Owner: Princeton University Art Museum (PUAM)
Object Number: 2019-288
Artist/Maker: Unrecorded maker, Goryeo dynasty (918-1392), Korea
Object: Bowl
Date: 13th - 14th century
Medium: Stoneware with white and black inlays under celadon glaze
Dimensions: h. 6.9 × diam. 19.75 cm (2 11/16 × 7 3/5 in.)

Inscriptions: "壬申," in center interior base.

Provenance: 1990 Dr. Robert and Bernice Dickes (New York), by gift to Richard and Ruth Dickes (Morristown, NJ), 1990. 1990–2019 Richard and Ruth Dickes (Morristown, NJ), by gift to the Princeton University Art Museum, 2019.

Examiner: Daisy Diamond (Objects Conservation Summer Intern, PUAM; Graduate Fellow, Winterthur/University of Delaware Program in Art Conservation (WUDPAC), Class of 2026)

Consulted: Elena Torok (Associate Objects Conservator, PUAM)
Jeff Evans (Manager of Visual Resources/Photographer, PUAM)
Zoe Kwok (Nancy and Peter Lee Curator of Asian Art, PUAM)
Kit Brooks (Curator of Asian Art, PUAM)

Proposal Date: June 10th, 2024

Description

This object is a circular shallow bowl decorated with a celadon glaze over white and black ceramic inlay. This object was likely manufactured on a potter's wheel, as indicated by the circular form and subtle undulations on the walls consistent with hand-throwing. The bowl is composed of a gray-tan stoneware with small black inclusions and body, body-glaze, and glaze layers visible in the break edges. The glaze surface is generally smooth with varied opacity, color, and crazing dependent on the thickness of the glaze. The shallow foot ring and bottom are also glazed with the exception of three spur marks.

The interior pale blue-green and navy designs feature from the center outwards: an inscription of the cyclical date *Imsin* (壬申; 1272 or 1332), two thin circular bands, sixteen semi-triangular motifs, four equidistant phoenixes

surrounded by a repeating geometric design, and a band with linear design elements near the rim (fig. 1).[1] The exterior wall features from base to rim: a row of acute angles framed by bands, four equidistant floral motifs with curvilinear designs in between, and a row of hatched lines (fig. 2).[2]

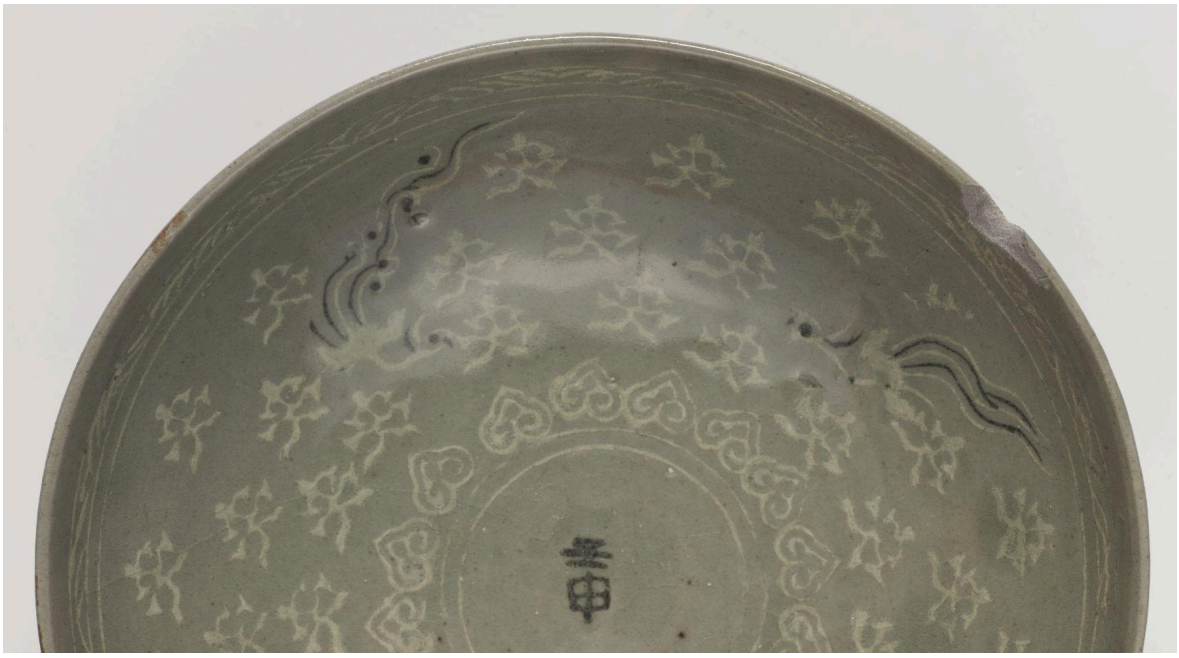

Figure 1. Interior wall design with central inscription of the cyclical date “Imsin” (壬申; 1272 or 1332).

