

From Hongshan to Silla: Tracing the Cultural and Technological Lineage of the World's Most Beautiful Face-Inlaid Glass Bead

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Abstract:

This study argues for a Korean origin of the Silla face-inlaid glass bead (Treasure No. 634), challenging previous claims of Indonesian or Roman origins. Analysis of its design elements – distinctly Korean motifs – and Korean archaeological evidence of glass production techniques support domestic production during the 4th-6th centuries. The hair topknot, flower decorations on both sides, and bird and flower decorations were confirmed to be unique Korean elements, and the glass government office Japgong-sa of Silla, Korea, who excelled in inlay and metalwork, installed Japgong-ho in Wae, Japan. And the tradition of using face design or beads as necklaces or worships have started in the Hongshan culture (BC 4,500). This study established the Silla face-inlaid glass bead as a product of Korea's advanced craftsmanship and distinct cultural identity, illuminating its location & significance within East Asian trade networks.

Keyword: Face-Inlaid Glass Bead, Silla, Hair Topknot, Bird & Flower, Sea silk road

Introduction

The world's most beautiful glass bead, measuring 1.8 cm in diameter, was unearthed in the presumed tomb of King Michu in Gyeongju (estimated to be from the 4th to 6th century), in 1973, delicately inlaid with many design elements on an indigo blue background, is world-renowned for their artistic and technical excellence. The tiny glass bead features four human faces, six birds, and four flowering trees in a delicate inlay technique that is both technical and artistic. Lankton has suggested that the bead was made in Java, Indonesia [1], and that

the four faces on the inlaid glass bead are the Hindu god Brahma, the bird is Hamsa, the bird ridden by Brahma, and the flowering tree is the temple flower Prangipani. He said that Jatim beads are similar to this bead and that the production techniques are still preserved, and suggested that east Java, Indonesia, could be seen as a source or stopover for Face-Inlaid Glass Bead. Yet there was no popular practice or custom of wearing the beads in Java.

In addition, Japanese glass expert said that the four faces were definitely those of the Roman kings and queens, and that they were either imported from Rome along the Silk Road or made directly by migrated Western craftsmen [2]. But Hernate Wurner, a curator at the Yeretz Museum in Tel Aviv, pointed out that it is difficult to assume that the Silla face-inlaid glass bead was made in Rome because no such glass beads have been excavated in Rome and there are technical differences between similar beads. A Korean glass expert said that the figure in the inlaid glass bead appears to be a woman wearing Central Asian make-up, suggesting that Silla had direct contact with Central Asia [3].

However, the design of the Face-Inlaid Glass Bead shows that the face inlaid statue is Korean 'hair topknot, Sangtu', the white birds are sky birds revered by the Jo-Yi(鳥夷, bird totem) of Dong-Yi(東夷, east countries) people, from the ancestor mythology and the flowering tree is a sacred life-tree of the Northern people. And many glass ruins in Korea have been found to contain iron-making slag alongside the glass beads, which serve as evidence for ancient Korean glass bead production based on evidence of Silla's superior iron-making technology. The discovery of blue tube glasses, and they appear to be imitation of jade beads, artifacts of the Metal Age, in the southwestern part of the Korean peninsula, and the excavation of many artifacts such as clay molds for glass casting, glass-making workshops, and crucibles from about the 1st century BC [4], suggest that Korea has been producing glass products since ancient times. Therefore, this study aims to verify the requirements to prove that the bead was produced in Korea by examining the designs and cultural symbols contained in the Inlaid Glass Bead, the meaning of the beads to the ancient Korean people, and the production and production environment of the slag glass.

Theoretical Background

1. Face-inlaid glass bead and early glass beads in Korea

A number of Face-Inlaid Glass Beads have been found in Rome, but they have arranged in one direction (Fig. 1a). According to Hernate Bühner, the Silla beads contain more elements that allow the identification of the figures (Fig. 1b), such as, hair style & side decorations, necklace and ears, as well as flying white birds and flowering trees. In particular, Silla face-inlaid glass beads are not Roman beads because they are inlaid with a technique that rotates 360° [5].

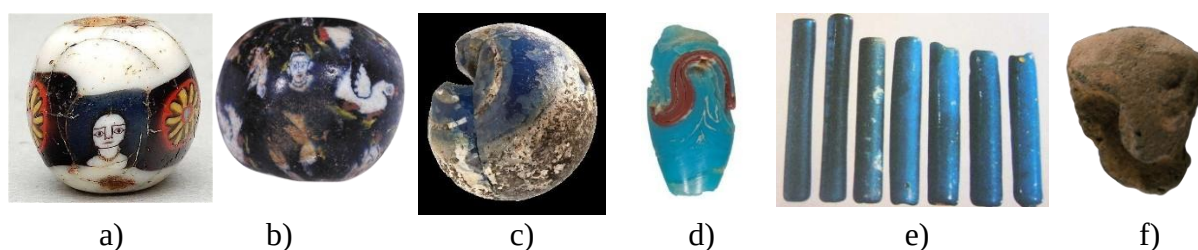


Figure 1. A Roman bead and Korean beads: Silla face-inlaid glass bead & various glass beads of Korea Gojoseon period

a) Rome face-inlaid glass bead - 1 way direction

b) Silla face-inlaid glass bead - 360° direction

c) Winding method bead from Boryeong Pyeongla-ri from stone coffin tomb (BC 5th century)

d) Wavy rhythm-inlaid glass bead - Songguk-ri from jar tomb (BC 5th century)

e) Blue tube glasses from Buyeo Hapsong-ri (seemed the 1st glass beads of Korea, about BC 7~8th century, length 5cm)

f) Clay mold of 'Curved-jade(曲玉)' glass beads from shell midden site with iron relics (Gungok-ri, Haenam, Gwangju, about BC 7~8th century)

Looking at the world glass, there are dated back 5,000 years old, it is not provide a clear basis for locating glass production sites or the origin of glass, meaning that the origin of glass cannot be attributed to any one region. Therefore, glass bead production must be considered in conjunction with Bronze and Iron Age technology and slag [6].

Korean finds include the most glass-related artifacts alongside bronze and iron relics, with five beads from Gangmun-dong Marsh, Gangneung indicating the use of slag [7]. In addition, 4,000 glass beads, molds, multi-layer glass beads, connected glass beads, and two-color half-and-half glass beads were excavated from the tomb of Naedong-ri in Yeongam; traces of glass workshops in Naju(水門貝塚) and the remains of factories in Seokpyeong in

Boseong were found; glass-bead molds were found nationwide, confirming that they were all the glass bead production sites [8].

