



The Gold Crown from the Seobongchong Tomb

The Manufacturing Techniques and Conservation Treatment of the Gold Crown Excavated from the Seobongchong Tomb in Gyeongju (Treasure No. 339)

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Introduction

Silla was an ancient Korean state that existed from 57 BCE to 935 CE. Even in the present day, numerous tombs with high mounds dating to the Silla period can be seen in Gyeongju, which remained the capital throughout the state's existence.

The representative cultural heritage item symbolizing ancient Silla is the gold crown. Such gold crowns have been unearthed from tombs at burial grounds of the highest status, making it highly likely that they were once in the possession of kings, queens, or royalty. To date, a total of six Silla gold crowns have been identified on the Korean Peninsula. Apart from the gold crown that is known to have been looted from a derelict tomb in Gyo-dong, Gyeongju, the remaining five were recovered, respectively, during excavations that took place in the following tombs: the North Mound of the Hwangnamdaechong Tomb, Geumgwanchong Tomb, Seobongchong Tomb, Geumryeongchong Tomb, and Cheonmachong Tomb. Of these, the Seobongchong Tomb is a wooden chamber tomb covered with a stone mound and an earthen layer dating to the Silla period which is located in Gyeongju's city center. It was first excavated in 1926, during the period of Japanese colonial

occupation in Korea. From 2016 to 2017, it was excavated once again, this time by the National Museum of Korea, revealing new artifacts and providing additional information on the tomb's size and structure (National Museum of Korea 2020). A wide range of grave goods were unearthed at the Seobongchong Tomb: a gold crown, ornaments (such as gold earrings, gold belt accessories, and other items), a silver container bearing the inscription “延壽元年” (“The First Year of the Yeonsu Reign Era”), lacquerware, glass vessels, various horse gear items, farming tools and other types of everyday tools. Interestingly enough, the grave goods assemblage did not include any weapons, which led researchers to infer that the deceased was female (National Museum of Korea 2014). The gold crown from the Seobongchong Tomb has a dome-shaped internal structure decorated with a bird-shaped attachment; it is the sole example of a Silla crown featuring such an internal structure.

The artifacts examined in this paper comprise one gold crown and six curved beads excavated from Tomb No. 129 at Noseo-dong in Gyeongju (known as the “Seobongchong Tomb”) (Table 1). The gold crown was repaired more than once after its excavation. Due to these repairs, the shape of the crown became partially deformed, and the need to return the artifact to its original shape was proposed. The nature of the shape

ID No.	Name	Quantity	Image Prior to Conservation Treatment	Period	Measurements	Materials	Note
Bongwan14319	Gold crown	1 piece		Silla	H36×Ø18cm, 803.3g	Gold and silver alloy, jade, glass	Treasure No. 339
Bongwan14338	Curved beads	6 pieces		Silla	Total 53.3g ① 17.97g, ② 11.26g, ③ 11.86g, ④ 6.8g, ⑤ 3.86g, ⑥ 1.54g	Jade (No. ①—⑤), Glass (No. ⑥)	Excavated along with the gold crown

Table 1. The Objects of Conservation Treatment and Measurements

deformation was introduced in detail in a thematic exhibition, *New Scientific Revelations about the Gold Crown from the Seobongchong Tomb*, hosted by the National Museum of Korea in 2015, and an estimated reconstruction of the gold crown was also provided (National Museum of Korea 2015). Subsequently, conservation treatment was carried out over a period of approximately five months from March to July in 2016, with the purpose of returning the gold crown to its original shape and to ensure the safe management of the artifact. This paper outlines the process of conservation undertaken on the gold crown from the Seobongchong Tomb and introduces the crown’s manufacturing techniques as was identified during the conservation treatment process. In addition, the manufacturing techniques of the Seobongchong Tomb gold crown are compared with those of other similar Silla crowns in order to establish the unique characteristics of the Seobongchong Tomb gold crown.

An Object of Research and Its State Prior to Conservation Treatment

The Basic Shape of Silla Gold Crowns

Silla crowns, which were produced according to an extremely formulaic style, consist of headband-shaped crown bases to which tree branch-shaped uprights were affixed. An in-depth archaeological study on such ancient Silla headband-shaped crowns was undertaken by Ham Soon Seop (Ham Soon Seop 2012; 2014). Each Silla crown features three vertical uprights with opposite branches, one positioned at the center of the crown, facing forwards, and one on either side. Flanking the side tree branch-shaped uprights is a pair of angled uprights with alternate branches. The crown headband and upright

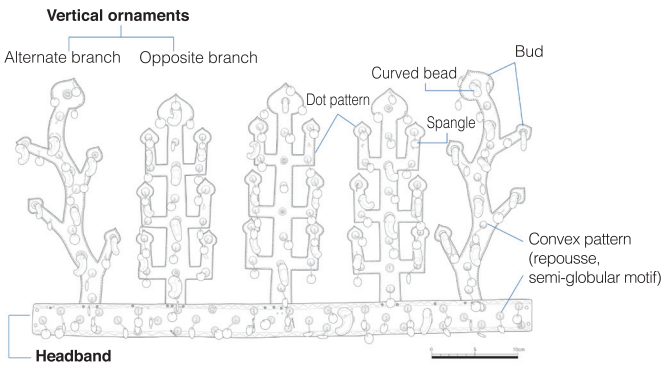


Fig. 1. Names of the parts of the Silla headband crown with tree-shaped uprights

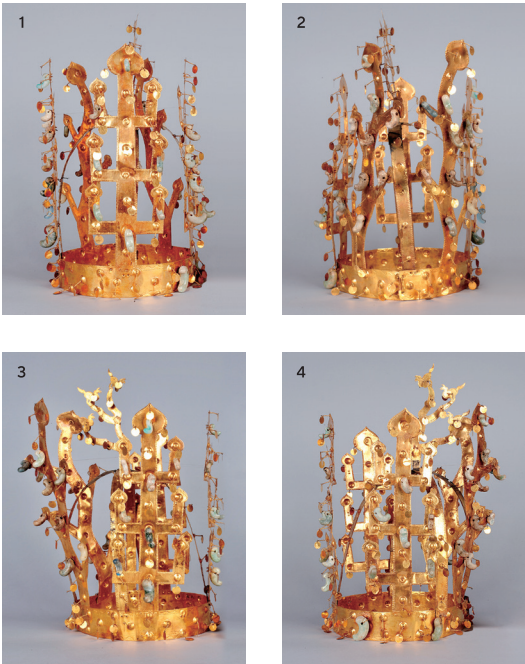


Fig. 2. Before conservation treatment: 1) front, 2) rear, 3) right, 4) left

decorations are additionally adorned using round gold spangles and curved beads (曲玉, K. *gogok*) that are attached with gold wire. Presented in Fig. 1 is the planar figure of the gold crown and images of the gold crown that were originally published in

the Seobongchong Tomb excavation report, additionally edited by listing the names of each crown component.

Investigation Prior to Conservation Treatment

The form, structural characteristics, and repaired sections of the artifact, as well as the degree of damage, was investigated in detail through the production of actual measurement drawings, observations with the naked eye, photography, and inspection under a microscope. In addition, related records and the excavation report were used to compare the present state of the artifact with its original state at the time of discovery in order to identify the sections of the gold crown in which shape deformation had occurred, and to establish a conservation treatment plan.

