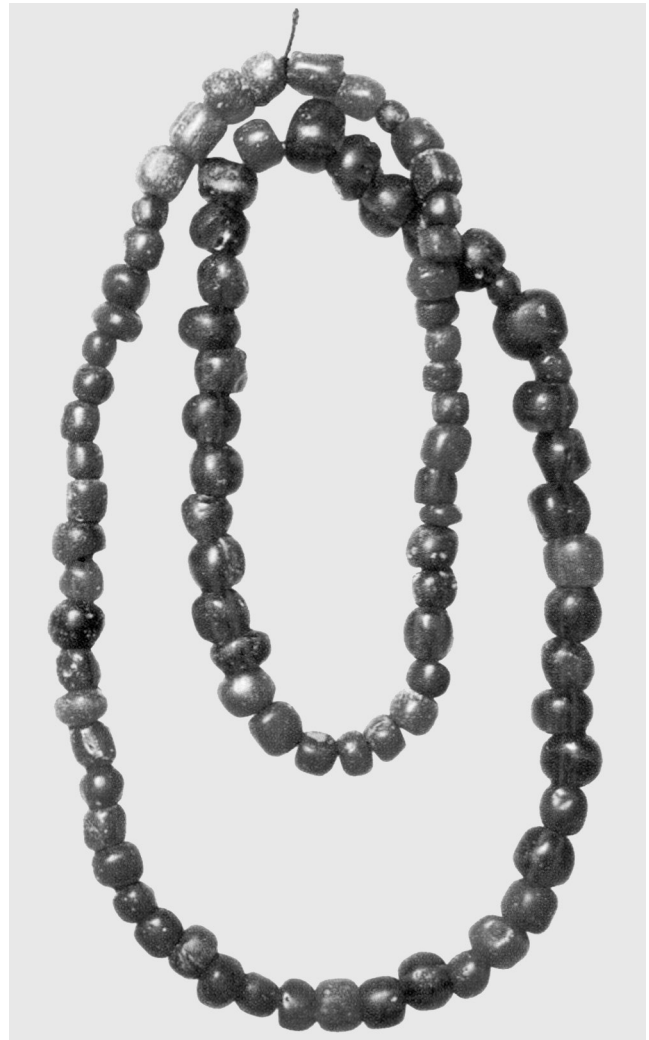


Figure 11. Han dynasty, K-Si series, blue-glass bead strand (author’s collection).

he was afraid they would follow the Western states and unite the southern Qiang. He cordoned off the western Yellow River, set up the four counties, opened the Jade Gate, and cleared the western regions... he built a palace with a thousand gates and ten thousand doors, built a heavenly terrace, and created ordered tents that were wrapped in Sui pearls and He jade....”

Further mention is made in the *Ode to the Western Capital*: “sewed with brocade, wrapped in silk with the Marquis of Sui’s legendary pearls scattered throughout.” The “pearls” made from “medicine” by the Marquis of Sui refer to glass beads. The *suizhu* of the Han dynasty must have been beads that were strung together to form ornaments. The large number of small glass beads from Guangdong and Guangxi very likely are the Han *suizhu*.

Beads were also used to adorn splendid swords. In his *Miscellaneous Records of the Western Capital*, Han historian Liu Xin wrote:

Han Emperor Wu received the white jade seal offered by Qin King Ziyang and Liu Bang's sword, the White Serpent Slayer. The sword was decorated with beads of seven colors and exquisite jade, and its sword case was decorated with five-colored glass. Inside the light from the sword could light up a room as if it were outdoors... (Jin Gehong 1985).

Glass Ear Spools

Glass earrings were very popular during the Warring States period, but are seldom seen during the early Western Han dynasty. They were replaced by smaller glass ornaments called spools⁵² (Figure 12). While the Han dictionary *Shuowen Jiezi* by Xu Shen does not include the word "spools" and the word does not appear until the Song dynasty in Xu Xuan's *Notes on the Shuowen Jiezi*, the Han work *Explaining Names – Explaining Jewelry* by Liu Xi states very clearly that "spools are beads passed through the ear." Sometimes beaded decorations hung from the holes in them. Their origin can be traced back to the Warring States period and early ear spools (Plate VC top) are similar to the Warring States tube beads with eye-pattern inlays.



Figure 12. Types of glass ear spools, Han dynasty. Left to right: concave drum, horn shaped, and unperforated.

Han ear spools are mostly dark blue or light blue. Western Han tombs in which such spools have been found include those in Sandaohao, Liaoyang, Liaoning (*Kaogu Xuebao* 1957, 1:123); Shaogou, Luoyang, Henan (19 specimens) (*Zhongguo Shehui* 1959:210); and Zhibuchang, Xianyang, Shaanxi (*Kaogu yu Wenwu* 1995, 4:27). Eastern Han tombs producing such spools include those in Pingba, Qingzhen, Guizhou (*Kaogu Xuebao* 1959, 1:101); Guanmahu, Wuzhong, Ningxia (*Kaogu yu Wenwu* 1984, 3:34); Qianping, Yichang, Hubei (*Kaogu Xuebao* 1976, 2:143); Zixing, Hunan (*Kaogu Xuebao* 1984, 1:108); Zhaoping, Guangxi (*Kaogu Xuebao* 1989, 2:226); Liujiaqu, Shanxian, Henan (*Kaogu Xuebao* 1965, 1:152); Xicun,

Guangzhou, Guangdong (Guangzhou 1981:352); Guixian, Guangxi (*Kaogu* 1985, 3:211); Zhaowan, Baotou, Inner Mongolia (Jinji Sun 1997, 9:230); Tomb M689, Luoyang, Henan (*Kaogu* 1992, 8:718); Mozuizi, Wuwei, Gansu (*Kaogu* 1960, 9:25); Baojintou, Qianping, Yichang, Hubei (*Kaogu* 1990, 9:827); Changsha, Hunan (Fu Juyou 2000:47); Mount Tianhui, Chengdu, Sichuan (*Kaogu Xuebao* 1958, 1:102); Linxian District, Xiqian, Guichou (*Wenwu* 1972, 11:44); Longgang Temple, Nanzheng, Shaanxi (*Kaogu yu Wenwu* 1987, 6:32); and Songzui, Fangxian, Hubei (*Kaogu Xuebao* 1992, 2:253). Clearly glass ear spools were very popular ear decorations in all places during the Eastern Han dynasty. A total of 35 glass ear spools from the late Eastern Han dynasty were found in 22 tombs at the Han Jin group tomb in Shangsunjia Zhai, Houzi He Xiang, Xining city, Datong County, Qinghai (Qinghai 1993:164-166). Ear spools disappeared following the Northern and Southern dynasties.

The most common ear spools are shaped like concave drums with broad ends and a constricted middle, with a hole down the center (Plate VC bottom). They comprise over 90% of all ear spools. The broad ends required a large ear hole. An improved version appeared later which had one flared end while the other was tapered. A hole passed down the center. These were easier and much more comfortable to wear than the drum-shaped ones. There was also another type of improved and simplified ear spool that was popular during the late Western Han dynasty which had no hole.

Different types of ear spools have been found together in some tombs, revealing that various types were in use at the same time (*Zhongguo Shehui* 1959a:210). By the Tang dynasty (618-907) there were no holed ear spools and the prevalent custom was to wear earrings. Looking at the excavated material, drum-shaped ear spools of blue glass were the most popular ear ornaments during the Han dynasty and the other two types of ear spools came later and only held a secondary position.

Most excavated light-blue glass ear spools are intact with some showing slight weathering. Most exhibit grinding marks and have smooth surfaces. It is noted in the Luoyang Shaogou Han Tomb report that "all those [spools] that are light blue still shone brilliantly as if they were new, despite their being buried in the ground for two thousand years" (*Zhongguo Shehui* 1959a:210). Chemical analysis has shown that none of the light-blue drum-shaped ear spools are of the Pb-Ba glass series and none of the 17 that were analyzed had Pb or Ba in them. Shi Meiguang has also analyzed similar light-blue ear spools excavated in Gansu and Guangxi and the results show no Pb or Ba (Shi Meiguang et al. 1986:307-313). Nevertheless, this form of glass ear spool is a typical type of Chinese jewelry and was produced in China.

Dr. Robert H. Brill has done a detailed analysis of two similar light-blue ear spoons from the author's collection:

This Han glass is a type of extremely interesting $K_2O:SiO_2$ (K-Si) series glass. This is a series that has recently been discovered and, as yet, has only been found in East Asia, Southeast Asia, and India. The samples we know of are from the 4th century B.C.E. to pre-4th century(?) C.E. Evidence has shown that India is one country that produced it, and we are still not sure if it was produced in other areas of Asia. Samples have been found in China, Japan, Thailand, Vietnam, and other Southeast Asian areas, and these may have been traded from India or other locations.

The problems surrounding this type of light-blue ear spoon are quite complicated and more research must be conducted to determine whether they were imported from India or produced in China.

Ear spoons of other colors are mostly standard Han Pb-Ba glass and exhibit weathering. Very few of the excavated spoons came with beaded adornments and such adornments must have hung from silk threads, most of which have decayed. Only a small number of those that hung from metal threads have been excavated from tombs.

Han Glass Beadmaking

Han glass beadmaking utilized three primary methods: molding, winding, and drawing. The first process involved the use of two-piece clay molds (Figure 13). A small mass of molten glass was taken from the furnace and wrapped around an iron rod coated with clay and formed into a rough bead. The rod and glass were then placed in the mold and the two halves pressed together to impart the desired shape. After cooling, the iron rod and bead were placed in water

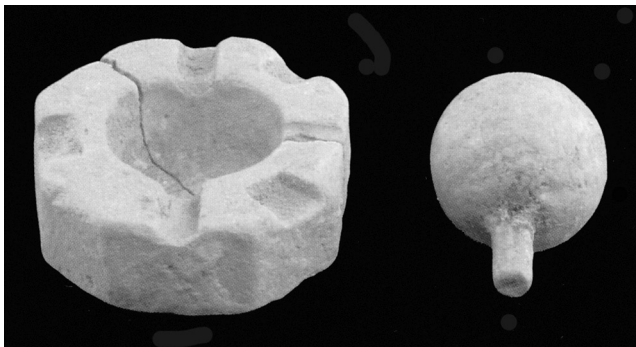


Figure 13. Clay mold for making glass beads (Width: 3.8 cm) (author's collection).

until the clay on the rod softened, allowing the bead to be removed. This is probably the way that the bodies of eye beads were formed, which would explain why many eye beads produced in China are extremely round and even.