A navy blue glass bead from Pyeongla-ri in Boryeong, dating to the 5th century BC, was excavated along with plain potteries, stone knives, and bronze artifacts [9]. This seems made by the winding method due to the horizontal stripes (Fig. 1c), and was domestically produced, as it was found to be made from a mixture of domestic lead [10]. The inlaid glass bead excavated from the Songguk-ri jar-coffin in Buyeo was also found to have been made by the winding method (Fig. 1d), and the wave pattern inlaid means the spiritual energy pattern of wavy rhythm (昇天入地紋) of Korean tradition, as shown in the Deokheung-ri and Okdo-ri tomb murals in Goguryeo and also appeared in brocade silk Geum(錦) of the animal style of Samkhan Gojoseon [11]. In addition, eight cylindrical tube glasses as the oldest in Korea were excavated with iron relics from the stone tomb in the Hapsong-ri in Buyeo, the oldest glass beads in Korea [12] (Fig. 1e). The ‘Curved-jade’ glass beads are unique beads found only in Korea, this mold proving that glass beads were not imported but were produced domestically(Fig. 1f) [13].

Ancient Korean beads are diverse in material, producing methods and finishing, and the amount of beads excavated is the highest in the world. This quantitative and qualitative diversity of bead artifacts indicates that the Korean people had the custom using beads since the Neolithic period, starting with stone or jade beads, and to the metal or by-product slag beads.

2. Techniques of Inlay and Metalwork of Ancient Korea

As evidenced by the blue glass attached on the gold earrings excavated from Gyeseong in Changnyeong, the ancient Korea people have developed inlay and metalworking skills since ancient times. ‘Inlay’ is a decorative technique in which patterns are dug into the surface and hetero materials are inserted or attached to them, and its artistic value is highly valued in various fields such as lacquerware inlaid with mother-of-pearl(螺鈿漆器), Goryeo celadon(高麗靑瓷), and gold and silver-inlaid incense burner(金銀入絲香爐) of Korea. In addition, the skill of metal inlaying, which involves the use of small jar shapes to create inlay with harmony and balance of 2 facing birds centered on one tree like a Silla's Gold and

Silver Inlay Jar, is difficult to reproduce with current technology. Early examples of inlays can be found on jade inlaid into the eyes of a Hongshan cultural(紅山文化) goddess statue, as well as on earthenware and jadeware inlaid with green pine stones excavated from the 'Dawenkou(大汶口)' Ruins of Dong-Yi people in Shandong peninsular [14].

Furthermore, ancient Korea had excellent metalworking technology [15]. Surprisingly, it had even plating technique in the 25th century BC [16], and bronze relics were found in the Lower Xiajiadian Culture during the Gojoseon Dynasty [17], which mixed zinc alloys of lower melting point. Gojoseon excelled in metalworking technology [18], as evidenced by numerous metal artifacts, such as Bronze Mirror with Geometric Designs(多紐細文鏡), Lute-Shaped Bronze Daggers(琵琶形青銅劍), Hwandudaedo(環頭大刀), Myeongdojeon(明刀錢), and 8-beads bronze bells(八珠鈴). And later metalworking flourished, enabling the production of high-performance ironware in ancient Silla [19], including a huge Iron Budha(丈六尊像 AD574 100 ton) of Silla Sambo(新羅三寶) and Hwangryongsa Daejong (皇龍寺大鐘 AD754 46.5 ton) [20]. In addition, Silla made magnets and compass from iron using mercury and exported them to the Tang Dynasty(唐 669), demonstrating its unique metalworking technology.

Ancient Korea developed alchemy and metallurgy, the chemical techniques for treating metals, had 'Coal division(炭典)' and 'Iron Bronze division(鐵鑪典)' of government offices [21]. Silla's gold-smithing techniques are world-renowned and highly prized for their craftsmanship and artistic expression, with filigree and granulation designs being particularly beautiful, 'Granulation Filigree(鏤金細工) technique' of decorating small metal grains by pasting them on the surface. Particular, the gold earrings excavated from Bomun-ri, Gyeongju, Silla, are made up of hundreds of small gold beads, each less than 0.5 mm in diameter, and show the pinnacle of Silla's metalwork technology. a small 3.6 cm 'Seongak-Danhwa-Ssangjomun gold foil (線刻單花雙鳥文金箔)' unearthed in Gyeongju in 2016 has a pair of doves and a flower with a delicate line of 0.05 mm.

Research method

This study employs a multidisciplinary methodology that integrates literature analysis, relic investigation, and technique-historical approaches to trace the origin, production techniques, and cultural significance of the Silla face-inlaid glass bead (Treasure No. 634). The research design is structured as follows:

1. Philological and Textual Analysis

A range of ancient texts and historical records from Korea, China, and Japan were critically examined to investigate the cultural, symbolic, and functional significance of glass beads across East Asia. Korean sources such as the *Samguk Sagi* (三國史記) and *Samguk Yusa* (三國遺事) were consulted alongside Chinese texts like the *Book of Later Han* (後漢書) and *Records of the Grand Historian* (史記), as well as early Japanese chronicles such as the *Nihon Shoki* (日本書紀). This analysis aimed to contextualize the emergence of face motifs on beads, the socio-religious meanings ascribed to such ornaments, and their relationship with elite burial practices and ritual usage. By cross-referencing motifs, terminology, and symbolic associations, the study established cultural continuities and differences surrounding bead usage in the East Asian cultural sphere.

2. Archaeological and Artifact Analysis

To gain direct insight into the object of study, a Silla face-inlaid glass bead housed at the Gyeongju National Museum was closely examined. The artifact was observed and illustrated in detail to document its structural features, such as the inlaid facial motif, floral patterns, and color layering. This primary analysis was supplemented by comparative studies with other excavated glass and face-related artifacts, including jade and stone beads from Hongshan culture sites such as Niuheiliang (牛河梁) in northeastern China, as well as prehistoric sites in Korea like Ulju Bangudae. These comparisons were aimed at reconstructing the production lineage of face motifs, identifying uniquely Korean elements, and tracing how facial symbolism evolved from the Neolithic to the Three Kingdoms period. Additionally, Silla-period sites including Hwangnamdae-chong Tomb and Cheonma-chong of Geongju, Korea provided contextual evidence of ornament usage and elite display.

3. Technological-Historical and Trade Network Analysis

This component focused on situating the Silla face-inlaid bead within the broader framework of ancient glass technology and trans-regional trade. Production-related techniques such as the use of molds, and iron cores were analyzed through the Korean relics.

The study also investigated possible connections to early Japanese glassworking by referencing the presence of glass bead-making specialists (雜工戸, Japgong-ho) recorded as being sent from Silla to Wae (倭), and the discovery of similar stylistic features of beads in Yayoi-period and Kofun-period burial sites in Osaka and Kyoto.