Gold Crown

The gold crown has a height of approximately 36 cm, a diameter of approximately 18 cm, and is made of a gold and silver alloy. The main body of the crown was made using a gold sheet (purity 19-20 K); the gold content of its attached parts differs slightly according to the type (Yoo Hyeseon et al. 2014; Shin Yongbi 2021). The crown consists of a long rectangular headband (55.5×3.7 cm), to which three three-tiered vertical uprights with opposite branches and two angled uprights with alternate branches are affixed (Figs. 1 and 2). The inside of the crown additionally features a dome-shaped structure made with gold bands intersecting at a right angle and affixed to the front, rear, left, and right parts of the crown’s headband. The band affixed to the left and right parts of the headband measures 56.6×1.6 cm while the band affixed to the front and back parts of the headband measures 56.8×1.6 cm. At the point where the two bands intersect, this dome-shaped decoration is adorned with an ornament made of gold sheet that is in the form of a branch with three birds sitting at the end of it. All of the components forming the gold crown’s structure—the headband, uprights, dome-shaped decoration, bird-shaped ornamental piece—were assembled together using gold rivets. In addition, the crown was decorated using round gold spangles that were made by punching holes into gold sheets, and with curved beads made of jade or glass. Several of the curved beads are missing or have been damaged.

Curved Beads

The curved beads, amounting to six in total, are not uniform in nature but rather vary in their size, shape, and material. Five of the beads were made of jade and one was made of glass. The glass curved bead is made of a bluish translucent material; half of the section featuring a hole (which can be seen as its “head”)

was broken off and attached with an adhesive. In the case of the five curved jade beads, the holes contained some bits of a gold wire. The composition of the gold wire is the same as that of the gold wire of the curved jade beads currently affixed to the crown’s headband (National Museum of Korea 2015).

Traces of Repair

Traces of repair on the gold crown could be observed prior to conservation treatment. Parts of the damaged bird-shaped ornamental piece had been repaired using an adhesive. Other damaged sections were repaired by affixing an additional metal plate to the rear using adhesive; metal wire was then used as an additional affixing measure (Fig. 5). The base of the bird-shaped ornamental piece had originally been bent into an “L” shape and

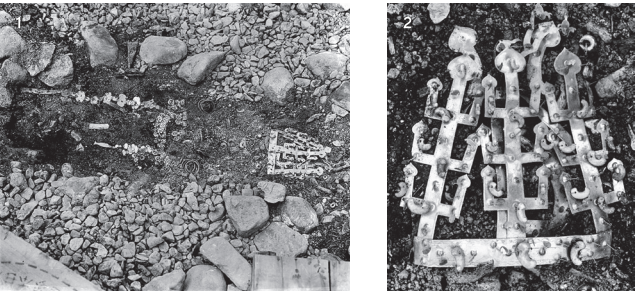


Fig. 3. Photos of the gold crown from the Seobongchong Tomb in situ during excavation (photos taken in 1926): 1) Plate 16126, 2) detail of Plate 16120



Fig. 4. Photo taken in 1934 after alteration (Plate 17332)

affixed to the top of the crown’s dome-shaped decoration, but this base part was found to have been broken off. The remaining section of the bird-shaped ornamental piece was affixed to the crown by adding a pair of L-shaped bronze plates to either side; they were then attached to the dome-shaped decoration by a metal wire that was wound around the entire section. At the time of its discovery, the entire crown had been pressed flat (Fig. 3), but in the photograph that was taken afterwards, the crown appears in a reconstructed state, with the dome-shaped decoration and parts of the bird-shaped ornamental piece also repaired (Fig. 4). The crown that appears in Fig. 4 is also different from its present

state, indicating that additional repairs took place several times after the crown was unearthed during excavation.

The four components of the dome-shaped internal decoration that would have originally been affixed to the crown band were all found in a detached state. Gold wire, similar to the type that was used to affix the curved beads to the crown, was found to have been used to connect the dome-shaped structure to the main crown structure, albeit in an unstable way (Figs. 6, 7, 8, and 9). The gold wire was found to be 23-24 K gold, distinguishing it from the gold used at the time of the crown's manufacture, which was 17-19 K gold; this indicates that that particular gold wire was used for repairs after the gold crown's retrieval from the tomb. Table 2 presents data on the gold content of the different parts of the gold crown. It can be observed that the characteristics of the gold used in the gold wire attached to parts of the curved beads and the crown headband differed from that of the other gold parts of the crown (Yoo Hyeseon et al. 2014; Shin Yongbi 2021). In addition, it was confirmed that the dome-shaped decorative structure was attached backwards. The direction of the headband and the bird-shaped ornamental piece was correct; the dome-shaped decoration, on the other hand, had been affixed with the back section wrongly located to the front of the crown and vice versa.

Type	Form	Gold Quality (K)	Notes
Crown headband, upright decorations	Gold sheet	19.3–19.5	
Connecting wires (of the spangles), spangles	Gold wire (thin)	18.7–19.0	
Bird-shaped decorative piece, dome-shaped internal structure (decoration)	Gold sheet	17.5–17.9	Material used at the time of manufacture
Rivets	Gold rivets	17.4	
Connecting wires (of the curved beads)	Gold wire (thick)		
Connecting wires (of the curved beads/headband)	Gold wire (thin/thick)	23.3–23.8	Material used during later repairs

Table 2. The Gold Content of the Different Parts of the Gold Crown from the Seobongchong Tomb

In addition to concerns surrounding the deformation of the gold crown's shape, the fact that the material which had been used during previous repairs caused friction on the artifact's surface, resulting in further damage, and that the corrosion generated

by the material used for repairs was polluting the surface of the gold crown were also issues of key concern. The possibility that additional damage might occur in the future to the already dilapidated parts during the replacement of artifacts on display, loan of artifacts, etc. was also an issue that required addressing.

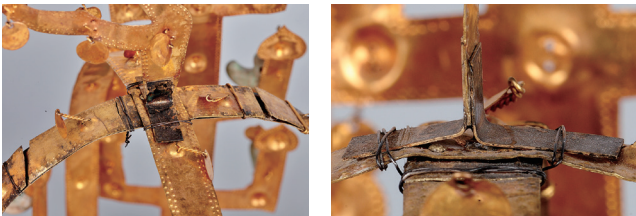


Fig. 5. Detail of the repair work undertaken on the damaged section of the gold crown from the Seobongchong Tomb

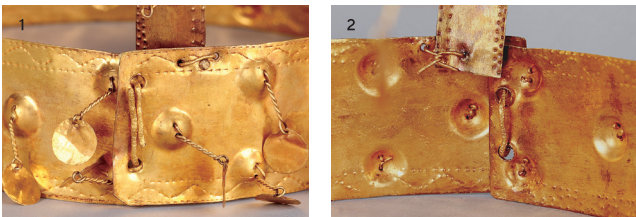


Fig. 6. Area of repairs to the dome-shaped decoration and crown headband: 1) outer side of the rear part, 2) inner side of the rear part



Fig. 7. The dome-shaped decoration in a temporarily attached state (circles show areas fixed using gold wire, arrows show rivets): 1) front, 2) right



Fig. 8. Affixed curved bead (below: original gold wire, above: modern gold wire used for repairs)

Conservation Treatment

The Dismantling and Cleaning of Components

In order to restore the incorrectly reconstructed parts to their original shape and to eliminate corrosive elements from the surface of the gold crown, the materials that were used during past repairs,

along with pollutants from the gold crown's surface, were removed.