The drawing method was frequently used to make small beads. Common in the West, it was less used in China. A narrow tube was drawn from a hollow gather of molten glass. Once cool, it was cut into short sections that become beads. Drawn beads have parallel-sided holes and longitudinal decoration.

Winding is the method used early on in China to produce glass beads. It involved winding a strand of molten glass around a tapered iron rod. Before the glass hardened, it was rolled on an iron plate or in a grooved mold until it achieved the desired form. Wound beads have tapered holes and their decorations are generally oriented around the bead. Most Han glass beads were formed by winding.

BEADS OF THE WEI, JIN, AND SOUTHERN AND NORTHERN DYNASTIES (220-589)

Chinese glassmaking entered a new era during the Wei, Jin, and Southern and Northern dynasties. During this period, a large amount of Western glass was imported into China and glassblowing technology was introduced. Looking at recently excavated glass objects from this time, most Six Dynasties glass consists of imported vessels such as bowls and vases. Locally produced beads and small thin-bodied vases may have been created due to the introduction of West Asian glassmaking technology.

An interesting find is a gilt-glass bead excavated from the M385 Southern dynasty tomb in Zixing, Hunan. According to the archaeological report it was "transparent... had a pure gold face, was broken, and had a diameter of 0.8 cm" (*Kaogu Xuebao* 1984, 3:347). Glass does not suit the description of "pure gold" so this bead must have had gold leaf applied to it. This type of decoration was popular during the Jin dynasty (Plate VD top). It is unknown if this item was made in China or is an import.

The *Book of Wei* mentions glass three times: in "Persia" it is called *poli* and *liuli*; in the "State of Dayue" it is called *liuli*; but in the "Great State of Qin" it is called *qiulin*. From this we can infer that glass imported during the Jin dynasty may have come from any of these three areas, but it would be a stretch to say that they were called by their Indian name.⁵³ Glass may have been first introduced from India or may be related to the *moni* produced in southern India. The *Book of Wei*, "Southern India," states: "Fuchou city lies in southern India, 31,500 *li* from here. The city is 10 *li* in

circumference, and produces *moni* beads and coral. 300 *li* east of the city lies Balai city, which produces gold..." (Wei Shou n.d.). "*Moni* beads" may be "glass beads." Therefore, Indian glass beads may have come to China during the Six Dynasties period.

In 1994, around 150,000 small glass beads were excavated from the West Gate ruins at the Northern Wei Yongning Temple in Luoyang. These were of many colors, including red, blue, yellow, green, and black. They were about 0.35 cm in diameter and "formed by cutting them from thin tubes" (Cheng Zhuhai 1981:101). These were composed of Na-Ca glass and were identified by Peter Francis, Jr., as Indo-Pacific trade beads; "we can only vaguely say that they are Indian glass beads" (An Jiayao 2000, 1:92). These beads may be the "*moni* beads" mentioned in the *Book of Wei*. Others think *moni* beads are a kind of hanging decoration. The word *moni* originates in Sanskrit and is a general term for precious pearls. The *Nirvana Sutra* says "if you throw *moni* beads into dirty water, the water will become clear." *Moni* beads are used in Buddhism and it is very likely they were introduced to China along with Buddhism during the Wei, Jin, and Southern and Northern dynasties.

GLASS BEADS OF THE SUI DYNASTY (589-618)

In 589, Sui Emperor Di defeated the Chen and unified China, ending its division under the Wei, Jin, and Southern and Northern dynasties, furthering the technology and culture of China's ethnic groups. Sui Emperor Yang built the Grand Canal, linking the North and South, and China's economy developed rapidly. Unfortunately, Emperor Yang was overly extravagant and resentment built up among the people; he died after only 37 years. The amount of glassware used during the Sui dynasty clearly increased and recent excavations of Sui tombs have discovered many examples. Most of these tombs were of the nobility, and the excavated glassware for the most part was not the traditional Pb-Ba glass. The more important objects include:

1. Kaihuang 9th year (589), Qingchan Temple, Xi'an, Shaanxi; one thin-necked glass vase (Sassanian Persia style), 10 colored beads, 13 green gaming pieces, and 4 dark blue ornaments (*Kaogu yu Wenwu* 1988, 1:62).
2. Renshou 4th year (604), Hali column base, Hui County, Shaanxi; 1 glass covered vase, 1 brick of materials, and 2 glass beads (*Kaogu* 1974, 2:126).
3. Daye 4th year (608), Li Jingxun tomb, Xi'an, Shaanxi; 1 small-mouthed glass vase, 2 egg-shaped glass objects, 1 small oval glass vase, 2 glass pestles, 1 glass covered can, 1 glass (brush) tube, 15 glass beads, and 1

remnant of a glass tube (Zhongguo Shehui 1980:22-23; *Kaogu* 1959, 9:471).

Excavated Sui glass vessels were mostly imported ones. The largest number of locally produced glass vessels was excavated from the Sui Li Jingxun tomb. Analysis of the glass covered can (box), egg-shaped object, and the tube-shaped object revealed that all had a high Pb content, were transparent green, and had shiny inner and outer walls. The two small glass cups (blue and green), neckless vase, and green oblong vase were Na-Ca glass.⁵⁴ Through an analysis of the object forms, An Jiayao (1984:424-425) believes that the Na-Ca glass excavated from the Li Jingxun tomb was produced in China. This reveals that the Pb-Ba glass composition used from the Warring States period to the Han dynasty was no longer in use by the Sui dynasty. During this time the glass made in China used a high-Pb system, as well as an Na-Ca system. According to the *Book of Wei*, the Na-Ca glass composition was introduced by the Darouzi people, but others believe it was created by He Chou of the Sui.

GLASS BEADS AND PENDANTS OF THE TANG DYNASTY (618-907)

Sui Emperor Yang loved grandeur, neglected his army, worked his people hard, and squandered money. By the end of the Sui dynasty, armies had rebelled in all quarters and, in 618, the imperial guard commander Yu Wenhua initiated a mutiny. Emperor Yang was killed, bringing an end to the Sui dynasty. The Sui official Li Yuan grasped this opportunity to raise an army in Taiyuan and gathered men from all over China to establish a regime. He united China in 618 and founded the Tang dynasty, calling himself Emperor Gaozu. Later, in the hundred-year period from Tang Taizong, Li Shimin (Zhenguan, 627-649) to Tang Xuanzong, Li Longji (Kaiyuan, 713-741), China was at peace and the country's politics, economy, culture, and foreign relations reached a level of prosperity never seen before. The Tang had close relations with the western regions and the states in the southeast, and people and merchants from all over came to the capital, Chang'an, by the hundreds of thousands. The An Shi Rebellion broke out in 755, causing the central government to lose its prestige. The government became corrupt and levied harsh taxes on the people so that there was no way for them to make a living. The Huang Chao rebellion began in 874, to which the whole country responded. Even though the rebellion failed, the Tang court could no longer be saved. In 907, the military leader Zhu Wen usurped the Tang throne and established himself as the Liang emperor, thereby ending 289 years of Tang rule. Early Tang

government and politics were well developed, and attracted many foreign cultures. During this time arts and handicrafts developed very quickly, and trade and communication with the outside world was widespread. Much West Asian glass was imported by land, sea, and the Silk Road.

Glass beads and pendants produced in China during the Tang dynasty have been recovered from the following archaeological sites:

1. 888, Jingling, Qian County, Shaanxi; glass pendant (Wu Zhenfeng and Han Zhao 1998: Figures 111-112).
2. Hongzunya Square tombs, Ning'an County, Heilongjiang; 31 glass beads and one tube.⁵⁵
3. Gao Shuying tomb, Xida Yingzi village, Chaoyang, Liaoning; 1 glass bead (Zhongguo Shehui 1984, 4:451).
4. Ximing Temple ruins, Xi'an, Shaanxi; light-blue fish pendant (Archaeological Institute of Kashihara 1995: Figure 79).
5. Jia village, Shangji County, Henan; a glass pendant with three holes and 111 glass beads (Wenwu 1964, 2:64).

Very few descriptions of glass ornaments excavated from Tang sites have been published, but Japan's Shosoin treasure house holds a good number of them, including necklaces and stringing beads (Shimonaka 1989: Figure 18). All have been preserved intact as if new and provide important information about Tang glass ornaments. A deep-blue glass fish pendant 4.9 cm in length and 0.15 cm in thickness excavated from the Tang Ximing Temple ruins, Xi'an, Shaanxi (Archaeological Institute of Kashihara 1995: Figure 79), is an example of typical Tang glass pendants (Figure 14). The fish pendant originated from "fish tallies" – upon entering and exiting the Tang palace gates, people had to present their fish tallies. The *New Book of Tang, Record of Carts and Clothing* relates: "Those of the fifth rank and above carried silver fish bags with them to prevent against

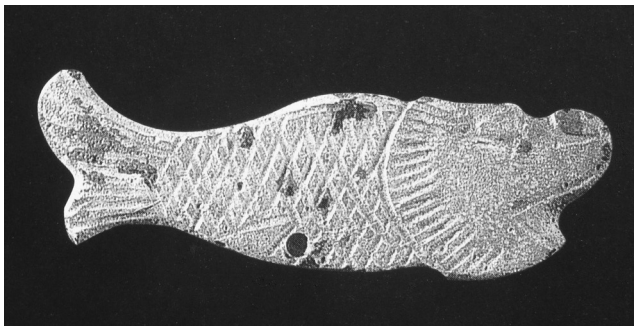


Figure 14. Fish pendant of deep-blue glass, Tang dynasty (Archaeological Institute of Kashihara 1995).

receiving false orders... in the second year of Tianshou (Wu Zetian, 691) these were changed to fish pendants... this is the origin of the official fish pendants." Later the pendants became available to ordinary people. There is a collection of Tang glass fish pendants in Japan's Shosoin.⁵⁶

Even though Tang dress codes did not require the use of glass pendants, these must have been popular at the time. Over 100 High Tang glass pendants and paste beads were excavated at Jia village, Shangcai County, Henan, in 1962. The report calls the pendants "crescent moon decorations." A hole has been drilled through at the upper edge and they have soft white bodies which are 5.9 cm wide. The report does not mention their disposition on excavation, but they may have been used in combination with the paste beads to form pendant adornments (Wenwu 1964, 2:64). In 1995, a couple of flat glass pendants (Figure 15) were excavated at Xizong Jingling, Qian County, Shaanxi, that were formed in a mold. One is somewhat pentagonal in outline while the other one consists of a perforated disc. Both appear grey from heavy weathering. Such pendants appear the same as



Figure 15. Glass pendants with dragon phoenix design, late Tang dynasty (Wu Zhenfeng and Han Zhao 1998).