A regional survey of excavated glass beads from Vietnam, Thailand, and the Philippines was conducted to assess broader Southeast Asian connections via the maritime Silk Road, and to distinguish Silla's inlaid beadwork from contemporaneous artifacts. Furthermore, the study integrated knowledge of ancient maritime technology, including shipbuilding and navigational capabilities, to reconstruct plausible trade and transmission routes. These trade routes facilitated not only the movement of materials but also the spread of craftsmanship and iconography, enabling Silla artisans to globally spread glass bead production.

Research Results

1. Drawing of Silla Face-Inlaid Glass Bead

1.1. Four Faces with Sangtu & flower-foil decorations

The sketch shows that the four faces on the bead are several people, not one identical person (Fig. 2a). Based on white faces and round eyes, they are often seen as Caucasians of Northern European descent [22] or as Roman kings and queens [2], but the basis for claim is weak because their hair, or other elements are also white.

Since ancient Koreans considered white to be sacred, it is assumed that the faces, hair, birds, flowers, etc. on the inlaid glass beads were all represented in white. Silla Kim Chunchu was wrote to have a white face, and Hwarang(花郎) had makeup their faces white of 'Nangjangyeonui'(三國遺事). White color was a good sign, and he/she presented to the king if white animals were acquired (三國史記 新羅). The expression style of drawing the nose from the eyebrows is identical to the style of the Baekje(百濟) smile tile. In addition, the face

portraits show hair Topknot Sangtu, decorated with a golden flowers on both sides, which is a definite characteristic element of the Korean. Dong-Yi(東夷) wore jade Sangtu headdress from the Hongshan period [23], and later the flowers of gold, silver, and chihwa(雉花) were decorated according to wearers' status [24], and wore many decorative buttons [25]. Unmarried young people, Hwarang or Gukjarang(國子郎) attending Sodo(蘇塗) School(肩堂), put a sky flower(天指花) on their headdress, when went out (符都誌). This tradition shows that the figures in the bead were characters of ancient Korea and the bead belongs to ancient Korea. What is claimed to be a neck wrinkle is more likely to be a necklace, which was a long-standing custom in ancient Korea. Sinchon-ri crown shows the flower decorations, and glass beads are attached to their ends (Fig. 2b).



Figure 2. Silla Face-Inlaid Glass Bead (Treasure #634) & Gold-bronze crown (National Treasure #295)
a) Face close-ups and 2 sketches of 4 faces from the bead (author's drawing)
b) Sinchon-ri gold-bronze crown (Naju, 4~5th century)

1.2. Flying white birds of blessings

In the drawing of the white birds, all six big birds were depicted flying wings (Fig. 3a), and this is the style of 'Floral and Bird' motifs (花鳥紋) of a traditional Korean pattern. It appears to be large swan or goose of the north, due to its large feet and open beak. Depicting animals with open mouths is a northern Scythian 'Animal Style' [26]. The Sotdae, wooden birds are widely distributed in Korea, north Manchu, and Japan, and the nomadic and Dong-Yi(東夷) peoples regarded birds as spirit of the heavens. And birds were used it in rituals and ceremonies with religious connotations, along with the sun, as messenger between the heavenly, earthly, and subterranean worlds [27]. Two birds on the 'Agricultural motif'

bronze ware(農耕紋), Koejong-dong in Daejeon, which is estimated to be about 3,000 years old [28], and a large amount of duck-shaped earthenware on the banks of the Nakdong River [29], shows how much ancient Koreans valued birds. In addition, ancient Korea has many myths about white birds, such as Gaya's Kim SuRo and Silla's Park HyukGeoSe, and the Goguryeo's JuMong, but the Center Jina (中原 支那) states other than the Shang(商) dynasty of Dong-Yi have no myths about birds and no inlaid bead artifacts.

Silla was known as 'the country of birds,' and also its sounds 'Sae(bird) Nara(country).'

Chickens of chicken comb were considered sacred animals, revered like dragons [30], worshipped as 'chicken gods(鷄神).'

In the 『Samguk-Yusa』, it is recorded that “The people of ancient India(天竺國) referred to the people of Haedong (海東) as 'Gugutak Yesulla (矩矩托禮說羅),' where Gugutak means chicken" [31]. As well as Goguryeo's SamjokO(三足鳥), god of the sun bird, and JoU-Gwan(鳥羽冠), the chickens are depicted high on the walls in tomb paintings. Also, it is said that in Makhan (Goguryeo's predecessor) there was a chicken whose tail was 5 feet (165 cm) long. The theses of the golden culture of the nomadic people of the steppe are trees, birds, and deer, and the Silla gold crown includes all of these. In particular, in the gold crown excavated from Seobongchong Tomb, the birds are sitting on the decorations of antlers and branches.

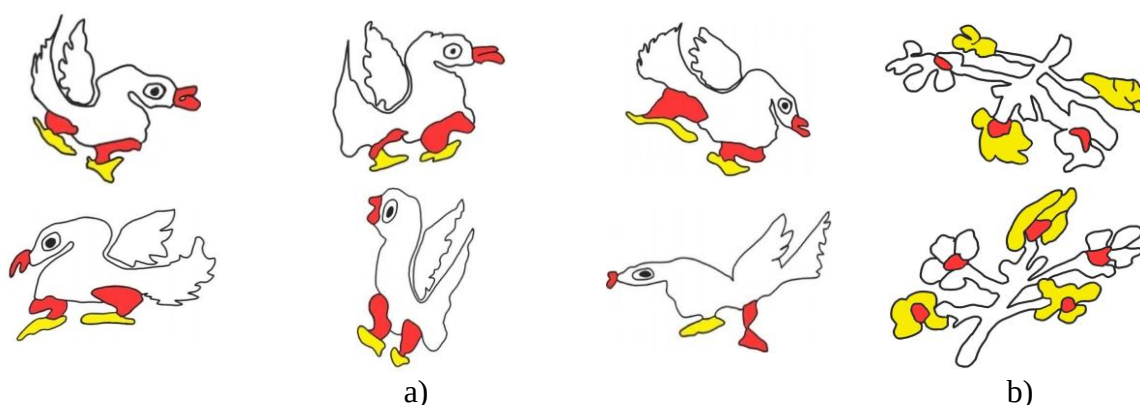


Figure 3. Sketches of birds and flowers from the bead pattern (author's drawing)

- a) Six sketches of flying white birds with large feet and open beak
- b) Two sketches of flower trees with symmetrical branch