Firstly, the gold wires that were used during repairs were unfastened in order to dismantle the bird-shaped decorative piece, the dome-shaped internal structure that had been attached to the headband backwards, and the crown headband (Fig. 9-1). Following this, the gold sheet and gold wire pieces that were damaging the artifact's surface were removed entirely. During this stage, the gold wire was unwound and the metal sheet used for repair was separated from the detached gold crown piece by applying acetone with a syringe in order to solubilize the adhesive (Fig. 9-2). Traces of degraded adhesive remained on the separated gold crown piece, as did corroded material and other pollutants produced by the metal piece used for repair and the gold wire. The pollutants were removed with alcohol and acetone that was applied using cotton swabs and a soft brush (Fig. 10). After the cleaning process, the dome-shaped internal structure was dismantled into a total of six pieces (Fig. 11). This revealed the assembly structure of each piece, as well



Fig. 9. The process of deconstructing the previously repaired area: 1) detaching the metal wires using small tools, 2) removing the affixed piece, 3) the detached gold crown pieces and material for repair

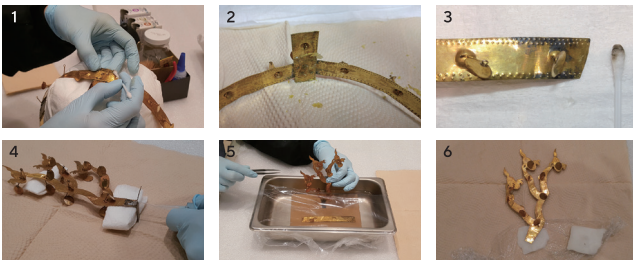


Fig. 10. Removing pollutants from the dome-shaped decoration: 1-2) removing adhesive and the corroded material on the surface, 4-6) removing the material used to repair the base of the bird-shaped decorative piece



Fig. 11. Dismantling the structure into pieces for repair

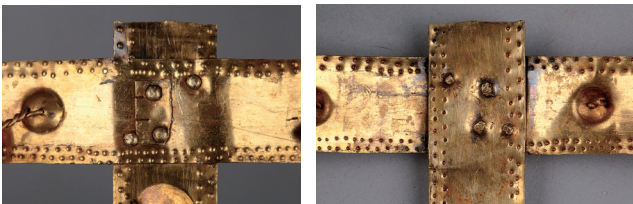


Fig. 12. Detail of the rivets in the area where the bands forming the dome-shaped decoration intersect: 1) front, 2) rear

as the shape of the rivets used, allowing the structure of the gold crown to be identified in detail (Fig. 12). During this stage, the length of the decoration affixed to the dome-shaped decoration, as well as the location where it was attached and the method of its assembly, were identified. Based on this information, a mock reassembly of the crown's dome-shaped internal structure was carried out in order to identify intersecting locations and points of possible structural instability.

Joining the Pieces and Enhancing Structural Stability

During the conservation treatment of the gold crown from the Seobongchong Tomb, the step that involved joining pieces together and enhancing structural stability was undertaken with two key goals in mind. The first was to connect the crown's headband and the four bases of the dome-shaped decoration—which had been temporarily fixed together backwards—in the correct way in terms of the direction of the pieces. The second goal was to reattach the damaged part of the bird-shaped ornamental piece to the dome-shaped decoration and to enhance the overall stability of the artifact by using a durable material as reinforcement. The sequence of the entire process was as follows: joining (assembling) the dome-shaped decoration → joining (affixing) the bird-shaped ornamental piece → stabilizing the assembled dome-shaped decoration using an acrylic frame.

1. Production of the Reinforcement Material

The dome-shaped decoration that was located inside the crown consisted of a total of three gold sheet pieces—a bird-shaped ornamental piece and two bands—which were then broken into six pieces. The gold sheets had a thickness of approximately 0.5 mm. The areas where the pieces intersected and were affixed to one another were too narrow to bear the weight of the gold sheets in a stable manner. Furthermore, the surface of the roughly cut edges had experienced morphological modification, so the surfaces were not joined together firmly as a result. These factors made it difficult to join the parts of the dome-shaped decoration together in an exact manner. As such, the conservation treatment involved the production of a new type of reinforcement material that would be suitable for use in joining the pieces of the gold crown from the Seobongchong Tomb in a stable way.

The Reinforcement Material for the Joining Points

The factors that were considered when selecting the reinforcement material for supporting the points where the

components of the dome-shaped decoration were joined will be discussed next. First, the material had to be reversible. Second, the material had to be transparent so it would not cover the manufacturing traces featured on the crown's surface. Third, it had to be strong enough to support the joining points of the dome-shaped decoration in a stable manner, since they are subject to continuous pressure due to the twisted nature of their structure. Fourth, it had to be elastic and flexible so that stresses during movement would not result in additional damage to the artifact. Finally, the material had to be easily malleable so that it could stay close to the joining points, which have curved surfaces. Upon considering a wide range of candidates, the decision was finally made to use a panel consisting of woven fiberglass covered with Epotek® 301, which is a highly transparent epoxy cold mounting resin. The key merit of this material is that—compared to an acrylic panel—it is highly reversible, and therefore less likely to damage the artifact during future treatments. The woven fiberglass makes it less likely for the reinforcing panel to break as a result of impact, and it is highly transparent, making it possible to observe the artifact surface even after the attachment of the reinforcing panel. The epoxy panel can also easily be produced according to the size and thickness required, and it is easy to cut and to apply surface treatments. Finally, the panel can easily be formed into a curved shape, thereby enhancing the stability of the reinforced part. Accordingly, epoxy panels that included woven fiberglass were produced as reinforcements for each joining point. Each of the panels were cut according to the requirements of the points where they were being used (Fig. 13).

The Acrylic Frame

The feasibility of reconstructing the gold crown in a way that its outer structure and dome-shaped inner structure could be separated in order to ensure stability during exhibition, packaging, and movement was discussed during the conservation treatment process. As a result, the decision was made to affix the dome-shaped decoration to an acrylic frame, rather than directly to the crown's headband section. This would allow the dome-shaped decoration to stand on its own and be easily detached and re-attached from the inside of the crown. Therefore, a frame was produced which could act as a structural reinforcement for the dome-shaped decoration, and be used as a support for the headband. An acrylic frame in the shape of a circle, with a diameter of 18 cm to fit the inner dimensions of the gold crown's headband, was produced. The location and area where the bases of the dome-shaped decoration were to

be affixed to the headband, the location of the rivets, etc. were marked onto the surface of the acrylic crown. Using a hand grinder, four grooves (of the depth of the gold sheets used in the gold crown) were cut into the acrylic crown (Fig. 14). The location of the rivet holes of the crown's headband were marked and then hammered from the back of the acrylic frame in order to form protrusions that could be used to hang the headband after the conservation process.