Tang jade carvings, so they must have been carved in the same way. The pendants are from the late Tang reign of Tang Xizong (873-888) and reflect the status of the glass pendants used by late Tang nobility. The author's collection also includes a set of Tang belt buckles of light yellow glass that were carved in an animal design using a jade-carving chisel. These are in the same style as Tang jade buckles, indicating that there was a close relationship between Tang glass and jade pendants.

GLASS BEADS AND PENDANTS OF THE FIVE DYNASTIES AND SONG DYNASTY (907-1279)

A group of glass-bead adornments was recovered from a Five Dynasties Chu tomb on the outskirts of Changsha, Hunan. It consisted of 25 objects, most of which were individually used beads and not beads intended for stringing. They were of many colors, including saucer red, colorless transparent, blue, ginger yellow, peacock blue, purple blue, and black and white. There were many forms including pea-, gourd-, and girdle-shaped.⁵⁷ These beads were more varied and more colorful than those of the Tang dynasty.

A few beads have been recorded from Northern Song archaeological contexts:

1. Jiayou period 3rd year (1058), Sharira Tower Earth Palace, Dasheng, Nanfeng County, Jiangxi; 9 glass beads.⁵⁸
2. Yuanfeng period 1st year (1078), Ganlu Temple, Zhenjiang, Jiangsu; colorless, transparent, glass stringing beads.⁵⁹

Excavated decorative objects from the Southern Song period are very few in number and include hairpins, earrings, double-diamond-shaped decorations, and seed-shaped adornments. Beads and pendants have been recovered from the following two published sites:

1. Third Tower, Chongsheng Temple, Dali, Yunnan; several glass stringing beads, 0.2 cm in diameter.⁶⁰
2. Huangsheng tomb, Fuzhou, Fujian; fragmentary pendant of semi-transparent brown glass (Fujian 1982:81).

It is worth noting that the fragments of the glass pendant found by the chest of the burial in the Fuzhou Huangsheng tomb "were brown and semi-transparent." According to the report, its chemical composition was "mostly Pb, Si, and As, with small amounts of Fe, Mg, Mn, Bi, Sn, Ag, Cu, Ca, and Na" (Fujian 1982:81). The composition of the pendant is clearly different from the traditional high-lead composition of the Song dynasty. The Huangsheng tomb dates to the late Song Chunyou period 3rd year (1243), revealing that the composition of late Song glass had begun to diversify and was not limited to just high-lead compositions.

During the Southern Song dynasty, the northern regions mostly fell into the hands of the Liao and Jin, and most of the objects found there were decorative glass beads. The lands of the Southern Song, which lay in the south, mostly produced small decorative glass objects such as glass earrings, bead adornments, hairpins, and pendant adornments. For these, sky blue and white were the most popular colors. Marbled glass beads (Plate VD bottom) appeared during the Song dynasty and continued into the Yuan dynasty.

The *Southern Song: Record of Clothing and Dress* states: "Now the caps of all the servants have imitation jade and green beads on them and velvet threads of five colors, unlike the two and three colors of jade traditionally worn on caps..." (*Songshi* n.d., vol. 152). It also mentions "belts, shirts, jade-like pendants, threaded imitation beads, red brocade ribbons, silver hoops..." (*Songshi* n.d., vol. 152). Apparently court dress of the Song dynasty used glass beads as decoration. Song dynasty pendant ornaments also included glass. The *Songshi: Record of Clothing and Dress* relates that "pendants incorporated false beads, and *heng* and *huang* jade pieces." These three items were components of ancient composite pendants, revealing that such were used during the Song dynasty, but unfortunately none have been excavated as yet.

GLASS BEADS AND PENDANTS OF THE LIAO AND JIN DYNASTIES (916-1234)

There is very little information about the glass beads and pendants of the Liao and Jin dynasties. Very few ornaments were used by ordinary people during the Liao dynasty, but globular pendant beads of transparent off-white and cream-yellow glass (Figure 16) were a popular form during the Liao and Yuan dynasties. After the body of the bead had been formed and the glass was still viscous, a tab of glass was pulled from it and perforated to create the suspension element. About 1.3 cm in diameter and 1.6 cm in height, these beads were found to contain a large amount of K₂O and 2.25% CaO. They were tied to cloth bags and clothing.

Glass beads and pendants were also scarce during the Jin dynasty. The pendants include several mold-pressed forms (Plate VIA) which also continued to be used during the Yuan dynasty. Archaeological reports have only mentioned the following items:

1. Aolimi ancient city, Suobin County, Heilongjiang; glass stringing beads, 1 animal-head pendant, 1 black glass oval pendant with blue painting, and 3 white glass gourd-shaped pendants (the upper end has a small iron ring attached) (*Beifang Wenwu* 1995, 2:123; *Wenwu* 1977, 4:56).

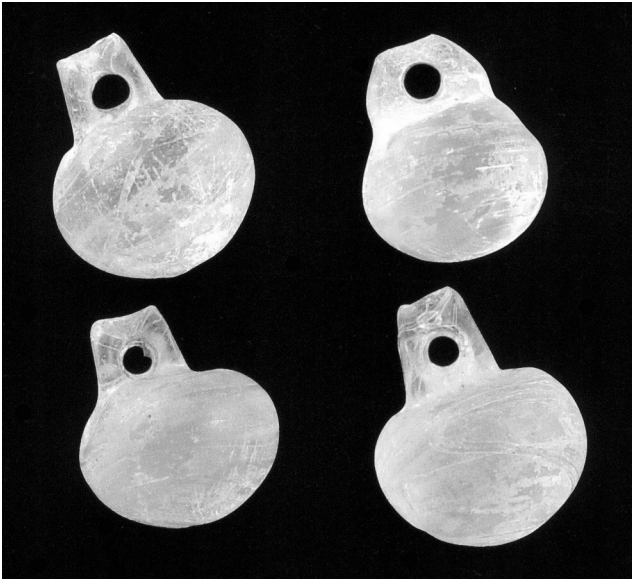


Figure 16. Transparent glass pendants, Liao dynasty (Diameter: 1.3 cm) (author's collection).

2. Yan Deyuan tomb, Datong, Shanxi; 1 small glass ring 1.9 cm in diameter and 2 strings of blue glass beads (*Wenwu* 1978, 4:1).

GLASS ADORNMENTS OF THE YUAN DYNASTY (1271-1368)

Yuan dynasty glass was used in more ways than glass from the Song or Liao and Jin dynasties. Small decorative glass objects excavated at Yuan sites include the following:

1. Wuxu Xidianzi, Donggangzi village, Hunchun, Jilin; 15 glass beads and spiral ornaments.⁶¹

2. Welcome Brickyard, Shiqiao, Fuyu County, Jilin; 8 flower ornaments (4 each of blue and white), 1 blue glass ingot-shaped ornament, 8 ear spools, 3 spiral ornaments, 1 dove-shaped ornament, 3 hoop ornaments, 3 melon-shaped ornaments, and 17 bead ornaments.⁶²

3. Sunjiashan, Yiliang County, Yunnan, late Yuan to early Ming tomb; 22 flower-petal-shaped glass bead adornments, 2 glass tubes, and 1 glass piece.⁶³

4. Daijitun M4, M7, and M9 tombs, Fuyu County, Jilin; glass flower hair adornment, 26 tube-shaped glass bead ornaments with spiral patterns, 3 semicircular glass ear spools (1 by each ear in the M7 tomb and by the right ear in the M9 tomb), 1 glass square pillar-shaped ear decoration, 3 semicircular glass beads, and 1 olive-shaped glass bead.⁶⁴

Most of the glass ornaments excavated from Yuan tombs come from the north and none have been found south

of the Yangzi River. The most popular Yuan glass ornaments were flower petals (Plate VIB top), beads, ear ornaments (Plate VIB bottom), and hairpins. Beads were mostly used individually, the most prominent of which is a spiral shaped one. Many melon-shaped glass beads have also been found from the later period (Plate VIC). Yuan glass ornaments are mostly white and light blue; other colors are fairly rare.

In 1982, the remains of a late Yuan to early Ming glassmaking workshop were discovered in Zibo city, Shandong. The archaeological report relates:

Traces of glass furnaces were congregated close together and arranged in a fairly neat manner. There was a large furnace located at the south end of the workshop. There were 21 smaller furnaces arranged largely south to north in a line. The furnaces were anywhere from 10.8 meters apart to 1 meter apart. The shallowest furnace was 1 meter, and the deepest was 1.65 meters. The large furnace had a square base, and the small furnaces had been completely cleaned. The furnace bases were flat and either double gourd-shaped or shaped like an inverse "T." Most of the other small furnaces were buried under the walls of troughs in the ground.... By analyzing the remains of the objects left in the smaller furnaces, we know that each of the smaller furnaces mostly produced one type of product. For example, a larger number of green glass beads were excavated from L1 and more milky-white hollow glass hairpins were found at L2... (Zibo 1985, 6:531).

The large furnace served to melt the raw materials used to make glass and the smaller ones were used to produce each type of object. Based on the research of Yu Jiafang, the glassmaking process used in Yuan dynasty Zibo has passed down to modern times. An old Zibo glassworker explained:

First saltpeter cans filled with ore were placed in these old hand-operated furnaces which were then sealed tightly. At high temperatures the ore in the cans would melt and become liquid glass. Once a certain temperature was reached, the glassworker would open one side of the furnace and use a long hook to open the lids of the cans and get rid of the material floating on the liquid glass. A metal bar (also called "material head" or "material scoop," which is a type of long-handled fire-resistant tool made of iron with a ball on the end) is dipped into the liquid glass in the cans and quickly pulled out to let the liquid glass flow onto a long metal slab lying on the ground. The glass then quickly forms a strip. While it is still soft, a glassworker stretches it to around one meter in length with iron pliers for use in the smaller furnaces (Zibo 1985, 6:531).

Based on the shape of the small traditional glass furnaces in modern Zibo as well as the remains of the glass workshop, the small Yuan glassmaking furnaces were gourd-shaped, with two larger ends and a smaller section in the middle forming a gourd shape on top. The area around the fire was closed off and the face of the furnace was flat with a hole in the middle for access to the fire. The worker would hold an iron rod with one hand and a glass strip in the other. Using the flames that came out of the hole in the furnace, the glass was softened and wrapped around the iron rod to be worked into spiral beads and stringing beads, as well as hairpins and small rings. Almost all Yuan glassware was made using this type of small furnace.