1.3. Divine Trees of the North

The flowering tree pattern is slightly tilted in the inlaid process, but in full bloom,

representing the vitality of the divine tree(聖樹 神樹 宇宙樹 生命樹) of the North(Fig. 3b). The branch form of '出' in the Silla gold crown centers as a sacred tree or divine tree, and is decorated with deer antlers, phoenix birds, curved jade, and roundlets around it, it is the 'Tree of Life' [32]. The shape of the character '出,' resembling symmetrical branches, is shown on the both gilt-bronze crown and the shield of Bokcheondong, Busan, and in numerous artifacts in the Shosoin (正倉院), Japan [33], which are confirmed to be the element of Silla artifacts [34]. The lacquered bottle(漆胡瓶) seems in the beak shape of a chickens head, the bead-shaped body, in which the flowers and flying birds in the field were inlaid, following this bird-flower trend. On the other hand, it is not easy to find such divine tree patterns in the relics from Indonesia and Southeast Asia. The 'flowers and birds' in the study beads has been used popularly as the Korean traditional style(花鳥圖), which pattern has also religious symbol, widely used by Koreans since ancient times, meaning the nature worship and eternity.

2. Types of Inlaid Glass Beads and their similarities

Surprisingly, world-wide rare two inlaid glass beads were excavated from Sikri-chong(飾履塚), Gyeongju, again (estimated to be in the 4th-5th century). 'Solar Cosmic' inlaid bead of navy background shows linked pearl-round pattern(連珠文) of dots and whirl circles in white, centered on cores of red and yellow(Fig. 4a), and 'Star Wreath' shows the wreath of yellow & green stars surrounding finer rings of colored bands(Fig. 4b). Forms of beads bearing beads are also found, glass beads with colored beads inlaid on a black background(Fig. 4c). Because Koreans believed in the transcendent power of beads, they had engraved the 81 dots on the surface of 'mother-son jade(母子曲玉), a form where a baby jade is attached to a curved jade'(Fig. 4d). And 'Firing bead(火珠)', at the end of the golden ruler scale(金尺), which were given to King Park HyukGeose(符都誌), symbolize the divinity of the sky.

Inlaid glass beads from other countries tend to be less artistic and technically sophisticated, such as 'Sun and Star' inlaid beads from Java (Fig. 5a & 5b), a face-inlaid glass bead with birds and human figures from the display of Arizona Museum, and an inlaid glass bead from the storage of Corning Museum of Glass. By the way, a face-inlaid glass bead was found at the Inari-mori Kofun in Yamagata, in the Tōhoku region of northern Japan [35] (Fig. 5c), and surprisingly, the design elements, faces, birds and flowers are exactly same as the

Silla's face-inlaid glass bead, though lacking in details. Yet this relic is missing and now only its drawings are preserved. Bronze bells, mirror shards, bronze swords, and earthenware from the surrounding area tomb, have been attributed to Silla, thus this bead was surely brought over from Silla. The fact that similar bead was excavated again in nearby Japan reaffirms that the face-inlaid glass bead was made in Silla.

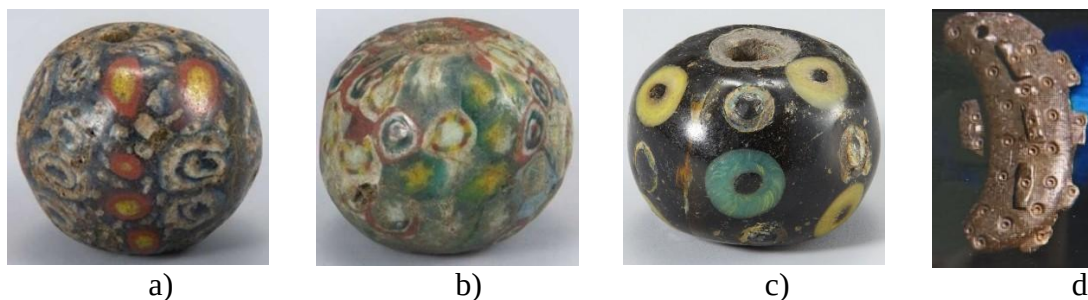


Figure 4. Inlaid glass beads of Gyeongju & Mother-son Jade

- a) Sun-eyebul inlay bead from Sikri-chong
- b) Yellow star wreath-inlay bead from Sikri-chong
- c) Inlaid glass bead from HwangOri No. 4
- d) 81 dot circles on magatama (length about 10cm)



Figure 5. Inlaid glass beads excavated from other places

- a) Sun & Star 'Jatim' beads from Java
- b) Core & Surround 'Jatim' beads from Java
- c) Drawing of face-inlaid glass bead from Inari-mori tombs (稲荷森古墳, 前方後円墳 4th century) of Japan & full schematic unfolded

3. Korean tradition that emphasizes wearing beads

Beads have been prized by the Korean people since ancient times. It was unusual custom for the Chinese eye, so they constantly recorded it in books (Table 1). “Red beads are produced in Buyeo, and a large bead is large as a wild jujube,” and “In Makhan(馬韓), gold and silver, and brocade silk & wool(錦罽) are not valued, but only beads are prized, and they decorate them on their clothes and wear them around their necks and ears.” The fact that gold, silver, and fine fabrics were common, and beads were even more precious, was shocking to the Center Jina (中原 支那) people [11]. This confirms that for the ancient Korean, beads were not just decorations or treasures, but important objects with religious symbolism.

The functional meaning of beads indicates that they are symbolic objects that fulfill human desires, such as transformation, wisdom, and wealth. There are many bead-related stories in Korea, such as the fox bead that grants transcendent wisdom, Bangri Deukbo(放鯉得寶), who gained wealth from gift bead in turn by the carp son of dragon king, and Imugi, who became a dragon with a woman's beads [36], as well as Japan's bead myths. But beads only appeared in the story of Wei Ping(魏平) in Song (531-517 BC) of the Warring States Period in ancient China (龜策列傳 史記).

Buyeo, Makhan, and Silla which carried on the beliefs of the Jo-Yi(鳥夷) people of Dong-Yi(東夷) and other northern tribes, regarded beads as sacred object, worshipping the egg, sun, moon, and stars. In the tale of the ‘SamjokO’(Three-legged crow, 三足鳥), birds are considered the sun in the sky, and egg as child of the sun. Thus, spherical beads are sacred and are worn nationwide as general decorations. The 『SamgukSagi Silla』 also indicates common people’s customs of using beads, during the reign of King Ilsung Yisagum(134~154), the wearing of gold and silver and the beads and jade jewelry(禁民間用金銀珠玉) in civilian life was prohibited at the time.