Figure 3. Exterior wall design.

[1] Image courtesy Jeff Evans, June 2024.
[2] Image courtesy Jeff Evans, June 2024.

Historical Context

This celadon glaze bowl is an example of ceramics made during the later years of the Goryeo (Koryŏ) Dynasty (918-1392) in Korea. The Goryeo Dynasty was a period of political stability, religious influence (Buddhism), and significant advancements in art. The extravagant lifestyle of the aristocracy stimulated artistic growth, including the renowned Goryeo celadon ceramics (Encyclopaedia Britannica 2024). Goryeo celadon ceramics emerged from the high-fired gray stoneware of the preceding Unified Silla Dynasty (676-935) alongside celadon glazes and kiln technology adapted from China (Lee 2003). The celadon, or "greenware," glaze is a green-blue color created by firing an iron-containing clay with a glaze containing iron oxide, manganese oxide, and quartz particles at a high temperature in a reducing kiln environment. Vessels with dark brown or black incised designs are likely due to iron oxide and firing conditions in the kiln (Lee 2003, Princeton University Asian Art Collection). Experimentation and innovation resulted in varied glaze colors, compositions, and firing approaches (National Museum of Asian Art 2011).

The process of inlay used for this bowl, known as *sanggam*, involved carving, stamping, or incising designs on the unbaked clay body, and then filling the cavity with black and white slip, which could then be sanded flush (National Museum of Asian Art 2011). A celadon glaze would then be applied over the patterns, and the vessel fired. This ceramics technique is believed to be adopted from metal and lacquer inlay. Korean *sanggam* celadon stoneware appeared during the reign of King Uijong (1147-1170) with the earliest known work containing scrolling floral designs excavated from the tomb of Mun Kong-yu dated to 1159. *Sanggam was* actively used until the end of the Goryeo dynasty (Princeton University Asian Art Collection). Bowls made with the *sanggam* technique were often used by the court and nobility for tableware or ritual vessels. *Sanggam* motifs included phoenixes, cranes, clouds, ducks, lotuses, floral elements and willows that "appear to float within a limpid green glaze" (figs. 4-7).

Poets and speakers at banquets often described "floating images" and "cranes taking flight" in these bowls (National Museum of Asian Art 2011). Scholar Dr. Pamela Vandiver, professor of materials science and engineering at the University of Arizona, described the "optical effect of the image floating above the surface of the pot as due to the increased reflection and local brightening from the internal surfaces of the cracks." This optical effect is attributed to the bending and scattering of light as it encounters quartz particles, bubbles, and micron–size crystals (fig. 3). Additionally, light is also reflected deeper within the glaze at the glaze-body interface (Karasu, Andaş, and Ak 2019).

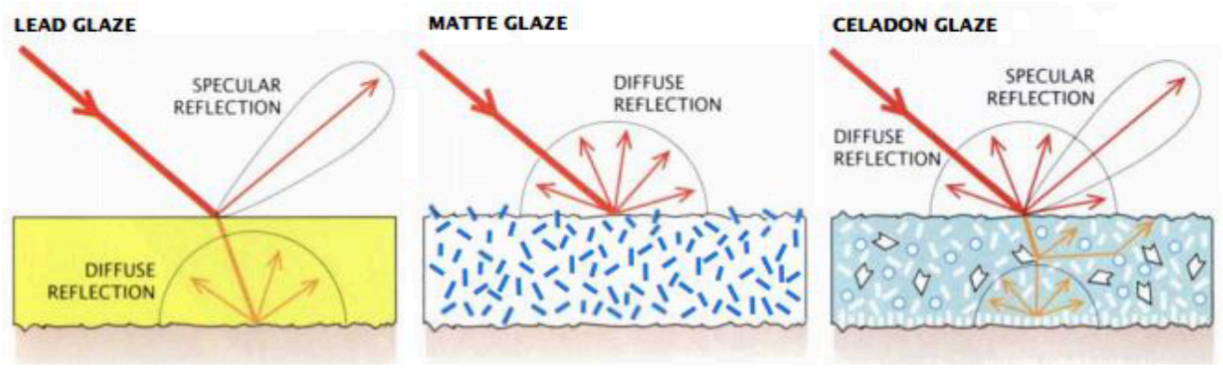

Figure 3. Optical interactions between light and different glazes. Lead glazes (left) are highly transparent, matte glazes (center) scatter light from crystalline protrusions, and celadon glazes (right) have both transparent and matte qualities. Image courtesy Karasu et al. 2019.

Figure 4. Bowl (12th–13th century). Goryeo dynasty (918–1392), Korea. Ceramic with inlaid decoration under celadon glaze. Image courtesy Princeton University Art Museum (y1966-57).