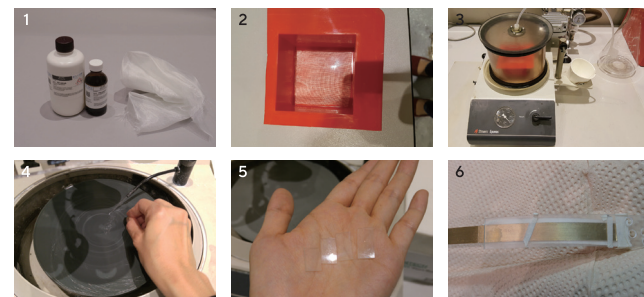


Fig. 13. Reinforcement materials supporting the rear of the joined area and the process of constructing the support: 1) preparing the materials (Epotek® 301, woven fiberglass), 2) mounting mold and glass fiber, 3) inserting the resin, 4) cutting and polishing the pieces, 5) finished sample of the reinforcement material, 6) preparations for the joining process



Fig. 14. The process of manufacturing the acrylic support
1) section affixing the dome-shaped decoration
2) the acrylic headband positioned within the gold crown
3) identifying the locations of the holes for affixing the headband prior to and after boring the holes

2. Joining the Components

The overlapping areas of the dome-shaped decoration components were very narrow, and the surface of the roughly cut edges experienced morphological modification over time. As a result, the joining points had to be hardy enough to withstand the continuous pressure emanating from the twisting force of the joined components. It was found to be impossible to maintain the joined state by only fastening together the overlapping areas. Therefore, the method of supporting the joined sections and their surrounding areas using a reinforcing material, as a means of dispersing the force, was selected. This method was possible because the material used in the gold crown was a stable gold and silver alloy.

The epoxy panel that was tailor-made specifically for the conservation treatment of the gold crown, featuring a woven

fiberglass fabric in the center, (hereafter referred to as the “reinforcement material”) was cut out then shaped using a hair dryer to fit the curves of the area behind the joining points of the crown components. For the rivet areas, which provide information on how the gold crown was assembled, holes were made in the reinforcement material so that the traces of manufacture could still be observed (Figs. 15-1 and 15-3). The prepared reinforcement material was then joined to the backside of the damaged areas of the dome-shaped decoration using Araldite® Rapid, an epoxy resin. In order to ensure that the areas being joined remained together while the adhesive was hardening, a temporary supporting frame was made according to the length and curves of the dome-shaped decoration using brass bands (Fig. 15-4). The exact joining points were identified and the reinforcement material was temporarily affixed to the brass bands. After the reinforcement material was joined to the gold crown parts, a string was wound around the joined area in order to ensure that it did not move while the resin was hardening (Fig. 15-5).

The bird-shaped ornamental piece was joined to the dome-shaped decoration after determining the correct location for the joining (Fig. 15-6). In order to ensure the stability of the joined area, the reinforcement material was used to make an “L”-shaped support, which was attached to the back of the joined area (Fig. 16). In addition, the locations of the rivets used to attach the bird-shaped ornamental piece were identified, and then holes were bored into their corresponding locations

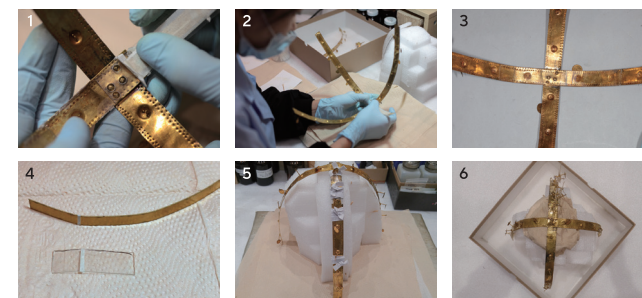


Fig. 15. The process of affixing the dome-shaped decoration: 1-3) joining and reinforcing the upper section 4-6) joining and reinforcement

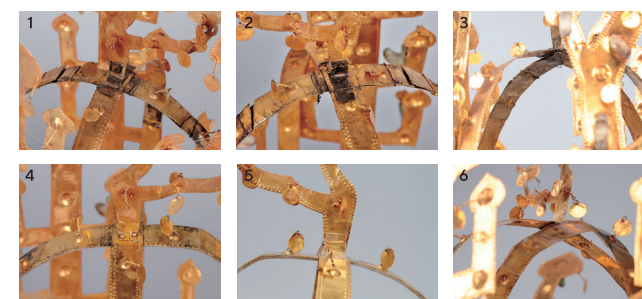


Fig. 16. Detail of the dome-shaped decoration: 1-3) prior to conservation treatment, 4-6) after conservation treatment

on the reinforcement material in order to ensure that there was no space in between the joined surfaces. The reinforcement material also ensured that the traces of the production methods visible on the surface were not covered by said material, thus allowing them to be observed.

3. Affixing the Crown Components to the Acrylic Frame

The dome-shaped decoration, which was assembled and reinforced, was attached to the acrylic frame by affixing each of its base sections to the grooves formed on the frame (Fig. 17). Upon affixing the dome-shaped decoration to the acrylic frame using Araldite® Rapid, an epoxy adhesive, fishing wire was used to additionally fasten the decoration to the frame via the rivet holes (Fig. 18). When the dome-shaped decoration and its frame, which were fastened together in the above manner, were assembled with the crown's headband, the base of the dome-shaped decoration came to be placed behind the fastening rivet of the headband (Fig. 19).

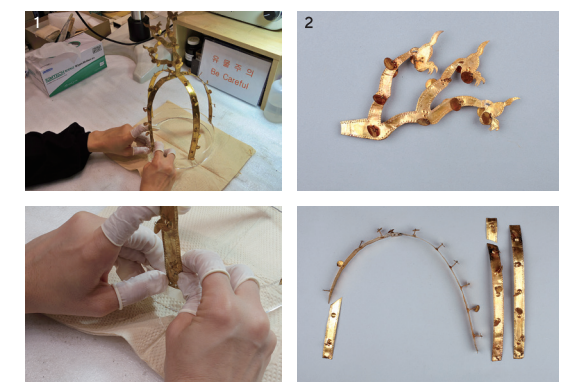


Fig. 17. Affixing the dome-shaped decoration and the acrylic support: 1) affixing process, 2) prior to joining, 3) after joining

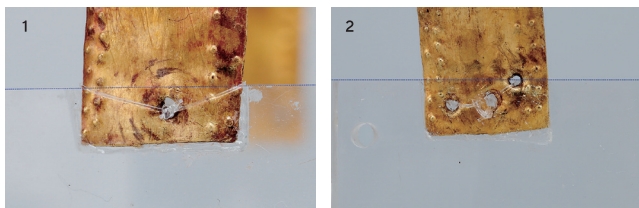


Fig. 18. Detail of the section where the dome-shaped decoration is attached: 1) front, 2) rear (dotted lines denote the perimeters of the acrylic support)



Fig. 19. View of the crown headband and the acrylic support in a joined state: 1) front-side, 2) front-inside

Attaching the Curved Beads

1. Identifying the Original Location of the Detached Curved Beads

The original locations of the six curved beads that were recovered along with the gold crown were identified and the beads were then fastened to the crown. Photographs taken at the time of excavation were used to establish the location and form of the connecting wires that were extant at the time. Unfortunately, even photographic records did not provide information on the location of one of the curved jade beads (curved bead No. 4), but based on a comparison of the roughly cut edges of the wires found, respectively, on the headband and curved bead No. 4, it was possible to make a connection between the two (Fig. 20).