A type of melon and spiral bead was popular during the Yuan dynasty and most of these beads were used individually as ornaments and not strung together. Of many colors, they are commonly seen scattered in Yuan tombs. The Yuan Yunnan Yiliang Sunjiashan fire burial tomb group consists of a total of 91 tombs, 20 of which contained a single glass bead and two contained two glass beads.

Glass objects recently excavated from Yuan tombs have mostly been from the late Yuan dynasty. Apparently the use of glass ornaments only started to become popular during the late Yuan dynasty and developed even more during the Ming and Qing dynasties.

The chemical composition of Yuan glass clearly differs from that of the Song dynasty. Analysis of glass pieces excavated from the Yuan glassmaking workshop in Zibo revealed them to be

different from the Chinese glass of the pre-Qin and Western Han dynasties. The clearest difference is that there is a high amount of silicon dioxide and it does not contain barium oxide. They may include lead oxide, or include it in very small amounts. Another clear characteristic is the large amount of potassium oxide. The amount of sodium oxide is close to the amount of these two and these amounts are far less than the large amount of sodium oxide found in glass from the ancient Mediterranean (Kaogu 1985, 3:538).

There is also a rather large amount of Al_2O_3 . According to the findings of the Glass and Enamel Research Institute, Ministry of Light Industry, Shanghai, the glass that came from the workshop “had a high amount of K_2O because of the large amount of saltpeter used. The Al_2O_3 in the glass comes from the use of feldspar minerals and F comes from fluorite” (Yi Jialiang and Tu Shujin 1984:408). According to the early Qing work, *Random Notes from Mount Yan: Glass* by Sun Yanquan, “glass is made from stone mixed with niter and refined with sea stones and transformed with copper,

iron, and red lead...” Niter has long been used as a raw material for making glass and the evidence from the Yuan glass workshop confirms that, as early as the Song dynasty or even earlier, the “lead, niter, and gypsum” composition mentioned by Zhao Rushi in the Song-era *History of the Various Foreign Countries* is correct and was continually used until the Yuan dynasty.

GLASS BEADS AND PENDANTS OF THE MING DYNASTY (1368-1644)

Glass was used much more widely in the Ming dynasty than in the Yuan and its main use was to produce imitation jade. This was used to create numerous items including composite imitation white-jade pendants. There were clear rules for the use of pendants and jade belts by officials during the Ming dynasty. The *Mingshi* (History of the Ming) states:

First rank: caps have seven bridges and do not use cicada ties. Leather belts and pendants should be jade. There are two tassels and hoops. Second rank: six bridges, leather belts, tassels and hoops, ivory, and the rest are like the first rank. Third rank: five bridges; leather belts with gold; jade pendants; tassels made of green, red, and purple; crane and flower brocade; a knot below in a green silk net; two golden tassels and hoops. Fourth rank: four bridges, leather belts with gold, “imitation jade” pendants, the rest like the third rank. Fifth rank: three bridges; leather with silver inlaid flowers; “imitation jade” pendants; tassels made of yellow, green, red, and purple; circling flower brocade; a knot below in a green silk net; two silver and gold tassels and hoops (Zhang Tingyu 1739a).

Ming dynasty dress codes apparently forbade the use of jade belts and pendants for those of second rank and below. Those of fourth rank and below could only use gold buckles and imitation jade pendants. The “imitation jade” refers to glass. A complete Ming composite jade pendant can be seen in the Wanli Emperor’s mausoleum and is composed of 236 jade pieces of different sizes. A large Ming imitation jade composite pendant is composed of a total of over 100 glass components (Plate VID) and may be of the type mentioned in the *Mingshi* as being worn by those of the fourth, fifth, and sixth ranks.

The reason Ming dynasty imitation jade objects were popular was probably because of the rather strict enforcement of the dress code. According to the *Mingshi*:

The dress of ordinary people,... jewelry, hairpins, and bracelets, may not use gold, jade, pearls, or *feicui* jade, and silver is no longer used. In the [Hongwu

period] 6th year the scarf hoops of ordinary people could not use gold, jade, agate, coral, or amber. Those who did not have a rank were treated the same as ordinary folk...” (Zhang Tingyu 1739b).

Many Ming imitation jade pendants have been passed down and this is also related to the dress code. During the Ming dynasty, jade was seen to be the most valuable material and those who were not officials or nobility could not use it. Even the first-place and successful examination candidates could not use jade with their court dress. Based on the Ming code, “the first place examination candidate has two bridges, red gauze, round collar, single scarf with brocade tassels, knee covers, gauze cap, pagoda-tree wood tablet, bright silver belt, ‘imitation jade’ pendant, court slippers, and wool socks – all as proclaimed by the emperor...” (Zhang Tingyu 1739c). We know that the emperor ordered that the first place candidate’s pendant ornaments be made of imitation jade, consequently the quality of the material was quite high. Not only were the transparency, luster, and quality just like that of jade, especially that of jade pendants, but jade craftsmen used jade-carving tools to create the patterns. They worked the glass when it was hard into exquisite things of beauty. Ming imitation jade pendants exhibit the same designs as their genuine jade contemporaries. These include flowers and birds, cranes and deer, and people, or some other auspicious markings, with clear, crisp lines that give them the strong style associated with the Ming dynasty.

Not many Ming tombs have been excavated recently and there are even fewer glass objects found in them. Those mentioned in archaeological reports include:

1. Huishun City Hall, Changchun, Jilin; 2 glass beads and 2 glass buttons (Jinji Sun 1997, 20:707).
2. Fuyu County, Jilin; 127 glass stringing beads, 6 glass flowers, 3 glass flower rings, 5 glass buttons, and 1 glass ladder-shaped flower decoration (Jinji Sun 1997, 20:735).
3. Fangjia Street, Xiaoyang, Hailong County, Jilin; 1 batch of glass stringing beads (Jinji Sun 1997, 20:777).
4. Xizhuangzi, Tieling city, Yinzhou District, Liaoning; 142 glass pinched beads (Jinji Sun 1997, 19:388).

Other smaller Ming tombs may have contained scattered glass beads and other objects, but these are not given much notice so there are no detailed archaeological reports on them. Based on the above list, all the sites where glass beads have been found are in the Northeast, concentrated in Jilin and Liaoning provinces. This suggests that the use of bead ornaments during the Ming dynasty was in the Northeast and this may have been a custom of the Manchus. The inhabitants of the central plains and southern areas don’t

seem to have used bead ornaments or included them with burials. The stringing beads that came from the Northeast were mostly simple round beads of many colors and in conformity with the customs of Manchu dress. They may have been locally produced.

Zibo, Shandong, was a main production site for glass from the Yuan dynasty all the way through the Qing, but unfortunately tombs from Shandong province rarely contain glass objects. Not many Ming glass objects have been passed down to the present day, and more material needs to be excavated and chemical analyses performed before research can progress.

Sun Tingquan (1613-1674) of the late Ming/early Qing dynasties wrote in his *Random Jottings from Mount Yan: Glass*:

The most valued of glass objects is the blue-green curtain. This is made from crystal with Mohammedan blue added and made into a strip like a chopstick. Like water flowing off ice it is wrapped like a thin curtain and transferred to redwood. Auspicious smoke slowly rises and at daybreak the shadows flee over the ground and its light resembles an imperial screen; our spirits are focused as one and combine with the darkness. They are used in altars and imperial temples and entrusted to Prison Wardens, called “state works” (Wenwu 1972, 10:20).

The most famous glass object of the Ming dynasty was called the “blue-green curtain” and, from Sun Tingquan’s description, it was made from highly transparent crystal glass with Mohammedan blue (cobalt oxide) as a coloring agent. The glass was drawn into a long chopstick-like tube that was then cut into tubular beads.⁶⁵ Unfortunately, no Ming “blue-green curtains” have survived nor have remnants so far been found in the remains of “altars and imperial temples.”

Random Jottings from Mount Yan: Glass also lists the basic techniques of glass beadmaking: “Long beads are made by coiling [winding], thin beads are poured [molded], large beads are made by coiling and breaking [likely pinching].” It also provides a quite comprehensive description of the glassmaking materials used in late Ming Yanshen town (present day Mount Bo): the raw materials of glass are stone, saltpeter, silver-rich ore, and copper, iron, and red lead. Later different amounts of “horse-tooth stone” (called “white”), “ice stones” (called “ice”), and “purple stones” (called “purple”) are added to achieve different colors. Sun Tingquan states that horse-tooth stone was snowy white like frost and when cut it formed a four-sided crystallized ore (possibly feldspar). Purple stone was a shiny purple ore resembling purple quartz. Ice stone was a transparent ore with many corners. There still is no consensus as to what these stones really were.

CONCLUSION

Glassmaking began in the Tigris-Euphrates region some 2,000 years before it came to China. Western glass may have been transmitted to China as early as the early Western Zhou or late Shang dynasty. Even though Chinese people knew how to make glass throughout the Western Zhou, Han, and Tang dynasties, glass continued to be imported from the West during this period. The exact route of this “glass road” is still not clear today, but it certainly predated the Silk Road by close to a millennium. Presently the earliest glass object found within China appears to be the “white bead with hole” excavated in 1972 from the early Western Zhou tomb in Luoyang Zhuangchungou, Henan (*Wenwu* 1972, 10:20). A larger group of similar glass stringing beads was excavated from the early to mid-Western Zhou Earl of Yu tomb. These so-called glass beads were in actuality a kind of “faience.” Chinese faience was mostly used to produce tube beads. This may be related to the limitations of the technology which was much inferior to that of the ancient Egyptians. China’s faience production techniques in the Western Zhou period must have copied those of the Mediterranean, and also independently created a Chinese faience utilizing a fusing agent different from that used in the West. The technique used to make faience tube beads lasted for about seven centuries until the late Western Han dynasty, a time when the Sichuan and Yunnan areas still used a similar, primitive, light-green faience tube bead (*Kaogu* 1983, 9:783).