Yuezhi(月氏, 月支, 目支) people melted mountain stones to make 5 colored glass and came to the capital of Northern Wei (魏世祖 拓跋燾 423-452) to trade(魏書 西域傳 大月氏國) [37]. The glass was so shiny and beautiful that everyone was amazed, and as a result, Chinese glass was treated poorly. This suggests that the Yuezhi possessed advanced

glass- making technology. And Yuezhi was the capital of the powerful Makhan, west one among Samkhan(三韓) of Gojoseon(後漢書 東夷傳) [38]. Yuezhi or Seres(ancient Silla, BC 7th century), known for their export of silk brocade, fur, jade and quality iron, had come and settled to Jinkhan(辰韓) of Gojoseon Korea [39]. This provides evidence of the early history of glass beads in ancient Korea.

Table 1. Korean beads wearing custom in the various ancient Chinese records			
後漢書 東夷列傳 432 AD	Buyeo (夫餘)	出名馬·赤玉·貂納大珠如酸棘	It produces famous horses, red jade, marten, and leopard cats, and the large bead is like wild jujube.
	Makhan (馬韓)	不貴金寶錦罽,不知騎乘牛馬,唯重瓔珠,以綴衣爲飾,及縣頸垂耳	They do not value gold, silver, silk brocade, or wool, and do not know how to ride an ox or a horse. They only value beads, which they sew into their clothes or wear around their necks or ears.
三國志 魏書 東夷傳 3rd century	Makhan (馬韓)	以瓔珠爲財寶,或以綴衣爲飾,或以縣頸垂耳,不以金銀錦繡爲珍	Beads are valued and are sometimes sewn into clothes or hung around the neck or ears, but gold and silver and brocade silk and embroidery are not considered precious.
晉書 東夷列傳 646 AD	Buyeo (夫餘)	其居喪,男女皆衣純白,婦人著布面衣,去玉佩.出善馬及貂納·美珠,珠大如酸棗	During the mourning period, both men and women wear white clothes, but the woman wears a face mask hemp and does not wear accessories of jade. Good horses, sable and leopard cats are produced, and the beads is as big as a jujube.
	Makhan (馬韓)	俗不重金銀錦罽,而貴瓔珠,用以綴衣或飾髮垂耳	In folk customs, gold, silver, silk brocade, and woolen fabrics are not valued, but beads are valued and are sometimes sewn into clothes or used to decorate hair or ears.
北史 列傳6 59 AD	Silla (新羅)	服色尚畫素,婦人辮髮繞頭以雜綵及珠爲飾	The color of clothes is white. The braid their 'pyeonbal'(辮髮) roll them up over their heads, and decorating them with various colored silks and beads.
舊唐書/ 東夷列傳 945 AD	Silla (新羅)	婦人髮繞頭,以綵及珠爲飾,髮甚長美.	The wives wear their hair up and adorn themselves with colored silk and beads, and their hair is very long and beautiful.
新唐書/ 東夷列傳 1060 AD	Silla (新羅)	不粉黛,率美髮以縹首,以珠綵飾之	Without applying powder or drawing eyebrows, they all wear their hair up, and decorate it with beads and colored silk.

4. Origin of Beads use

4.1. Jade Beads and Faces

Stones are natural material that have shaped ancient cultures, and obsidian from Baekdu Mountain in Korea was the most advanced high technology in ancient, leading the society of fine stone tools. Stone had been worshipped from before Dangun Gojoseon, because it was believed that Hwanggung(黃穹), the eldest son of goddess Mago, was turned into stone. Koreans loved stones [40] and specially, jade, beautiful stone, in high persons. The goddess of the Hongshan culture(紅山文化) had holes in the ears to wear jade earrings.

The prototype of stone beads in Hongshan with dimensions of 2-7 cm in diameter and 1.5-5.0 cm in height (with hole diameters of 0.7-2.0 cm) around 4,000 BC (Fig. 6a, 6b & 6c). The tradition of beads dates back to the Neolithic period, and it is recorded that ‘Blessed is the land full of beautiful colored stones’ [41] for the land of Bu-do(符都) established by Dangun. Also, a large number of jade beads (0.5-3.0 cm) have also been found in Jinju, Tongyeong, Yeosu, and Geojedo on the Korean Peninsula, including Danyang Suyanggae relics(丹陽). “Faces” are found in artifacts from the Paleolithic and Ice Age periods. Smiling faces carved on deer shin bones, World's oldest 100,000 years ago, excavated from Duro Mount.(杜老峰) in Cheongju, show that ancient Koreans might carved faces to honor divine beings, the great ancestor Hwanung(桓雄) and to avoid disaster. The Neolithic period shell mask excavated in Busan has a face made by drilling three holes (Fig 6e), and the face earthenware with graduation ruler excavated in Uljin is depicted in detail, suggesting that shamanic practices were performed at the time (Fig. 6f). Also, Hongshan people also made necklaces of gem stones (Fig. 6d & 6h), specially, there is a round shell pendant of human face (Fig. 6g). The necklace is 70cm in total length and consists of 64 chicken bones and a shell face, which was expressed by clearly engraving the eyes, nose holes, and mouth.

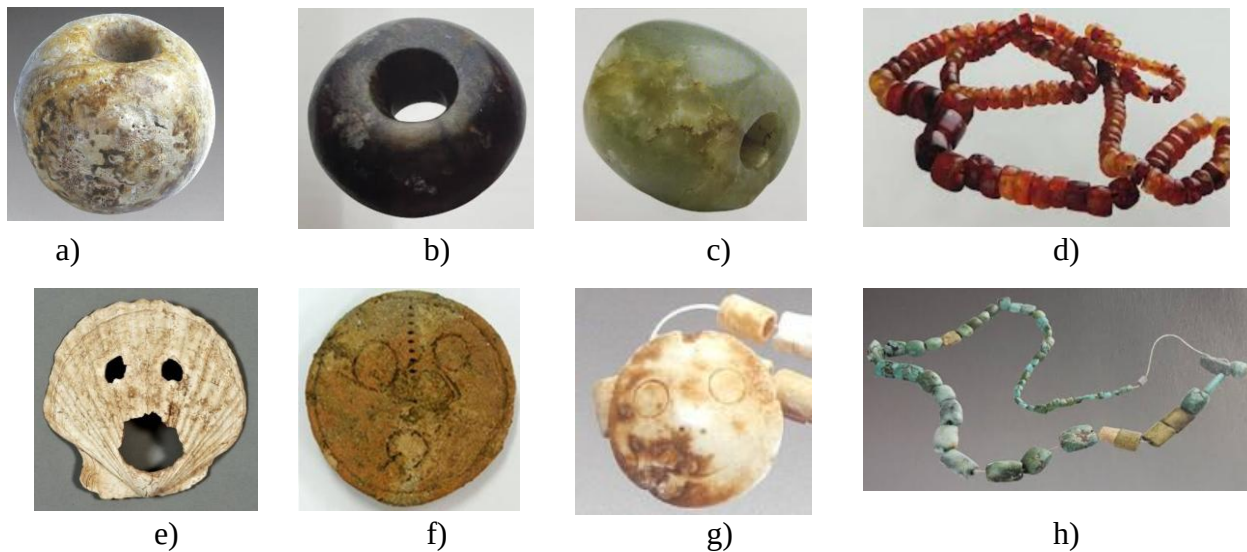


Figure 6. Hongshan Culture Stone beads and artifacts with carved faces of Neolithic period