Fig. 20. Rough edge of the remaining gold wire section securing curved bead No. 4: 1) remaining gold wire near the gold crown, 2) detail of Fig. 20-1, 3) remaining gold wire near the curved bead, 4) detail of Fig. 20-3

2. Fastening the Curved Beads

In order to make a deliberate distinction between materials that had originally been used at the time of the artifact's manufacture and materials used during the conservation process, 24 K gold

wire was used to fasten the curved beads to the crown. The direction in which the gold wire was twisted, as well as the method and appearance of the connection, followed the original as much as possible. The gold wire was cut and then threaded through the hole in the head section of the curved bead; at the back part of the bead, the wire was then twisted once to the right and fastened. Both ends of the gold wire were then threaded into the holes remaining on the crown's headband, and then each end was folded in the opposite direction and securely fastened so that the wires would not fall out (Fig. 21).

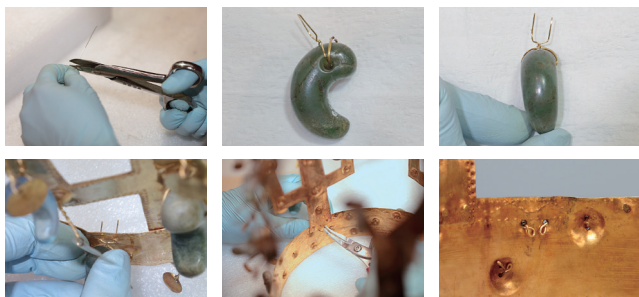


Fig. 21. Reinforcement materials supporting the rear of the joined area and the process of constructing the support: 1) preparing the materials (Epotek® 301, woven fiberglass), 2) mounting mold and glass fiber, 3) inserting the resin, 4) cutting and polishing the pieces, 5) finished sample of the reinforcement material, 6) preparations for the joining process

The head section of the glass curved bead (curved bead No. 6) had been damaged, so half of the detached head was fixed back on using adhesive. After using acetone to remove the degraded adhesive and to clean the remaining traces, a strengthening treatment consisting of Paraloid B-72 10wt% (in Xylene), which is an acryl resin, was applied to the area with cracks. Afterwards, the head and body sections of the glass curved bead were threaded with the gold wire and then the two sections were glued together using Loctite 401, an instant adhesive. The glass curved bead was fastened to the gold crown utilizing the same method used for the jade beads.

Results of the Conservation Treatment Process

Photographs were taken after the conservation treatment process in order to leave records of the artifact's appearance, and the details of the conservation treatment process. These included the materials used, changes in artifact dimension following conservation, and new information obtained during the process. These data were also recorded on a "conservation treatment" card. The dimensions of the gold crown following conservation are as follows: 36 cm in height, 18 cm in diameter, and a total weight of 832.3 g. Various traces associated with the gold crown's original structure and its manufacturing process were newly identified through the investigations following the

conservation process. Using this new information, conservation specialists carried out research which simulated the joining process of the components of the dome-shaped decoration. As a result, possible parts of structural instability were identified, which led the conservation specialists to consider new methods of reinforcement when assembling the gold crown. Materials for repair used during past conservation treatment processes (metal sheets and metal wire), which caused damage by producing friction against the gold crown's surface, were removed and the reinforcement material that was used in the past was replaced with a more stable version. In addition, the locations of the six curved beads that had been recovered along with the gold crown were identified and the beads were fastened to the crown. The crown's decorative dome-shaped attachment, which had been fastened to the crown's headband backwards, was correctly re-attached, making it possible to reconstruct the original appearance of the gold crown from the Seobongchong Tomb. In addition, a support was produced which allowed the dome-shaped decoration and crown headband to be separated and then re-attached. These measures will ensure ease in the storage, display, and research on the gold crown in the future.

	Entire Crown	Outer Section of the Crown	Dome-shaped Decoration
Front			
Right			
Left			
Rear			

Table 3. The Gold Crown from the Seobongchong Tomb after Conservation Treatment

Manufacturing Technology

Manufacturing Process of the Gold Crown

The gold crown from the Seobongchong Tomb was manufactured according to the following process: preparation of materials → engraving of patterns → attaching the spangles → assembling the components → attaching the curved beads.

1. Preparation of Materials

Images below present the process by which the components of the gold crown were drawn and cut out. The gold crown from the Seobongchong Tomb consists of a total of nine gold sheets and other small pieces. It comprises the following six different types of parts: 1) one gold sheet for the crown's headband, 2) three gold sheets for the vertical uprights with alternate branches, 3) two gold sheets for the angled uprights with alternate branches, 4) two gold bands forming the dome-shaped decoration (the band extending from left to right: 56.6×1.6 cm; the band extending from front to back: 56.8×1.6 cm), 5) one bird-shaped decorative piece, and 6) attachments (spangles, gold wires, gold rivets,

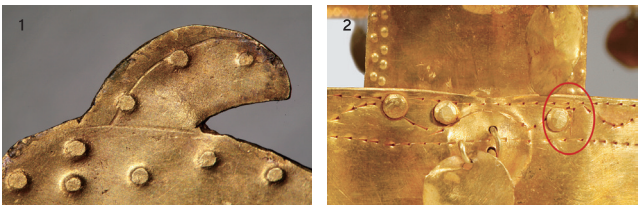


Fig. 22. Manufacturing traces on the gold crown from the Seobongchong Tomb: 1) sketch for cutting (the comb part of the bird-shaped decorative piece), 2) marking the location of the upright decoration on the front of the headband

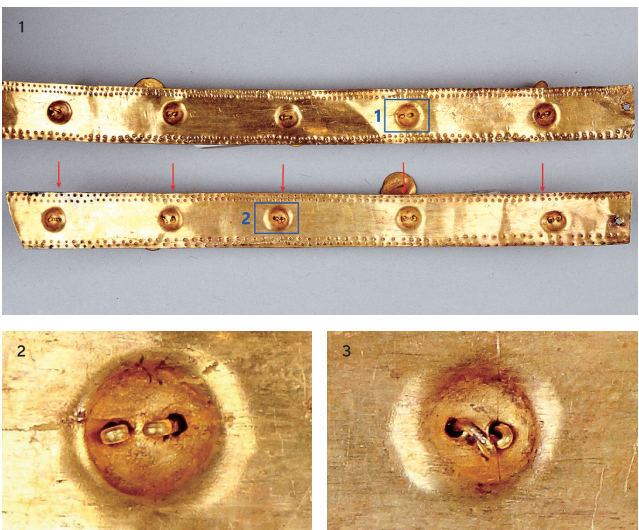


Fig. 23. The repousse, semi-globular motifs and markings for their locations (above: left-right direction band, below: front-rear direction band): 1) comparison of the intervals between the repousse, semi-globular motifs and the location of the incised lines, 2) detail of box 1, 3) detail of box 2

curved beads). It was possible to observe traces of the fine lines on the surface that had been used to mark out the shape of the crown components, to sketch the decorative patterns, and to mark out the locations of the attachments prior to cutting out the crown components from the gold sheet (Figs. 22 and 23).

2. Engraving Patterns

The second stage in the manufacturing process was to enhance the decorative nature of the crown components that were cut out by incising patterns onto their surfaces. The crown components were adorned with line or wave patterns that were rendered by making continuous wedge-shaped incisions, or with continuous dots or semi-globular motifs made using the repousse technique. Given that the repousse, semi-globular motifs featuring incised patterns were not at all deformed, it appears likely that the repousse technique was applied after the decorative lines were incised (Fig. 24).