Figure 5. Bowl (12th–13th century). Goryeo dynasty (918–1392), Korea. Stoneware with inlaid designs. Image courtesy Minneapolis Institute of Art (31.51.2).

Figure 6. Bowl with design of phoenixes and peonies (1300-1350). Goryeo dynasty (918–1392), Korea. Stoneware with white and black inlays under a celadon glaze. Image courtesy Smithsonian National Museum of Asian Art (F1909.322).

Figure 7. Celadon Bowl with Inlaid Willow, Reed, Water, Animal Design, and Inscription of "Gisa (己巳)" (1389). Goryeo dynasty (918–1392), Korea. Stoneware, thrown, with inlaid decoration under celadon glaze. Image courtesy V&A (C.578-1918).

The original use of this bowl is unknown, but it likely contained foodstuff and was excavated from a burial environment (consultation with Zoe Kwok, Nancy and Peter Lee Curator of Asian Art at PUAM, and Kit Brooks, Curator of Asian Art at PUAM; July 2024).

Condition

This bowl is structurally stable and in fair aesthetic condition due to a small loss on the rim. This loss occurred before the object entered PUAM's collection. Aside from the aforementioned loss, the bowl is in good condition. Variable gloss, brown surface marks, and stable glaze crazing are present and consistent with the natural aging of this object (fig. 8).[3]

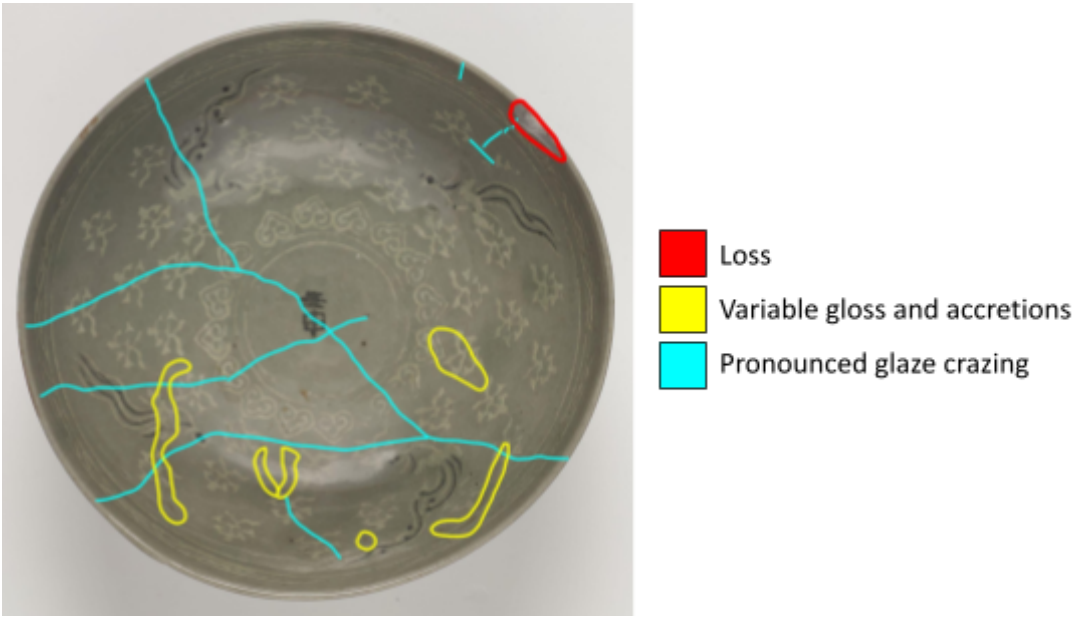

Figure 8. Condition diagram.

The 1 x 2 ⅛ cm loss (fig. 9)[4] is associated with nine fragments: six larger fragments range from ⅖ to 1 ⅖ cm with identifiable original locations within the loss, and three smaller fragments below < ⅖ cm are not able to be returned to their original locations (fig. 10).[5] These fragments do not constitute the entirety of the loss. A dry fit of the fragments was completed to determine the order of assembly and ensure no fragments are locked out.

Figure 9. Loss on the rim.

[3] Image courtesy Jeff Evans, June 2024.
[4] Documented with an iPhone 15 ISO 160, f1.6, 1/60s, June 2024 through the eyepiece of a Leica M80 Stereomicroscope.
[5] Documented with an iPhone 15 ISO 32, f1.6, 1/120s, June 2024.