- a) Stone bead of Hongshan (diameter 6.0cm, hole 1.0cm, height 4.8cm)
- b) Stone bead of Hongshan (diameter 3.3cm, hole 0.9cm, height 1.0cm)
- c) Jade bead of Hongshan (diameter 1.5cm, hole 0.7cm, height 2.0cm)
- d) Agate 133 pieces of beads of Hongshan (necklace length 60cm)
- e) Shell face mask of open mouth in Dongsam-dong, Busan Korea (length 10.7cm)
- f) Clay face of open mouth with the trace of ruler measures & compass (Uljin, Korea)
- g) Shell face pendant of Hongshan (diameter 3cm)
- h) Turquoise 54 pieces beads of Hongshan (necklace length 40cm)

4.2. Diversity of Korean Beads

It was confirmed that beads were made from various materials and various producing techniques, through the analysis of Korean beads relics in the collection of the National Museum of Korea [42]. Beads were not limited by material and had diverse and complex shapes, and finishing, excelled in the art of surface decoration and joining materials.

Materials were earthen, stone, jade, black jade, shell, silver, gold, bronze, slag, white clay, celadon, white porcelain, and glass, etc. Shapes were gourd, twin, continuous pearls, coil, octahedron, hexahedron, polyhedral, prismatic angle, animal shape, oval, concave, cone, top, pinwheel, janggu, bowl, triple-layered glass beads (glass bead-gold leaf-glass film) and Yidang(耳璫), etc.

Specially, glass beads were made with multi-techniques, such as, multilayer, striped, and inlaid, by rolling them thinly, adding colored strings, inlaying wave patterns, making petals,

cutting vertically, cutting rotating, combining two colors, making horizontal or vertical stripes, swirling, dotting, coating, gold foil, porous, gem-decorated, and merged [43]. The existence of the beads diversity means that beads were popular and essential in daily life and that the place of origin of beads was the ancient Korea.

It is said that gilded glass beads were first made in Alexandria, Egypt, in the 3rd century BC and spread to surrounding areas, eventually circulating in Korea in the 1st century BC [44]. But the exchange via Maritime Silk Road is impossible in this period, because the Indian Ocean Silk Road opened relatively late [45]. Thus these beads may have been transmitted to Egypt from the East via Land Silk Road.

4.3 Relationship between form method of glass beads and iron core

A bead mold was excavated along with bronze daggers of Gojoseon [14, 46], and it has a groove where the iron rod for the bead hole was inserted, in addition to the pouring slot (Fig. 7a). It is unclear whether the mold for glass beads or not, but it is certain that melting something were shaped into a bead [18]. Although it is possible slightly to lower the melting point of glass ingredient with additives, very high temperatures are required (about 1,500°C). The mold method for glass beads must use iron rod core (about 1,538°C) that does not melt even at the high melting point of glass, and glass powders.

Glass beads are made in other various ways, such as by winding, stretching, and folding, except mold, so glass beads were not related to the Iron Age. North Korean scholars dated the introduction period of iron and glass in Korea to the 7th centuries BC [13], while South Korean scholars dated it to the 1st centuries BC [47], based on the claims of colonialists, connecting Iron Age and glass.

Mud molds for glass beads have been excavated from Galmae-ri in Asan (Fig. 7b) and nation-wide indicating that beads and ironware were produced and popularized nationwide. The glass-bead mold excavated from Songhak-dong in Iksan, is characterized by a dense arrangement of 3mm beads size spaced 2mm apart and a 1mm hole for the iron core, which is quite sophisticated. In addition, among the iron tools from the Nakrang Earthen Fortress (樂浪土城) excavation in Pyongyang, North Korea, small iron core tools are pointy at one end (Fig. 7c) [48], and it is regarded be iron core tools used for glass bead molds.

Gojoseon had an early and independent development of microliths (細石器), Comb-patterned earthenware(빗살무늬토기) and glass-processing, producing beaded ornaments from a variety of ores, glass, bronze, and gold [49]. According to excavation reports from Saejuk-ri and Unseong-ri in North Korea, Gojoseon possessed the world's first iron processing and heat treatment technologies for steel production, already in the 6th century BC. This suggests that the people of Gojoseon had already been making and using steel from wrought iron and pig iron hundreds of years before the BC era, and had knowledge and processing technology for iron [50]. When looking at ChiU(蚩尤, 銅頭鐵額) and the first form of iron character '鍔', 'metal(金) of the Dong-Yi people(夷)', meaning that ChiU and Dong-Yi invented the secret method of turning soft iron into steel. (Good quality of) irons were produced in ByeonJin(弁辰, Seres), and supplied to Makhan, Ye(穢), Wae(倭), and etc.(三國志 弁辰條) [51]. Therefore, it is believed that Gojoseon's high metallurgical technology were even utilized in the recycling of by-product slag to produce beads.

The large workshops that produced gold, glass, and bronze at the Wanggungri ruins in Iksan (Fig. 7e), as well as the glass, bronze, and ironware at the Hwangnam-dong ruins in Gyeongju (Fig. 7f), and the bronze and glassware at the Guhwang-dong ruins in Gyeongju, were the examples.