3. Attaching the Spangles

After the patterns were engraved, further decoration was applied in the form of spangles. The spangles adorning the gold crown from the Seobongchong Tomb are round, have a diameter of around 10 mm, and were produced using the punch-out method. The spangles decorating the gold crown—apart from the bird-shaped ornamental piece and the tips of the upright decorations—all feature semi-globular motifs that were rendered using the repousse technique. The spangles have holes near their upper edges through which gold wire was inserted; both parts of the inserted wire were twisted five to eight times in a clockwise direction to form a stem. The ends of the stem were inserted into holes on the surface of the gold crown and then fastened by folding them over (Fig. 25).

4. Assembling the Components

The structure of the gold crown was erected during this stage. Studying the parts where the upright decorations and the headband were joined revealed that the upright decorations were placed in a way that they covered the repousse, semi-

globular motifs and the gold wire of the spangles (Fig. 26). This indicates that the uprights and the headband were joined *after* the spangles were attached. The entire structure of the crown was finalized after the uprights were attached to the headband, the two gold sheet bands were used to form the dome-shaped decoration (to which the bird-shaped ornamental piece was fastened), and this dome-shaped decoration was fixed to the headband. The structural assemblage of these components was undertaken using gold rivets.

5. Attaching the Curved Beads

The final stage in the manufacture of the gold crown involved attaching the curved beads. The curved beads were connected to the headband and the upright decorations via gold wire that was inserted into the heads of the curved beads and then twisted once behind the bead head. The bead was then attached in such a way that it hung parallel to the surface of the gold crown. The headband of the gold crown was adorned with six curved beads that were positioned along its upper edge, at the front, the rear, and in between the uprights. The curved bead located to the back of the headband was affixed at a spot where the base of the dome-shaped decoration and the headband overlapped and were fastened with rivets. A hole was bored into this overlapping section into which the wire used to attach the curved bead was inserted. The remaining curved beads were attached to places where the semi-globular repousse motifs of the spangles were absent. In some cases, the pre-existing decorations were deliberately removed in order to make room for the curved beads. In the case of the uprights, some of the spangles were removed and replaced with curved beads. Observations reveal that, in total, fifty-four curved beads were originally attached to the gold crown.

Comparing the Dome-shaped Decorations of Ancient Silla Crowns

The type of dome-shaped decoration observed inside the gold crown from the Seobongchong Tomb was also used in the following ancient Silla crowns: the gilt-bronze crowns from Cist

1 of Tomb 37 at the Dalseong Burial Ground in Daegu (Fig. 27), the gilt-bronze crown from Tomb B-16 at the Chodang-dong site in Gangneung (Fig. 28), as well as the gilt-bronze crowns in the Okura Collection in Japan (said to have come from Ulsan) and in the Musée National des Arts Asiatiques – Guimet (Fig. 29). Of these, the crown in the Musée National des Arts Asiatiques – Guimet Collection is believed to be the same as the measurement drawing of a gilt-bronze crown (said to have come from Yangsan) .

adorning the dome-shaped decoration of the Seobongchong Tomb gold crown resembles a bird, whereas in case of the other four crowns it is decorated with an *unju* (a dangling decoration similar to those found on Silla's equestrian gear). In the case of the latter, the *unju* decoration could be affixed using an inner stem piece (Fig. 27) or be fastened with rivets (Fig. 28) (Chuncheon National Museum 2008). Differences could also be observed in the location of the points where the dome-shaped decoration was joined with the crown – this difference

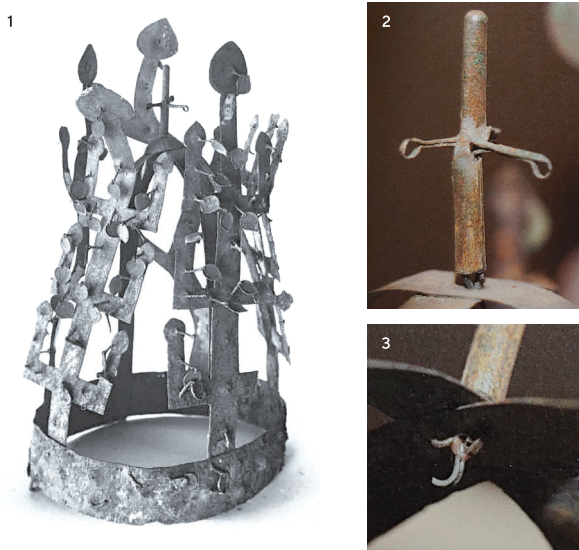


Fig. 27. Gilt-bronze crown from Tomb 37 of the Dalseong site: 1) photo of the excavated crown (Plate 24769), 2) upper section decoration, 3) detail of the connecting part of the upper section decoration



Fig. 29. Other Silla crowns featuring dome-shaped decorations: 1) gilt-bronze crown said to have come from Ulsan (Okura collection, Tokyo National Museum, Japan), 2) gilt-bronze crown of the Guimet Collection, France



Fig. 28. Gilt-bronze crown from Chodang-dong, Gangneung: 1) excavated state, 2) x-ray image of the *unju* decoration, 3) the *unju* and a piece of the dome-shaped decoration, 4) rivets located at the intersecting part below the *unju*

Table 4 presents a comparison between the manufacturing techniques of the dome-shaped decorations of ancient Silla crowns. Of the five crowns, four are made of gilt-bronze (i.e. bronze covered with gold), while the fifth is the gold crown from the Seobongchong Tomb. The upper ornamental piece

is likely to have arisen from the way in which the dome-shaped decoration was affixed to the headband. In the case of the four gilt-bronze crowns, the dome-shaped decoration was affixed to the headband using rivets. On the front and left and right sides of the crown, the dome-shaped decoration was fastened to the headband by placing it behind the uprights and then joining the layers using rivets while in the rear side of the crown, the dome-shaped decoration was affixed to the center of the headband's rear section. In the case of the Seobongchong Tomb gold crown, the headband was not permanently joined together while two holes were bored into either end of the headband. However, the position of these holes did not correspond exactly, making it unlikely that rivets would have been used in the holes. As such, the headband was likely fastened together using organic ties. In addition, the base of the dome-shaped decoration does not overlap with the locations of the upright decorations in the case of the Seobongchong Tomb gold crown, and the rear of the dome-shaped decoration was fixed to the base of the right section of the headband. Overall, the front-rear axis of the dome-shaped decoration is aligned slightly to the right,



Fig. 24. Repousse, semi-globular motifs and wedge-shaped incision lines



Fig. 25. Attaching the spangles: 1) on the uprights, 2) on the bird-shaped decorative piece

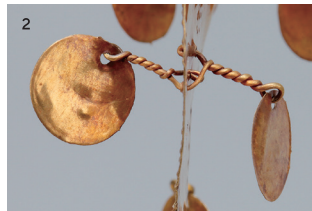


Fig. 26. Joined section of the upright decoration (alternate left branch)

Site		Seobongchong Tomb, Gyeongju	Cist 1 of Tomb 37 at the Dalseong Burial Ground, Daegu	Tomb B-16 at the Chodang-dong site, Gangneung	Said to Have Come from Ulsan (Okura Collection)	Musée National des Arts Asiatiques – Guimet Collection
Features						
Material		Gold	Gilt-bronze			
Shape of the Upper Decorative Piece		Bird-shaped gold sheet	unju			
Joining Method	Intersecting sections of the bands forming the dome-shaped decoration	Rivets	Stem located within the unju	Rivets	Unknown	Unknown
	Dome-shaped decoration & bird-shaped ornamental piece					
	Crown headband & dome-shaped decoration	Rivets	Rivets			
	Uprights & crown headband					
	Connecting the crown headband	Detachable (likely use of ties)	Fixed (using rivets)			
Location Where the Dome-shaped Decoration Is Fixed to the Headband	Front	To the right of the vertical uprights with opposite branches	Overlapping with the vertical uprights with opposite branches			
	Side	Between the vertical upright with opposite branches and angled uprights with alternate branches				
	Rear	Right end of the headband	Center			

Table 4. Comparison of Dome-shaped Decorations of Silla Crowns Unearthed on the Korean Peninsula

and although it could not be widely extended when wearing or taking off the crown, the ties could be slightly loosened.