Around the late Spring and Autumn and early Warring States periods (ca. 5th century B.C.), China successfully began making genuine glass objects and produced highly transparent glass as well as very fine eye beads. Early glass eye beads were valued objects imported from Western Asia. The eye beads excavated from the late Spring and Autumn Henan Gushihou Gudui and Shanxi Taiyuan Jin state Zhao official tombs were all made of typical Na-Ca glass imported from Western Asia. Not long after this, domestic eye beads with strong Chinese characteristics appeared. The composite-eye bead designs found on beads excavated from the early Warring States Shandong Qufu Lu ancient city M52 tomb and the late Spring and Autumn to early Warring States Hunan Changsha Martyr’s Park no. 3 wooden-outer-coffin tomb is different from those on eye beads from Western Asia. It appears that during the late Spring and Autumn period, the Chinese learned how to form genuine glass and copied Western Asian eye-bead concepts and production techniques to create genuine Chinese glass beads.

From the Western Zhou to Eastern Han dynasties, the main fusing agent in Chinese glass was a combination of Pb and Ba, which does not seem to have derived from the

Na-Ca glass of Western Asia. The composition of faience of the Western Zhou period changed many times and was not at all uniform. Faience tube beads from the Warring States period basically used the Pb-Ba composition exclusively. Glass objects from the Warring States period were mostly eye beads, inlays, tube ornaments, ear ornaments, sword ornaments, and funerary objects. Production techniques included pressing, molding, and drawing, and glass vessels had not yet been produced. Glass production of this period had, in principle, developed into an independent craft form. Glass was used to create new decorative items that were completely different from the style of contemporary gold, silver, jade, stone, horn, and lacquer objects.

Han glass design and production techniques saw great advances and the transparency of the glass was greater than that of previous eras. Glass products from this period were mostly ear spoons, cicada mouthpieces, small ornaments, stoppers, bi-discs, and rings. Glass produced during the Eastern Han period belonged to the K-Ca glass system. This type of glass was also once found in India and Southeast Asia and its chemical composition is extremely similar to one type of dark-blue glass ear spoon that was popular during the Han dynasty. The Pb-Ba system of glass was no longer produced by the late Eastern Han dynasty.

According to the *Wei shu*, during the Northern Wei period, the Darouzi people cast glass in the capital. They not only introduced Western glass compositions, but may have introduced glassblowing techniques as well. During the Western Zhou to Eastern Han dynasties, Chinese glass had continually used a Pb-Ba composition, but by the Southern and Northern Dynasties it had, for the most part, been completely replaced by the Western Na-Ca glass composition. The pressed molding and casting methods popular during the Han dynasty gradually died out after the Eastern Han period.

The Sui dynasty continued the use of Na-Ca glass that was seen in the Wei and Jin periods. Even though the Sui dynasty only lasted 37 years, glass craftsmanship appears to have undergone extraordinary development during this period. Molds were seldom used during the Sui dynasty and casting had already died out completely by that time. The glass is mostly green with a high level of transparency. The items produced, such as egg-shaped objects, brush holders, and jars with lids, were all of a clearly Chinese style, which established the characteristics of Chinese-made glass vessels.

During the Tang dynasty, trade with other countries developed along the Silk Road which brought in much Western glass. Tang glass was mostly Na-Ca series and

highly transparent. Glass vessels were mostly colorless and transparent and other decorative objects and inlays were bright green, red, and yellow, and very finely made. This was one of the peaks in the development of Chinese glassmaking.

The glass of the Song dynasty employed highly purified red lead as a fusing agent and did not contain Ba, so it was consequently a high-lead composition. Northern Song glassmaking techniques continued the developments of the Tang dynasty and primarily produced small bottles though small bead ornaments were produced as well. After the Northern Song period, glass was used even more infrequently. Blown glass dishes were no longer made and fewer glass bead ornaments were seen. From the Northern Song period up to the present day, no Chinese-made glass vessels have been found, revealing that Song glassmaking went into decline after the Song court moved south.

A large number of imported glass objects were excavated from Liao dynasty tombs of nobles, but domestically made glass was extremely rare. By the Jin dynasty both imported and Chinese-made glass was extremely rare. According to the *Jin shi*, while ordinary people were clearly ordered to observe the rule that “dishes and eating utensil containers may not be made of... glass,” Jin glass bead ornaments were commonly used by ordinary folk.

Yuan glass was also mainly used for decoration and vessels were rare. The composition of glass was not uniform, which may be related to differences in local workshops. By the end of the Yuan dynasty, glassmaking had made a comeback, as can be seen by the example of the late Yuan glassmaking workshop excavated in Zibo, Shandong. Imitation jade made of glass was popular during the Ming dynasty and used as a replacement for white-jade pendants.

Ming glass objects mostly consisted of common everyday objects like “blue-green curtains,” hairpins, chess pieces, ink stones, wind chimes, handled cups, and belt buckles. A high level of craftsmanship went into the imitation jade pieces which could easily be mistaken for genuine jade, and “imitation jade” pendants were made using jade-carving tools, resulting in exquisite pieces.

Through missionaries, Qing dynasty (1644-1911) emperors imported European glassmaking techniques from the West and made glass in the imperial palace. Chinese glassmaking drew a new breath of life. Qing glass was appreciated and praised by the emperors and saw much development, becoming a new art. Produced in the heart of Beijing, it was called “Jing material.” Glass was produced in other areas such as Boshan, Shandong; Guangzhou, Guangdong; and Suzhou, Jiangsu. After the Qing dynasty,

Chinese glassmaking craftsmanship quickly waned and mostly focused on snuff bottles and small decorative objects.

Since 1949, over 500 tombs mentioned in publications have produced ancient glass objects and their number is limited. Based on a rough estimate, apart from eye beads, fewer than 200 types of glass objects have been excavated in China. Bead ornaments are the most numerous, followed by imitation jade pendants and funerary objects. Chinese glass was mainly used for decorative objects and Chinese people used its special characteristics of bright colors and plasticity to create many ornaments with unique styles. This is an achievement of Chinese material culture that is worthy of study and appreciation. Modern Western glassmaking has already become a form of “pure art.” In comparison, China’s glassmaking craftsmanship has clearly lagged behind, which we must take note of and work on developing.

ENDNOTES

1. Editor’s note: In 2001, Simon Kwan published his exemplary work on *Early Chinese Glass* which presents a thorough examination of Chinese glassware from the Western Zhou (1100-771 B.C.) to Qing (A.D. 1644-1911) dynasties. As the text is in Chinese and relatively little is known about Chinese glass, this article presents a translation of the sections relevant to beads and pendants. Consequently, information about glass vessels and non-perforated ornaments is generally not included. Although it was not possible to include the massive catalog that comprises the bulk of the book, a representative sample of the beads and pendants depicted therein have been included in the article. To view all 231 entries, each of which has a brief English heading, the reader is encouraged to consult the book. It also contains two English-language articles on the chemical composition of early Chinese glasses that may be of interest to some readers.

Sincere thanks go to Valerie Hector who graciously provided the bulk of the translation, much of which she funded herself. Thanks also to Jeffrey A. Keller for the excellent translation. Gratitude is expressed to Mr. Simon Kwan for kindly allowing the translated material to be published in this journal.

2. For related articles see Zhang Weiyong (1986, 2:64-69, 96), Li Suzhen and Tian Yucheng (1986, 2:70-73), and Shen Fuwei (1981, 4:275-286; 1982, 2:352-364).
3. As stated previously, glass (*boli*) appeared in China as early as the Spring and Autumn period, but the word

liuli did not appear until the Western Han dynasty. There was no uniform, definite word for “glass” before the Western Han dynasty.

4. The phrase “primitive glass” was used as early as the 1980s, as in Wang Shixiong (1986:26-30), and accepted into use (*see* Qi Dongfang 1999:23-29). Regarding the problem of the origins of Chinese glassmaking techniques, Yang Boda believes that Western Zhou faience was already glass and that the techniques could have been used as early as the Shang dynasty, but Zhang Fukang believes that Western Zhou faience cannot be called glass. “Primitive glass” is situated between the two. Even though it cannot be called glass in the modern scientific sense, it is still a stage in the development of glassmaking techniques, just like the period of developing ceramics, which is called “primitive ceramics.”
5. Beijing was the site of glass production during the Qing dynasty and merchants of the time called glass made in Beijing *Jingliao* (Beijing glass). The character *liao* originated from the industrial language of the glass artisans of Boshan, Shandong. During the Qing dynasty, local and nearby minerals were used to produce glass pieces and rods in Boshan and these were semi-finished products. Glass artisans in Beijing imported these semi-finished glass pieces and rods to form glass items of all styles. Strictly speaking, the Beijing glass industry was just a processing industry.
6. The beads “were all unearthed near the head, there were many of them... light green and spherical, 0.5 cm in diameter and a hole diameter of 0.3 cm” (Zhongguo Shehui 1959b:59).
7. The faience tubes had a quality, luster, and corrosion identical to those from the tomb of Duke Yu (Yang Boda 1980:22; Zhongguo Shehui 1959c:24).
8. The report states that “*liao*” beads and glass beads were unearthed; the “*liao*” beads were light green and irregularly shaped; the glass beads were pinkish-purple and very thin (Zhongguo Shehui 1963:62).
9. White “*liao*” beads were unearthed (*Wenwu* 1972, 10:26).
10. The faience beads included rhomboid tubes and spherical beads and oval beads with spotted decoration, grayish-green; originally strung together with agate, stone, and pearl tube beads, over 1,300 pieces (*Wenwu* 1976, 4:43).
11. The three light-blue beads “had irregular shapes and holes, the wall thickness of the beads varied, they were corroded and had spots that looked like sugar, and they had extremely small grooves and air holes” (Yang Boda 1980:21).
12. Barium may have been introduced as a component of additional materials because it can have a flux effect like a base or a stabilizing effect on calcium. On the other hand, it could have been associated with ingredients containing lead. Barium can produce a certain muddiness in glass, therefore barium may have been introduced by Chinese glassmakers to create a jade-like effect (Bubeier et al. 1986:27).
13. A white glass bead was found on the disturbed soil layer of the early Western Zhou Luoyang Panjiagou M54 site and pinkish-purple glass beads were unearthed from the Western Zhou Zhangjiapo H423 site.
14. The eye beads from Spring and Autumn to early Warring States Martyr’s Park tomb no. 3 in Changsha, Hunan (*Wenwu* 1959, 10:70) and the State of Lu ancient city Tomb M52 (early Warring States) in Qufu, Shandong (Shandong Sheng *Wenwu* 1982:178) all have Chinese characteristics but lack chemical analysis.
15. The drawing in the report is not clear and the report says, “unearthed from 3 tombs... inner body is white, exterior painted with colored material, some engraved with floral patterns and have soft textures.” Based on the decoration shown in the report and the description, these must be faience beads with lattice patterns (*Zhongyuan Wenwu* 1997, 3:21).
16. “The body is pillar-shaped... green glaze applied to the exterior, pierced with a small hole. Located by the skeleton’s neck at the time of excavation, it was a hanging decoration used at the time” (*Kaogu Xuebao* 1957, 3:86, Fig. 14:10-11).
17. “Bluish-green, not transparent... 2.2 cm long, 0.2 cm hole diameter.” From their luster and size, we know that faience tubes and beads were still used in the Sichuan region (*Wenwu* 1974, 5:66).
18. Five tubes and beads were unearthed from Dongsunba boat-casket tombs M5, M10, M49, and M50, of which “two were bluish-green... had holes that were large at one end and small on the other, 2.4 cm and 1.6 cm long respectively, with roughly 0.6 cm diameters” (*Kaogu Xuebao* 1958, 2:93).