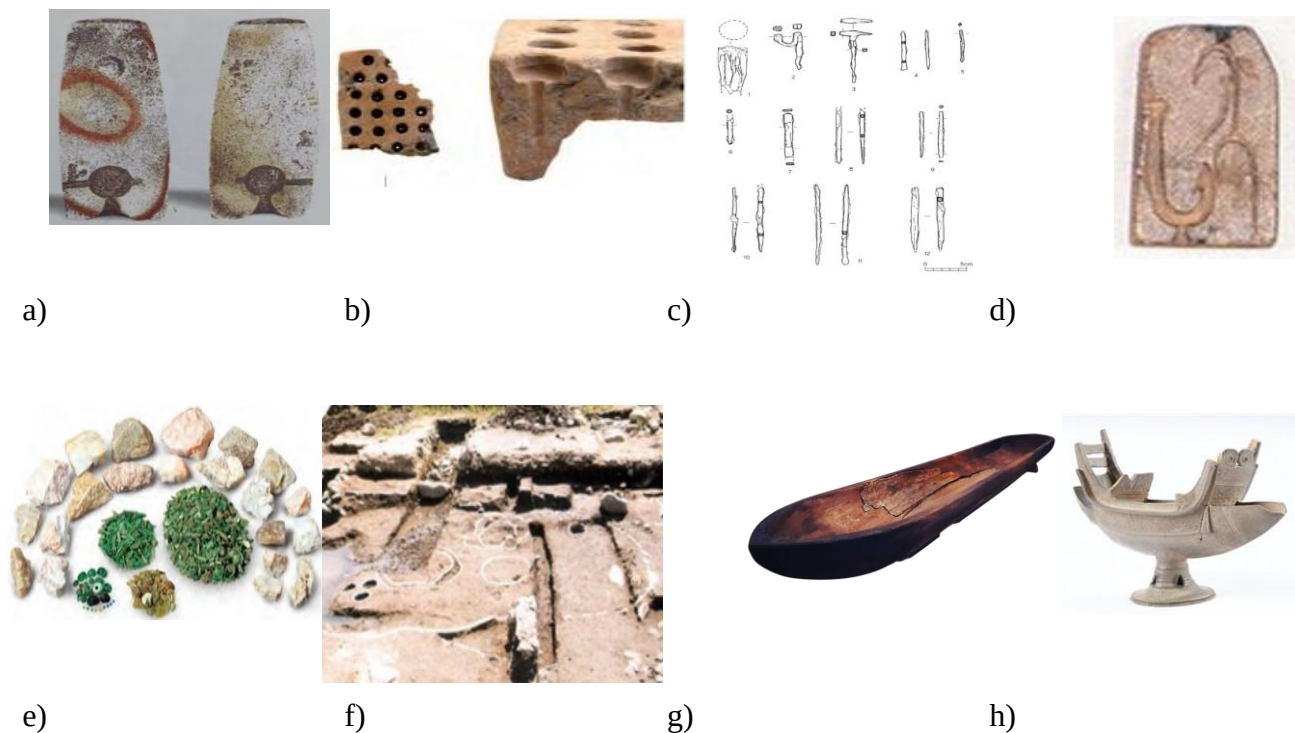


Figure 7. Glass bead molds, glass-related relics, glass workshop and proofs of ocean sailing

- a) Stone mold of beads from Bukpyo Gangga-dun relic, Hongshan (夏家店下層文化) (BC2,000)
- b) Clay cast of glass beads from the Galmae-ri sites in Asan [52]
- c) Iron tools for mold of glass beads excavated from Nakrang Toseong, PyungYang
- d) Stone mold of large fishing hooks excavated from Yeongam, Jeollanam-do (National Treasure No. 231: length 11.93cm, width 7.05cm, thickness 2.17cm)
- e) Glass-making Ore and semi-processed products from Iksan Wanggungri [4]
- f) Glass workshop of Hwangnam-dong, Gyeongju
- g) Wooden boat (8,000 years old) from Bibong-ri, Gyeongsangnam-do (length about 3m)
- h) Earthenware Ship 's square-shaped head and stern (方頭方艏, Silla or Gaya)

5. Glass Bead Workshops in Korea and Overseas Expansion

During the Three Kingdoms period(三國時代), Goguryeo had mine slaves and Silla utilized the labor of quasi-slaves for industrial production, and among the various handicraft sectors operated by the government offices of Silla was the Jabgong-sa(雜工司), which was dedicated to gold, silver, jade, and other small crafts[21]. The blue color of the bead background is the color of the northern people, and beads also appear in the myth of Japan's

founding by the northern people.

Many people of Baekje and Silla went to Japan Wae around the 5~6th century, and built Jabgong-ho(雜工戸) government office in the Daejang-seong(大藏省) division, starting to produce metalware and glassware (7~8th century) [33]. The identical name of the same government job proves that it was built by the people of Silla. Lots of same glass beads to Korea had been found in Japan Wae, during the Kofun, Asuka, and Nara periods. Inlaid Glass Beads were excavated in Nara and Hyogo Kobe, and gilded glass beads were found at Takaidayama Tumulus in Osaka and Ishinokirato Tumulus in Nara.

Most of the glass beads excavated in Indonesia are dated to the 6th and 7th centuries or later [1], and the beads produce started relatively late, and implied that Indo-Pacific beads or Jatim beads were resulted from outsourcing. Considering the large amount of glass bead artifacts found in Korea in the earlier period, the relics remains of glass-making nationwide, the same names of the glass-making government office, the excellent metalworking and inlaying techniques, and excellent marine technology handed down from ancient times (Fig. 7d, 7g & 7h), it is assumed that glass production technique was transferred from Silla to South Asia regions. In Arab records, Silla was also described as a utopian of 5~6 islands nation with many kings, clean water that cured all diseases, and a house that smelled like ambergris when sprinkled with water. Silla was described as a very positive place, but on the other hand, among the islands, there was the uncivilized 'Vāq vāq Island (倭)', a country with a half-naked queen [53]. Roman glass was mainly consumed by the Romans, but its production was carried out by neighboring countries, the case of Silla will be similar to this.

6. Analysis of Glass Bead Exchange

Glass beads were the items of Silk Road trade, the examples are the 'Eyeball inlaid' glass beads from Silla, Java, Central Asia and Altai [35], and 'Star inlaid' glass bead from Silla and Java. Three-layer gilt glass beads have been excavated from Cheongdang-dong in Naju, Bannam-myeon in Gyeongju, Geumgwanchong, and the tomb of King Muryeong of Gongju, and are found from the Mediterranean coast to Japan and Southeast Asia [35]. The global presence of gold leaf glass beads in Egypt, Central Asia, the Black Sea coast, Scandinavia, Java, and Silla Korea, is likely due to the prestige of gold as a material. Similarly, spherical aggregate jewelry made of gold grains is also widely distributed, including Korea, Vietnam,

the Philippines, and Indonesia [35]. In particular, the fact that the Indo-Pacific glass beads started on the eastern seaboard of India around 500AD, where Tamil language similar to Korean, was spoken, confirms that glass beads spread along the Sea Silk Road, centered on ancient Korea (Baekje & Silla).

Located at the crossroads of the Maritime Silk Road, the islands of Southeast Asia were rich in spices, as well as wood, tin, and gemstones, but lacked skill, so they were under the guidance of talented teachers [47]. The elites are believed to have been Silla or Baekje people, because historically, Korean traders sailed by monsoon winds and currents and exchanged with Southeast Asia [54]. Later, Arab merchants described Silla as a utopia with plenty of gold and abundance, and smells ambergris when sprinkle water at their houses, and once entered Silla, and all kinds of diseases will disappear, and you don't want to come out [55].