Corrections Applied to Decorative Elements Observed on the Surface of the Gold Crown from the Seobongchong Tomb

Observations on the surface areas featuring the spangle decorations and the curved bead decorations have revealed that, in the case of the gold crown from the Seobongchong Tomb, the curved bead decorations were not attached at the original time of the crown’s manufacture, but were added at a later date, accompanied by the correction of pre-existing decorative elements. This correction of decorative elements is a new fact that was previously unknown.

Comparison of the Holes Used to Attach Curved Beads and Spangles

The surface of the gold crown from the Seobongchong Tomb features pairs of holes which were used to affix ornaments, such as spangles and curved jades. Of these, the pairs of holes used to affix the spangles are small in size, aligned along a vertical axis, and similar in appearance throughout the entire surface of the crown. Compared to this, two different types have been identified for the pairs of holes used to affix the curved

beads. On the crown headband, the holes are aligned along a horizontal axis. However, on the uprights, the holes are aligned along a vertical axis, as in the case of the spangle holes. Of the pairs of holes for the curved beads found on the uprights, an additional hole could be observed in several cases (Fig. 30). This is a characteristic that had not been identified in the case of the holes for the spangles; it is distinctive only to the holes used to attach the curved beads.

Comparison of the Nature of the Repousse, Semi-globular Motifs Where the Curved Beads and Spangles Have Been Attached

The location of the spangles and of the repousse, semi-globular motifs were designated from the onset of the manufacture of the gold crown, and therefore illustrate a common pattern. However, two different patterns can be seen for the location where the curved beads were affixed. The first pattern involves curved beads attached to the flat section of the gold crown. Those located on the crown headband and the branches of the vertical uprights with opposite branches are of this pattern (Figs. 31 and 32). In this case, the holes used to affix the curved bead are aligned along a horizontal axis when found on the headband while they are aligned along a vertical axis when found on the uprights. The second pattern involves curved beads that have been affixed to the indented part of a repousse, semi-globular motif. The ones located on the trunk of the vertical uprights with opposite branches and on the angled uprights with





Ornament	Material	Material Used to Attach the Ornament	Location	Axis of Holes for Attachment	Repousse Semi-globe
Spangle	Gold (19-20K)	Gold wire (thin, 19-20K)	Bird-shaped decorative piece	Vertical	×
			Upright		 (Globe-shaped) 
			Headband		
Curved Bead	Jade, glass	Gold wire (thick, 17K)	Upright (trunk)	Vertical	 (Indented globe-shaped) 
			Upright (branch)		×
			Headband	Horizontal	×

Table 5. Comparison of the Ornament Attachment Methods of the Gold Crown from the Seobongchong Tomb

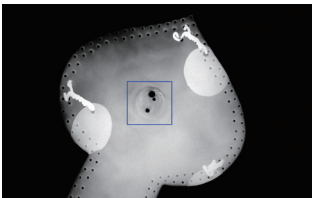


Fig. 30. X-ray image: detail of the hole used to attach the curved bead to the case of the upright

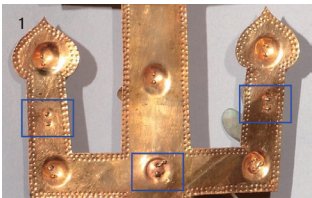
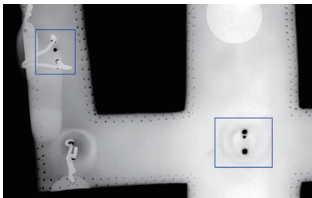


Fig. 32. View of where the curved bead was attached to the crown headband – image of a pressed repousse, semi-globular motif located below a horizontal pair of holes: 1) front 2) rear

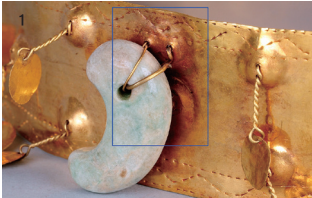


Fig. 31. Location where the curved bead was attached to the symmetrical tree-shaped branch decoration (boxed): 1) rear, 2) bottom side of Fig. 31-1

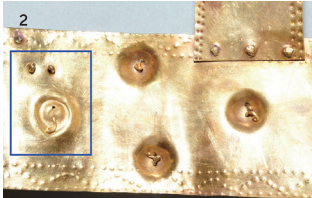


Fig. 33. View of where the curved bead was attached to the crown headband: image of a pressed repousse, semi-globular motif featuring a vertical pair of holes and a horizontal pair of holes located below. 1) prior to the attachment of the curved bead, 2) after the attachment of the curved bead



alternate branches are of this pattern (Fig. 31-2). In this case, the holes used to affix the curved bead are always aligned along a vertical axis. Such indented, repousse, semi-globular motifs can also be observed on the crown headband. In the case of the curved beads attached along the upper edge of the headband, the pre-existing spangles were removed and then the repousse, semi-globular motifs were indented prior to affixing the curved beads (Fig. 32). Out of some of the indented, repousse semi-globular motifs, some feature pairs of holes (vertically aligned) but no ornament (Fig. 33).

Table 5 compares the way in which the spangles and curved beads were affixed among the ornaments adorning the gold crown from the Seobongchong Tomb. The gold wire used to attach the curved beads was thicker but of lesser quality than that used for the spangles. It appears that, in the case of the uprights, the curved beads were affixed using the holes that had already been bored for the spangles. In the case of the headband, when the curved beads were attached to a place where spangles had previously been absent, then holes were newly bored into

the surface. The materials and shapes of the curved beads used to decorate the gold crown are varied, which possibly suggests that items that had previously been used elsewhere were recycled as decorations for the crown.