19. “Pinkish-green, one of the tubes had protruding rings on each end and its center was covered in a protruding dot pattern” (*Kaogu* 1983, 9:783).
20. The blue and white circular patterns should be the dragonfly-eye decorations often seen during the Warring States period, but the report also says: “the etched-pattern *liuli* beads developed from etched stone beads; the eye patterns from the etched stone beads were used on the etched *liuli* beads and brought from India and Pakistan. Extremely few etched stone beads and etched *liuli* beads have been unearthed in China; most of them have come from the Southwest and Xinjiang, and they are even less common within Jiangxi.” The dragonfly-eye beads we know of now are not concentrated in the Southwest and Xinjiang, so it cannot be determined whether this report refers to dragonfly-eye beads or etched beads (*Nanfang Wenwu* 1993, 4:16).
21. Sixteen eye beads were unearthed from sites M1, M6, and M7 (late Warring States period) in Pingliang, Gansu. The beads were already fragmented and 2.2 cm in diameter and 0.5-0.7 cm thick (*Kaogu yu Wenwu* 1982, 5:2).
22. Locations where eye beads of the late Warring States period have been unearthed in Xianyang, Shaanxi, include the Xianyang petroleum plant (*Kaogu yu Wenwu* 1996, 5:4), Huangjiagou (*Kaogu yu Wenwu* 1982, 6:12), and Taerpo (Xianyang 1998:176).
23. An eye bead was recovered from the M13 tomb (late Warring States period) in Qingchuan, Sichuan (*Wenwu* 1982, 1:12).
24. An eye bead was recovered from the late Warring States tomb at Jinjing, Wulian, Qianwei County, Sichuan (*Kaogu* 1983, 9:783).
25. An eye bead was recovered from Tomb M1 (late Warring States period) at Beilingsongshan, Zhaoqing city, Guangdong (*Wenwu* 1974, 11:76).
26. Nine eye beads from the Qin to early Han dynasties were unearthed in Shan County, Henan (Zhongguo Shehui 1994:153).
27. A total of 16 eye beads were unearthed from the Yuan family M6 Qin tomb at Qin’an, Gansu (*Kaogu Xuebao* 1997, 1:68).
28. One eye bead was unearthed at Mianyang, Sichuan (*Kaogu yu Wenwu* 1986, 2:20).
29. Two western Han “etched beads” (dragonfly-eye beads) were excavated in Chongqing, Nan’an District, Sichuan (*Wenwu* 1982, 7:29).
30. The oblong glass beads recovered from the early and middle Western Han tombs at Shizhaishan, Jinning County, Yunnan, “were dark blue and had six light blue spots inlaid in their surfaces” (Yunnan 1959:126). These must be eye beads.
31. A single eye bead came from Tomb M1048 (early Western Han dynasty) at Huanghuagang, Xianlie Road, Guangzhou (Guangzhou 1981:165). Others were recovered from the King of Southern Yue tomb of the early and middle Western Han dynasty (Guangzhou 1991:133-134).
32. According to the report, this “glazed pottery bead” was “grayish-white, spherical, and had a small hole running through it. It had a sunken rolling-cloud pattern in its surface. Remnants of a low-temperature sky-blue and light-green glaze can be seen in some of the patterns (like the shallow sunken grooves). It was 1.2 cm in diameter with a hole 0.2 cm in diameter” (*Jiangnan Kaogu* 1986, 2:48). This must be an eye bead with a pottery body.
33. Both mirrors are fragmentary, “they have basically the same form, size, and decoration... decorated with 18 inlaid glass beads... diameter 14.5 cm, thickness 0.6 cm” (*Wenwu* 1999, 8:9, 32:5, Figure 1:1-2)
34. According to An Jiayao (2000:21), in the latest analysis of the three other eye beads from the tomb of Marquis Yi of Zeng, “the results still have not been officially published, but the analyst, Senior Engineer Shi Meiguang, told me that these three samples are all ordinary sodium-calcium glass and contain no lead or barium. He suspects the 2.8% lead oxide contained in the first sample may have come from contamination of the glass surface.”
35. In ancient times the word for medicine referred to various chemicals as well.
36. The pottery-bodied eye beads from Erligang, Zhengzhou, underwent three tests; their “surfaces were brown-black glass” and they contained 2.70% Na₂O and 3.33% CaO (Zhang Fukang et al. 1986:71).

37. Fan Shimin and Zhou Baozhong (1983:104) report that x-ray fluorescence analysis of the “inlaid color glass beads” revealed Si⁺⁺, K⁺⁺, Ca⁺⁺, Pb⁺⁺⁺, Ba⁺⁺⁺, Fe⁺, Cu⁺; other components include Sr⁺, Gd⁺, Ga⁺.
38. The tubes are 7.2 cm long, 0.8 cm in diameter, and have a hole 0.5 cm in diameter (Hubei Sheng Jingzhou 1985:92).
39. The tube is 2 cm in diameter with a hole 0.65 cm in diameter (*Jiangnan Kaogu* 1988, 3:32).
40. The tube is 3.0 cm long and 1.1 cm in diameter with a hole 0.5 cm in diameter (Gao Zhixi 1995:55).
41. The stringing beads included 77 that were “round or oblong in shape, dark green, vertical holes, diameter of 0.4 cm, found on a copper mirror,” 17 that were “oblong, opaque black, vertical holes, diameter of 0.2 cm, located in the center of the coffin,” and 17 that were “oblong, white or blue, vertical holes, diameter of 0.2 cm, located at the center of the coffin” (Guangzhou 1981:165).
42. The beads appear to have been attached to a garment: “the glass beads on the breast of the jade coat were already scattered and a small number could be seen to be arranged as if strung.... some of the aforementioned beaded garment decorations had traces of silk at their bottoms and they were originally sewn onto the fabric” (Guangzhou 1991:133-134).
43. “Shaped like abacus beads, different sizes, the large ones had diameters of 4 mm and thicknesses of 3 mm; the small ones had diameters of 3 mm and thicknesses of 2 mm; opaque dark blue” (*Hunan Kaogu Jikan* 1989, 5:118).
44. The beads are of “two types: 1) transparent, dark blue, light blue, light green, moon white, dark green, light green, lake green, white, and a few light yellow ones. Round, oblong, oval, tube-shaped, long hexagonal, long square, and flat jug shaped. Included is one white melon-shaped bead with six lobes and a gilt surface. 2) opaque, mostly brick red, yellow, green, and some black. Apart from some rhomboid specimens, the rest are all round or oblong” (Guangzhou 1991:292).
45. The beads are “bead or ring shaped, holes in the center, more or less the same size. The large ones are bead shaped with floral patterns on their sides; the small ones are flat ring shapes. All are white” (*Kaogu Xuebao* 1959, 2:84-85).
46. Bead cores “are light green, exteriors are dark green, both sides are slightly flat, and there are small round holes in their centers” (*Kaogu Xuebao* 1957, 1:161).
47. Of the beads, “3 are light green, transparent, large in the middle, small at the ends, with twelve or eight sides, 0.8-1.0 cm diameter.... 122 are bead shaped, oblong, cylindrical, or flat jug shaped... brightly colored dark blue and light blue. Most are transparent, some are semi-transparent. Diameter: 0.4-1.5 cm” (*Kaogu Xuebao* 1984, 1:108).
48. “Found within the right (female) coffin... one oblong black glass bead, three light black-green, two round... also, many scattered glass beads in front of two (male and female) coffins, totaling 1,965 beads, dark blue, light blue, and green” (Guangzhou 1981:352; *Kaogu Xuebao* 1957, 1:152).
49. “Some green and coffee colored, only one pink one, four are carved into fish, flower-basket, and melon shapes” (*Kaogu* 1995, 3:283).
50. “54 purple oblong, 27 yellow-white oblong, 20 olive-shaped that are light yellow with white stripes, length 1.1 cm, diameter 0.7 cm; 13 agate beads with dark brown stripes, holes drilled in both ends but do not connect; 2 white heart-shaped jade beads. Scattered at time of excavation” (Guangzhou 1981:454).
51. These are components of a beaded coat. The report says “some of the aforementioned beaded coat decorations [glass beads, glass shells, and gold, copper, and silver bulbs] have traces of silk at their bottoms and were originally sewn onto the fabric” (Guangzhou 1991:213).
52. [Editor’s note] While technically not beads, because many ear spools were perforated and some were actually adorned with beads, they are included here.
53. *Poli* in literary Sanskrit is *pozhiija* or *popozhiija*. The 7th-century *Yiqie jing yinyi* (Phonetic and Semantic Dictionary for all Sutras) (Hui Lin n.d., vol. 24) explanation of *Apidamo jushe lun* (Abhidharma Storehouse Treatise), vol. 11, has *pozhiija*, “also called *popozhiija* (*spatika*), the name of a treasure in Western countries. In the past what was called *poli* was an error and omission in the transliteration.” The common pronunciation of *poli* or *popozhiija* was *phaliha*.