Before Silla, Baekje had produced Baduk checkerboards made of ebony, which is found only in Southeast Asia, and actively traded with Palembang and Java in Indonesia, Cambodia (Bunam), and OcEo in Vietnam. In other words, Baekje had been a maritime state(百家濟海) that was closely connected to Yamato-Wae(大和倭) and had far stronger control over the Southeast Asian region earlier than the Center(中原) and Silla. The world's oldest (最古) log boat, dating back 8,000 years, discovered in Bibong-ri, Changnyeong (Fig. 7g), is not a raft or a leather boat, but resembles a boat found at Liangzhu Ancient City(楊州), where the Huai-Yi (淮夷) of Dong-Yi people lived. The discovery of jade earrings(玉玦) from the Hongshan culture in the ruins of Sahuin(沙黃) in central coastal Vietnam [56] is an example of this. The whale-hunting petroglyphs of Uljin Bangudae, as well as the large 8cm long fishing hooks (Fig. 7d), indicate that fishing was carried out by boat far away.

Later, Kunlun ships(崑崙船) [37] depicted in a relief from the Bodobudr Temple (the 8th century~) on the Indonesian island of Java have square-shaped bow(方頭) and stern(方艏) and multiple large sails (Fig. 7h), similar to the shape of boat-shaped earthenware found in Gyeongju and Hyunpung, suggesting that they were the vessels of the Great general of Silla. Silla was the best in shipbuilding and seamanship in East Asia, followed by the landlocked Tang Dynasty, and Japan was last, despite being an island nation, in the 9th century [55]. The Silla people were not only skilled at building ships, but also at navigating them with

the first compass, and Jang Bogo(張保臯) was called the “King of the Sea” and went even to Persia in 834 [57].

As such, the ancient Korean people played a central role in the maritime Silk Road trade due to their early development of navigational technology, which was based on the exchange of information, intelligence, and maritime technology. Silla's treasures and spices, remained in Shosoin(正倉院), Japan, and glass beads in Southeast Asia are evidence of Silla's maritime dominance [58]. At that time, records showing that Baekje and Silla possessed superior shipbuilding and sailing techniques are shown in Table 2.

Table 2. Records that prove the powerful maritime power of Baekje and Silla	
北史 7 th century	In 3 months by sea to the south, there is Dammora(耽牟羅) country, which size is a thousand li from north to south and hundreds li from east to west. Dammora belonged to Baekje.
日本書紀 AD 545	Baekje gave two slaves of Bunam to Wae(倭).
日本書紀	(9th century), Silla sent a shipbuilder to Japan, who became the founder of Inabe (猪名部)
續日本後紀 839	(He/she) commanded Taejaebu(太宰府 Kyushu), “Build a Silla boat so that it can withstand the storm.”
	An official of Daemado(對馬島) spoke of the excellence of the Silla ship and requested that one of the six Silla ships owned by the Taejaebu beshared.

Conclusion

This study presents a comprehensive analysis of the Silla Face Inlaid Glass Bead (Treasure No. 634), concluding that it was most likely produced domestically during the Silla period. The artifact demonstrates not only advanced technological craftsmanship but also reflects Silla’s distinct cultural identity and symbolic worldview.

Through comparative analysis with Roman glass beads, significant technical differences were identified—most notably the bead’s unique 360-degree inlay technique and the exceptional precision in the depiction of a human face.

The decorative elements on the bead—a human face, white flying birds, and flowering trees—are interpreted not as mere ornamentation but as carriers of deep cultural and religious symbolism. The human face, adorned with a topknot hairstyle and gold floral motifs on both sides, is seen as a representation of nobility and elevated status in Silla society. The white bird is understood as a celestial messenger to the Dong-Yi people, possibly linked to the Silla founding myth, while the flowering tree is interpreted as a sacred tree motif shared with northern nomadic cultures. The bead's overall style reflects northern influences, with symbolic references to the blue color of the north, the tree of life, and a large white bird, possibly a swan—all reinforcing the interpretation of the bead as a culturally localized and symbolically rich object.

Ancient Koreans are known to have placed high religious value on beads, crafting them from a variety of materials such as jade, stone, clay, metal, and glass. These beads adorned various parts of the body—head, ears, neck—and were used not only for decorative purposes but also as markers of status and ritual significance. In ancient Korea, gold and silver were esteemed even more than silk brocade Geum(錦) or wool Gye(麤), further emphasizing the symbolic weight of bead craftsmanship.

Of particular significance is the Hongshan culture (紅山文化 ca. 4500 BCE), where face-carved pendants and beads were discovered, and where a mold used for bead-making has been excavated—offering early precedents for the face motif and production technology. These findings help trace the cultural and technological lineage that culminates in the Silla face bead.

Additional archaeological evidence further supports the theory of domestic production. Two rare inlaid glass beads discovered in Gyeongju, along with a comparable surface-inlaid glass bead unearthed in Japan, suggest a shared technical tradition and regional production network. The presence of glassworking sites, molds, crucibles, and slag remains across the Korean Peninsula—particularly in Silla contexts—demonstrates a sophisticated level of local glass production capability. Notably, the use of slag, a byproduct of iron smelting, in bead production highlights Silla's expertise in metalworking and material optimization.

This new interpretation considers not only stylistic and archaeological parallels but also broader historical and geopolitical contexts. Silla's ancestral connections to the ancient Seres, a people known in the West as exporters of silk, fine iron, and furs as early as the 7th century

BCE, underscore the longstanding technological proficiency of the region in glassmaking, metallurgy, and inlay techniques.

Furthermore, the study emphasizes the extensive and enduring interactions between Northeast and Southeast Asia, dating back to the Neolithic period. These interactions are evidenced by shared cultural elements and artisan exchanges. Just as Baekje Japgon-Sa established a craftsman's bureau Japgong-Ho within the Japanese Wae, likely for the transmission of bead-making and other crafts, Silla too appears to have played an instrumental role in regional technological dissemination in Southeast Asia. The fact that Silla was described as 5~6 islands by Arab geographers and was actively engaged in maritime trade further suggests that Silla was not merely an importer of foreign goods, but a central node in the maritime Silk Road, likely outsourcing specific crafts while exporting its own expertise and aesthetic.

In conclusion, the Silla face-inlaid glass bead reflects the kingdom's advanced craftsmanship, symbolic sophistication, and maritime connectivity. It serves as both a material testament to Silla's place within East and Southeast Asia's ancient exchange networks and a valuable key to understanding the complexity and creativity of Korean heritage.

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