Comparison of the Ornament Attachment Methods of the Gold Crown from the Seobongchong Tomb and Other Silla Gold Crowns

Based on a comprehensive analysis of the surface morphology around the area where the ornaments were affixed, as well as the method of attachment, it is likely that the basic mode of decoration for the gold crown from the Seobongchong Tomb at the time of its manufacture was the use of repousse semi-globular motifs and the attachment of spangle ornaments. It was only later that some of the spangles were replaced by curved beads. In order to establish if this was a phenomenon distinctive to the gold crown from the Seobongchong Tomb or if it occurred in case of other Silla gold crowns as well, the decorative methods observed for Silla gold crowns were compared. Table 6

Location of Discovery			North Mound, Hwangnamdaechong Tomb		Geumgwanchong Tomb		Seobongchong Tomb		Cheonmachong Tomb		Geumryeongchong Tomb		Gyo-dong	
Photo														
Curved Bead	Material		Jade		Jade		Jade, Glass		Jade		None (only spangles)			
	Location	Upright	End buds, intersection, bending	With a repousse semi-globular motif	End buds, intersection	With a repousse, semi-globular motif	[Opposite branches] End buds (large), intersection; [Alternate branches] End buds, middle of stem	With a repousse, semi-globular motif	[Opposite branches] End buds (large), middle of stem [Alternate branches] End buds (large)	With a repousse semi-globular motif				
							Middle of branch	Without a repousse, semi-globular motif	[Opposite branches] Middle of branch [Alternate branches] Intersection	Without a repousse, semi-globular motif				
	Headband		Middle		Middle		Upper edge		Upper edge					
	Hole type	Upright decoration	Vertically aligned				Vertically aligned		Horizontally aligned (See Note 2)					
		Headband					Horizontally aligned							
Pattern	Upright decoration		Repousse, dotted pattern (one line), repousse, semi-globular motif				Repousse, dotted pattern (two lines), repousse, semi-globular motif				Repousse, semi-globular motif			
	Headband		Continuous indented wedge lines, wave patterns, circle patterns, repousse, semi-globular motif		Continuous indented wedge lines, wave patterns, repousse, semi-globular motif		Continuous indented wedge lines, wave patterns, repousse, semi-globular motif		Continuous indented wedge lines, wave patterns, circle patterns, repousse, semi-globular motif		Repousse, dotted pattern (two lines), repousse, semi-globular motif		None	
Notes							1) Dome-shaped decoration comprised of two crossed bands and featuring a bird-shaped ornamental piece on top 2) If featuring a repousse, semi-globular motif beneath the attached curved bead, the top of the globe was indented slightly, and then the bead was affixed		1) Correction of semi-globular motif at area where curved bead was later attached (similar to the example of the Seobongchong Tomb gold crown) 2) An unused pair of vertically aligned holes located below a horizontally aligned pair of holes used to affix curved bead (in the upright decoration section)		Side extensions of the angled uprights with alternate branches manufactured separately and then attached using rivets		Large leaf-shaped spangles affixed to repousse semi-globular motif	

Table 6. Comparison of Decorative Techniques of Silla Gold Crowns Unearthed on the Korean Peninsula

presents the characteristic elements of the decorative techniques observed from six Silla gold crowns that were unearthed at sites within the peninsula, which have been examined in order to identify the relationships that may exist between them.

Interestingly enough, the results of the comparison of the decorative methods applied to the six Silla gold crowns unearthed from the Korean Peninsula reveal that the crown from the Cheonmachong Tomb was also subjected to decoration corrections. In the case of the gold crown from the Cheonmachong Tomb, as in the case of the gold crown from the Seobongchong Tomb, when curved beads were attached to positions featuring repousse semi-globes, the repousse, semi-globes were also flattened prior to the curved beads being attached. In addition, a characteristic feature of the Cheonmachong Tomb gold crown is that, even though the repousse half-globes already featured holes aligned along a vertical axis, they were left unused and additional holes were bored along a horizontal axis in order to attach the curved beads (Fig. 34). Similar correction work has also been observed for the curved beads adorning the branches of the symmetrical tree-shaped upright decorations of the gold crown from the Cheonmachong Tomb. As in the case of the gold crown from the Seobongchong Tomb, the curved beads of this section were attached to a flat surface. However, instead of using the pre-existing vertically aligned holes, horizontally aligned holes were newly bored in order to attach the curved beads. This makes it possible to infer the removal of a pre-existing ornament (Fig. 34). In addition to this, other similar characteristics have been observed between the gold crowns from the Cheonmachong Tomb and Seobongchong Tomb.

Conclusion

The morphological damage that occurred to the gold crown from the Seobongchong Tomb was repaired and several curved beads that had fallen off were affixed back to their original spots through conservation treatment. Because the artifact undergoing conservation treatment experienced instability in the areas where it was joined, an epoxy panel with a woven fiberglass core was used as reinforcing material for the joining areas, thereby enhancing the overall stability of the gold crown during storage and display. In addition, conservation treatment was undertaken in a way that the dome-shaped internal decoration

structure of the crown could be detached from the outer headband and supported by a frame. This was done in order to increase ease of handling and decrease danger of inflicting damage when managing, displaying, or studying the artifact. Pre-existing materials were newly used according to the artifact's characteristics and state of conservation, and new techniques and approaches were applied, taking into consideration the stability of the artifact and issues in regard to terms of management. This can be summarized as the key outcome of the conservation treatment of the gold crown from the Seobongchong Tomb. The various methods of cleaning, joining, and reinforcing artifacts of cultural heritage according to different situations will continue to be the subject of study in the future. Furthermore, explorations of conservation techniques that will ensure the effective and stable treatment of artifacts of cultural heritage with as little damage as possible will continue to take place.

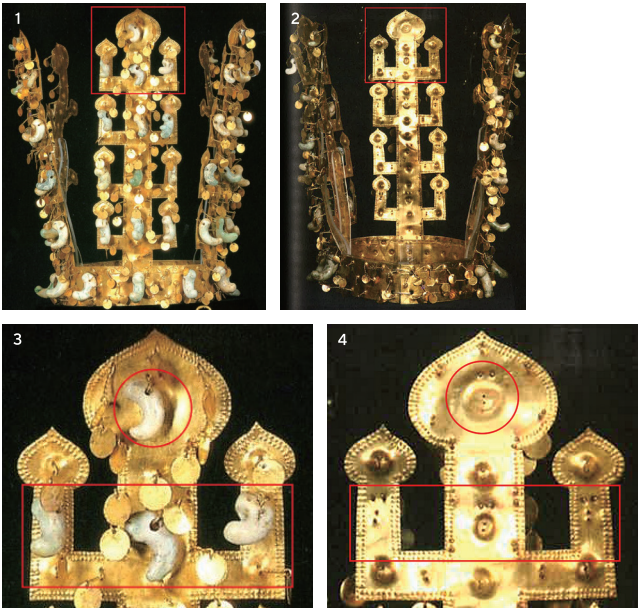


Fig. 34. Section of the gold crown from the Cheonmachong Tomb decorated with curved beads: 1) front, 2) rear, 3) detail of front, 4) detail of rear

In addition, it was possible to newly identify various traces associated with the crown's manufacture during the course of the conservation treatment process, as well as establish how corrections were later applied to attach the curved beads to the gold crown. At the time of its manufacture, the gold spangles were the basic form of decoration of the gold crown from the Seobongchong Tomb. At a later date, some of the spangles adorning the uprights of the gold crown were replaced by curved beads, and curved beads were also affixed to the crown's headband. Comparative analysis was undertaken on a total of six Silla crowns unearthed on the Korean Peninsula in order to establish if the above-mentioned phenomena could be observed

in the case of other gold crowns. Parallel correction traces, along with other similarities, could be observed for the gold crown from the Cheonmachong Tomb. It is hoped that future interdisciplinary research may shed light on the meanings behind such actions as correcting the decorations and then adding curved beads to the gold crowns from the Seobongchong Tomb and Cheonmachong Tomb, as well as illuminate what the potential relationship was between the common procedures observed on both gold crowns.

Translated by Ko Ilhong

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