54. X-ray fluorescence analysis revealed that lead was a major element in the glass jar (box) while the little cup and vase did not contain lead. The jar, vase, and little cup all contained potassium and calcium. Even though analysis did not reveal their sodium content, we can be sure that the vase and little cup were not high-lead glass made in China and must be from a Na-Ca system (An Jiayao 1984:424-425, 456; Qi Dongfang 1998:126, 127).
55. The glass beads include 1 gear-shaped green bead, 2 white connecting beads, 5 yellow beads, 2 black beads, 2 blue beads, 15 dark blue beads, and 1 yellow tube (Kaogu 1997, 2:15).
56. There are yellow, green, blue, and colorless transparent fish pendants; the yellow and green ones are made of lead glass and the blue ones are Na-Ca glass (Shimonaka 1989: Figure 59).
57. A total of 27 beads were uncovered at tomb no. 125 outside Changsha City, Hunan. "Apart from orange-red shuttle-shaped agate beads and brownish-red amber beads, the rest were all *liuli* beads that were pea-shaped stringing beads and single beads. The single beads included two brownish-red, six colorless transparent, and one ordinary blue. The stringing beads included nine colorless transparent, one ginger yellow, two peacock blue, one alternating black and white in a watermelon pattern, one dark blue, and one long ordinary blue with a tapered midsection" (Kaogu 1966, 3:164).
58. Of the beads, "seven were green and round but not very regular... the largest was 2 cm in diameter and the smallest was 1.4 cm in diameter; one was iron-gray and shaped like a screw; one was white and had powder stuck to its surface, round, 3 cm in diameter" (Jiangxi Wenwu 1989, 2:31).
59. The stringing beads "were colorless and transparent, had diameters ranging from 1.2-1.5 cm, had holes through them, and were prayer beads" (Kaogu 1961, 6:312).
60. The glass beads "were mostly round and oblong, there were also some oval, ring, square, and flower shapes. They were black, dark blue, light blue, green, brown, tea colored, emerald green, light yellow, and white. One of the square-shaped beads was multi-colored" (Kaogu Xuebao 1981, 2:259).
61. "Most of type I were round and had a small hole through their center. They were black, white, or blue and transparent or opaque. Type II were spiral-shaped, had holes through their centers, were blue or white, and were all transparent. Type III were white, opaque, irregular-shaped, and had holes through their centers" (Jinji Sun et al. 1997, 20:838).
62. The floral decorations "were flat and oval-shaped, there were four of each of blue and white, four were petal-shaped with two needle holes in their center; 2.7 cm long, 2.3 cm wide." The one ingot-shaped decoration "was flat, had a tapered waist, and was blue and transparent. A floral pattern was carved in relief on one side, the other side was flat. Both ends had needle holes. 3.7 cm long, waist 1.5 cm wide." There were two types of ear spools. The three screw-shaped decorations "had round pillar bodies, were carved with screw patterns, and there was one each of blue, green, and brown; 0.5-0.9 cm long." The one dove-shaped decoration "was flat, white and semi-transparent, had a hole through the top and bottom, rhomboid patterns carved in both wings; 2.5 cm long." The bead decorations "were semi-circular or olive-shaped, some were transparent, there were also some that were white, brown, and sky blue... 0.7-1.4 cm long, 1.0-1.6 cm in diameter" (Wenwu 1995, 4:42).
63. The beads "were mostly petal-shaped. M33: 1, white... 1.6 cm long, 2.3 cm in diameter." The tubes "had a hole through the middle. M80: 1, blue, 2.1 cm long, 1 cm in diameter" (Kaogu 1993, 11:1018).
64. The floral decoration from M4 was found "by the head. Flat oval-shaped, blue, four-petal shapes, two needle holes in the middle; 2.7 cm long, 2.3 cm wide." The bead decorations from M4 "were scattered around the neck. Round pillar bodies, carved with screw patterns, light blue... 0.6 cm long." The ear spools unearthed from M7 "were found one by each ear. Semi-circular, black, one large and one small, all connected to small rings. 1.3-1.6 cm long." The ear decoration from M9 "was located by the right ear. Colorless, semi-transparent, nearly square pillar shaped, narrow at the top and wide at the bottom, hole through the top. 1.8 cm long." The beads from M9 "were located under the neck. One was olive-shaped, colorless and semi-transparent, hole through the middle, 1.7 cm long; three were semi-circular, one white and two green, all with holes through the middle, 0.4-0.6 cm long" (Wenwu 1996, 11:69-75).

65. [Editor's note] This is not the only interpretation. Valerie Hector (2013: pers. comm.) has carefully reviewed the Chinese text and concludes that the curtain was, in fact, composed of glass strips or rods that were connected by twining.

REFERENCES CITED

An Jiayao

- 1984 Zhongguo de zaoqi liuli qimin (Early Glass in China). *Kaogu Xuebao* (Journal of Archaeology) (4):413-448.
- 2000a Boli kaogu sanze (Three Principles of Glass Archaeology). *Wenwu* (Cultural Relics) 1.
- 2000b *Boli qi shihua* (A History of Glassware). Zhongguo da baike quanshu chubanshe, Beijing.

Archaeological Institute of Kashihara

- 1995 *Kentoushi ga mita chugokubunka: Chugoku shakai kagakuin kouko kenkyusho saishin no seika* (Chinese Culture as Seen by the Japanese Missions to Tang Dynasty China: The Latest Finds of the Institute of Archeology, Chinese Academy of Social Sciences). The Museum, Archaeological Institute of Kashihara, Nara Prefecture, Kashihara, Japan.

Beifang Wenwu (Cultural Relics of the North)

- 1995 *Beifang Wenwu* 2.

Bubeier et al.

- 1986 Yipi zaoqi Zhongguo boli de huaxue fenxi (Chemical Analysis of Some Early Chinese Glass). In *Zhongguo gu boli yanjiu – 1984 nian Beijing guoji boli xueshu taolun hui lunwenji* (Research in Ancient Chinese Glasses: Proceedings of the International Symposium on Glass, Beijing, 1984), edited by Gan Fuxi. Zhongguo jianzhu gongye chubanshe, Beijing.

Cheng Zhuhai

- 1981 Shitan woguo gudai boli de fazhan (An Exploration into the Development of Early Chinese Glass). *Guisuanyan Xuebao* (Journal of the Chinese Ceramic Society) 9(1):101.

Dubin, Lois Sherr

- 1987 *The History of Beads: From 30,000 B.C. to the Present*. Thames and Hudson, London.

Fan Shimin and Zhou Baozhong

- 1983 Guancang bufen boli zhipin de yanjiu – jiantan boli shi de ruogan wenti (Studies of Glasswork in the Collections – Also Discussion of Several Problems in the History of Glass). *Zhongguo Lishi Bowuguan Guankan* (Bulletin of the Museum of Chinese History) 5.

Fitzwilliam Museum

- 1978 *Glass at the Fitzwilliam Museum*. Cambridge University Press.

Fu Juyou

- 2000 Zhongguo zaoqi boli yanjiu zhisi – pei huaguang zhi huanhuang, er zhaoye zhi mingdang (Early Chinese Glass Studies 4 – Beautiful Round Jade, Bright Ear Spools). *Lishi Wenwu – Guoli Lishi Bowuguan Guankan* (Bulletin of the National Museum of Chinese History) 83.

Fujian Sheng Bowuguan (Fujian Provincial Museum)

- 1982 *Fuzhou nansong Huang Sheng mu* (Southern Song Tomb of Huang Sheng of Fuzhou). Wenwu chubanshe, Beijing.

Gao Zhixi

- 1995 Hunan chutu Zhanguo boliqi jiqi tedian (Warring States Glassware Unearthed in Hunan and Their Characteristics). *Zhongguo Wenwu Shijie* (World of Chinese Cultural Relics) 122 (October). Wenwu chubanshe, Beijing.

Guangzhou Shi Wenwu Guanli Weiyuanhui (Guangzhou City Cultural Relics Management Committee)

- 1981 *Guangzhou Han mu* (Han Dynasty Tombs of Guangzhou). Wenwu chubanshe, Beijing.
- 1991 *Xihan Nanyue Wang mu* (Western Han King of Southern Yue Tomb). Wenwu chubanshe, Beijing.

Henan Sheng Wenhua Ju Wenwu Gongzuo Dui (Cultural Bureau of Henan Province, Cultural Relics Work Team)

- 1959 *Zhengzhou Erligang*. Kexue chubanshe, Beijing.

Henan Sheng Wenwu Yanjiusuo (Cultural Relics Research Institute of Henan Province)

- 1991 *Xichuan xia si Chunqiu mu* (Spring and Autumn Tomb Beneath the Xichuan Temple). Wenwu chubanshe, Beijing.

Hou Dejun

- 1986 Tan woguo gudai boli de jige wenti (On a Few Problems with Early Chinese Glass). In *Zhongguo gu boli yanjiu – 1984 nian Beijing guoji boli xueshu taolun hui lunwenji* (Research in Ancient Chinese Glasses: Proceedings of the International Symposium on Glass, Beijing, 1984), edited by Gan Fuxi. Zhongguo jianzhu gongye chubanshe, Beijing.

Huan Kwan

- n.d. *Yan tie lun* (Discourses on Salt and Iron).

Hubei Sheng Bowuguan (Hubei Provincial Museum)

- 1980 *Zeng Houyi mu* (Tomb of Marquis Yi of Zeng). Wenwu chubanshe, Beijing.

Hubei Sheng Jingzhou Diqu Bowuguan (Hubei Province Jingzhou Regional Museum)

- 1984 *Jiangling Yutai Mountain Chu mu* (Chu Tomb of Yutai Mountain, Jiangling). Wenwu chubanshe, Beijing.
 1985 *Jiangling Mashan yihao Chu mu* (Tomb No. 1 at Mashan, Jiangling). Wenwu chubanshe, Beijing.

Hubei Sheng Wenwu Kaogu Yanjiusuo (Hubei Provincial Institute of Cultural Relics and Archaeology)

- 1995 *Jiangling Dongzhou jiudian mu* (Eastern Zhou Tombs at Jiudian, Jiangling). Kexue chubanshe, Beijing.

Hubei Sheng Yichang Diqu Bowuguan (Hubei Province Yichang Regional Museum)

- 1992 *Dangyang Zhaojiahu Chu mu* (Chu Tomb of Zhaojia Lake, Dangyang). Wenwu chubanshe, Beijing.

Hui Lin

- n.d. *Yiqie jing yinyi* (Phonetic and Semantic Dictionary for all Sutras).

Hunan Kaogu Jikan (Hunan Archaeology Quarterly)

- 1989 *Hunan Kaogu Jikan* 5.

Jiangnan Kaogu (Jiangnan Archaeology)

- 1986-1988 Various issues.

Jiangxi Wenwu (Cultural Relics of Jiangxi)

- 1989 *Jiangxi Wenwu* 2.

Jin Gehong (ed.)

- 1985 *Xijing zaji* (Miscellany of the Western Capital), vol. I. Zhonghua shuju chubanshe, Beijing.

Jinji Sun et al.

- 1997 *Zhongguo kaogu jicheng: Dongbei juan* (Collection of Chinese Archaeology: The Northeast). 20 vols. Beijing chubanshe.

Kaogu (Archaeology)

- 1959-1998 Various issues.

Kaogu Xuebao (Journal of Archaeology)

- 1957-1997 Various issues.

Kaogu yu Wenwu (Archaeology and Cultural Relics)

- 1982-1996 Various issues.

Li Suzhen and Tian Yucheng

- 1986 *Zhongguo gudai shiwen zhong de boli shiliao* (Historical Materials on Glass in Early Chinese Texts). *Gugong Bowuyuan Yuankan* (Palace Museum Journal) 2.

Li Xiaocen

- 1996 *Guanyu Zhongguo qianbei boli de fayuandi wenti* (Problems Concerning the Place of Origin of Chinese Pb-Ba Glass). *Ziran Kexue Shi Yanjiu* (Studies in the History of Natural Science) 15(2).

Nanfang Wenwu (Cultural Relics from the South)

- 1993 *Nanfang Wenwu* 4.

Nicholson, Paul T.

- 1993 *Egyptian Faience and Glass*. Shire Publications, Shire Egyptology 18.

Peng Hao

- 1996 *Churen de fangzhi yu fushi* (Textiles and Decorations of Chu). Hubei jiaoyu chubanshe, Wuhan.

Peng Zicheng et al.

- 1988 *Dui Baoji Yuguo mu chutu liaoqi de chubu renshi* (A Preliminary Look at the Glass Objects Unearthed from Yu State Cemeteries in Baoji). In *Baoji Yuguo mudi* (Yu State Cemeteries in Baoji), by Lu Liancheng and Hu Zhisheng. Wenwu chubanshe, Beijing.

Qi Dongfang

- 1998 *Suidai boli* (Sui Dynasty Glass). *Gugong Wenwu Yuekan* (The National Palace Museum of Chinese Art Monthly) 186.
 1999 *Yurunyong jinghua boli* (The Jade-like Shine and Luster of Glass). *Lishi Wenwu: Guoli Lishi Bowuguan Guankan* (Historical Artifacts: Journal of the National Museum of History) 66 (January):23-29.

Qinghai Sheng Wenwu Kaogu Yanjiusuo (Archaeological Institute of Qinghai Province)

- 1993 *Shangsun Jiazhai Han Jin mu* (Han and Jin Tombs of Shangsun Jiazhai). Wenwu chubanshe, Beijing.

Shandong Sheng Wenwu Kaogu Yanjiusuo (Archaeological Institute of Shandong Province)

- 1982 *Qufu Luguogucheng* (State of Lu Ancient City in Qufu). Qilu shushe, Jinan.

Shen Fuwei

- 1981 *Bi liuli he Yindu baoshi maoyi* (Trade in Bi-Disk Liuli and Indian Precious Stones). In *Zhonghua Wenshi Luncong* (Journal of Chinese Literature and History) 4.
 1982 "Poli" shiming (An Explanation of the Name "Poli"). In *Zhonghua Wenshi Luncong* 2.

Shi Meiguang et al.

- 1986 *Yipi Zhongguo Han mu chutu jia boli de yanjiu* (A Study of K Glass Unearthed from Han Chinese Tombs).

Guisuanyan Xuebao (Journal of the Chinese Ceramic Society) 14(3).

Shimonaka, Hiroshi

1989 *Shosoin no takaramono* (Treasures of the Shosoin). Heibonsha, Tokyo.

Shinji Fukai (Edna B. Crawford tsl.)

1977 *Persian Glass*. John Weatherhill, New York and Tokyo.

Songshi

n.d. *Songshi* (History of Song), vol. 152: *Zhuchen fu shang* (Servant's Clothing 1).

Tao Zhenggang

1996 *Taiyuan Jin Zhao Qing Tombs*. Wenwu chubanshe, Beijing.

Wang Junxin et al.

1994 Guangxi Hepu tangpai Xihan gu boli de qian tongweisu shizong yanjiu (Copper Isotope Tracing Research on Ancient Western Han Glass from Tangpai, Hepu, Guangxi). *He Jishu* (Nuclear Techniques) 17(8).

Wang Shixiong

1986a Baoji, Fufeng chutu de Xi Zhou boli de jianding yu yanjiu (An Appraisal and Study of the Western Zhou Glass Unearthed at Baoji and Fufeng). In *Zhongguo gu boli yanjiu – 1984 nian Beijing guoji boli xueshu taolunhui lunwenji* (Research in Ancient Chinese Glasses: Proceedings of the International Symposium on Glass, Beijing, 1984), edited by Gan Fuxi. Zhongguo jianzhu gongye chubanshe, Beijing.

1986b Shaanxi Xi Zhou yuanshi boli de jianding yu yanjiu (Appraisal and Research of Primitive Western Zhou Glass in Shaanxi). *Wenbo* (Relics and Museology) 2.

Wei Shu

n.d. *Wei shu* (Book of Wei), Vol. 102: Nan Tianzhu zhuan (Historical Narrative of Southern India).

Wenwu (Cultural Relics)

1959-1999 Various issues.

Wenwu Ziliao Congkan (Collected Archaeological Data)

1980 *Wenwu Ziliao Congkan* 3.

Wu Zhenfeng and Han Zhao

1998 *Shaanxi xin chutu wenwu xuancui* (Selected Cultural Relics Newly Unearthed in Shaanxi). Chongqing.

Xianyang Shi Wenwu Kaogu Yanjiusuo (Archaeological Institute of Xianyang City)

1998 *Taerpo Qin mu* (Qin Tombs of Taerpo). Sanqin chubanshe, Xi'an.

Yang Boda

1980 Xi Zhou boli de chubu yanjiu (A Preliminary Study of Western Zhou Glass). *Gugong Bowuyuan Yuankan* (Palace Museum Journal) 2.

Yao Qinde

1996 *Wuguo wangshi yuqi* (Royal Jade from the State of Wu). Shanghai renmin meishu chubanshe, Shanghai.

Yi Jialiang and Tu Shujin

1984 Shisi shiji Boshan de liuli gongyi (Fourteenth-Century Boshan *Liuli* Techniques). *Guisuanyan Xuebao* (Journal of the Chinese Ceramic Society) 12(4) December.

Yunnan Sheng Bowuguan (Yunnan Provincial Museum)

1959 *Yunnan Jinning Shizhaishan gumuqun fajue baogao* (Excavation Report for the Tomb Group at Shizhaishan, Jinning, Yunnan). Wenwu chubanshe, Beijing.

Zhang Fukang, Cheng Zhuhai, and Zhang Zhigang

1983 Zhongguo gu liuli de yanjiu (A Study of Early Chinese Glass). *Guisuanyan Xuebao* (Journal of the Chinese Ceramic Society) 11(1).

1986 Zhongguo gu liuli de yanjiu (A Study of Early Chinese Glass). In *Scientific and Technological Insights on Ancient Chinese Pottery and Porcelain*, pp. 91-99. Shanghai Institute of Ceramics, Science Press, Beijing.

Zhang Tingyu

1739a Huangdi mianfu (Imperial Dress). In *Mingshi* (History of the Ming) 67.

1739b Wenwu guan chaofu (Court Dress of Civil and Martial Officials). In *Mingshi* (History of the Ming) 67.

1739c Zhuangyuan ji zhu jinshi guanfu (Dress of the Top Candidate and All Successful Candidates). In *Mingshi* (History of the Ming) 67.

Zhang Weiyong

1986 Boli mingshi bian (Distinguishing the Truth about Glass). In *Gugong Bowuyuan Yuankan* (Palace Museum Journal) 2.

Zhao Kuanghua

1991 Shitan Zhongguo chuantong boli de yuanliu ji liandanshu zai qijian de gongxian (An Exploration into the Origins of Traditional Chinese Glass and Contributions from Alchemy). *Ziran Kexue Yanjiu* (Studies in Natural Science) 10(2):147.

Zhao Qingyun

1996 Henan sheng chutu gu boli zhipin zonghe yanjiu (Comprehensive Study of Early Glass Unearthed in Henan

Province). In *Henan wenwu kaogu lunji* (Collected Papers on Henan Cultural Relics and Archaeology), edited by Henan sheng Wenwu Kaogu Xuehui. Henan renmin chubanshe, Zhengzhou.

Zhongguo Meishu Quanji Bianji Weiyuanhui (ed.)

1987 *Zhongguo meishu quanji 44: Gongyi meishu 10, jin yin boli falang qi* (Treasury of Chinese Fine Arts 44; Arts and Crafts Section: Gold, Silver, Glass, and Enamel, vol. 10). Wenwu chubanshe, Beijing.

Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo (Chinese Academy of Social Sciences, Institute of Archaeology)

- 1959a *Luoyang Shaogou Han mu* (Han Tombs of Shaogou, Luoyang). Kexue chubanshe, Beijing.
- 1959b *Luoyang Zhongzhou lu (xigongduan)* (Zhongzhou Road [Western Section] in Luoyang). Kexue chubanshe, Beijing.
- 1959c *Shangcun Ling Guoguo mudi* (State of Guo Tomb at Shangcun Ling). Kexue chubanshe, Beijing.
- 1963 *Fengxi fajue baogao* (Fengxi Excavation Report). Wenwu chubanshe, Beijing.
- 1980 *Tang Chang'an chengjiao Sui Tang mu* (Sui and Tang Tombs in the Suburbs of Tang Chang'an). Wenwu chubanshe, Beijing.
- 1984 Zhongguo zaoqi boliqi jianyan baogao (Early Chinese Glass Examination Report). *Kaogu Xuebao* (Journal of Archaeology) 4.
- 1994 *Shan Xian Dong Zhou Qin Han mu* (Tombs of the Eastern Zhou, Qin, and Han Dynasties in Shan Xian County). Kexue chubanshe, Beijing.

Zhongguo Wenwu Jinghua Bianji Weiyuanhui (Gems of China's Cultural Relics Editorial Committee)

1997 *Zhongguo Wenwu Jinghua* (Gems of China's Cultural Relics). Wenwu chubanshe, Beijing.

Zhongyuan Wenwu (Cultural Relics of Central China)

1997 *Zhongyuan Wenwu* 3.

Zibo Shi Bowuguan (Zibo City Museum)

1985 Zibo Yuanmo Mingchu boli zuofang yizhi (Late Yuan, Early Ming Glass Workshop Remains of Zibo). *Kaogu* (Archaeology) 6.

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