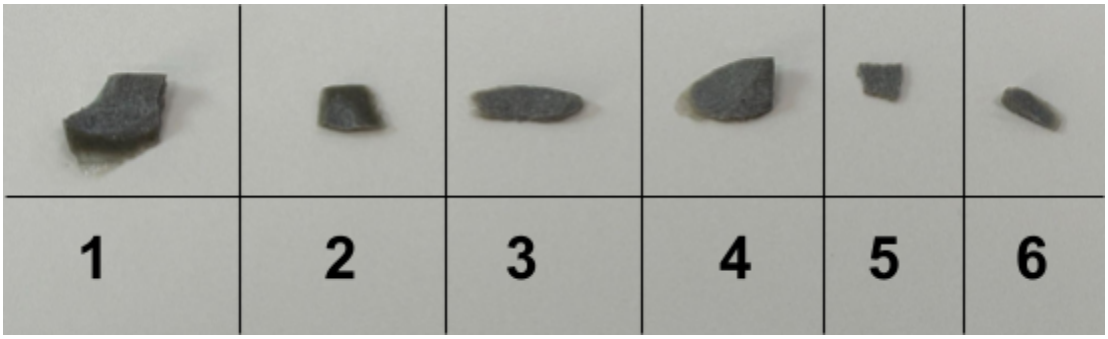

Figure 10. Six larger fragments and reassembly order. Three smaller fragments not pictured.

The variable gloss and a brown surface accretion is potentially related to glass weathering of the glaze, use of the object, or soiling from non-historical contexts (fig. 11).[6]

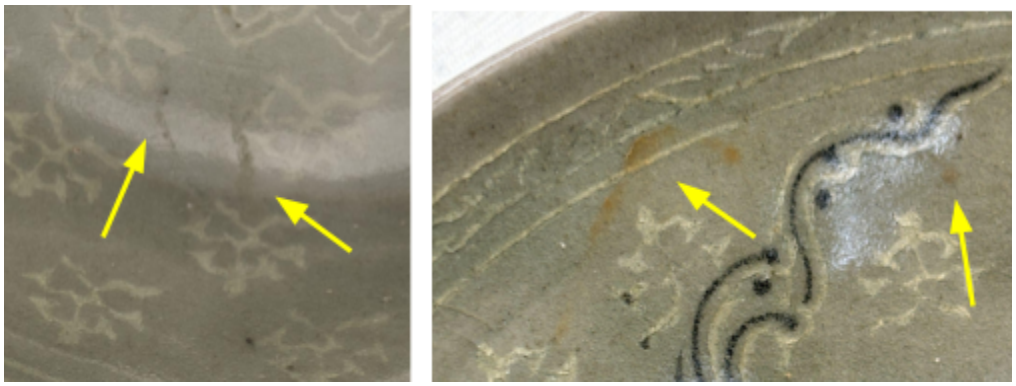

Figure 11. Variation in gloss (left) and brown surface accretion (right) on the glaze layer.

Several characteristics can be attributed to the historical context of the object rather than damage, including: stable crazing within the glaze from differing rates of expansion and contraction (fig. 12),[7] glaze loss along the rim from use or thinner application, and fabrication marks on the underside of the bowl from kiln furniture.

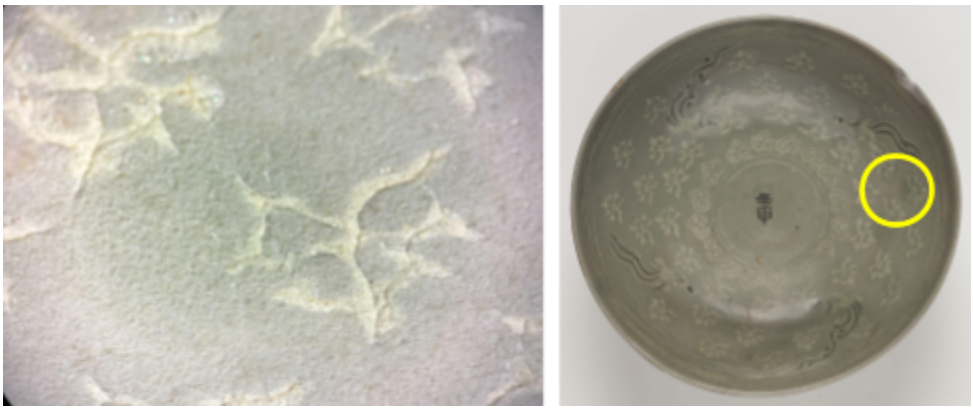

Figure 12. Micrograph of glaze crazing (L) with reference image (R).

[6] Left image courtesy Jeff Evans, June 2024. Right image documented with an iPhone 15 ISO 40, f1.6, 1/120s, June 2024.
[7] Left image documented with an iPhone 15 through the eyepiece of a Leica M80 Stereomicroscope. Reference image at right courtesy Jeff Evans, June 2024.

Purpose of Treatment

The purpose of this treatment is to re-establish aesthetic integrity by re-assembling extant fragments to their original locations.

Treatment Proposal

1. Complete before treatment photo documentation (est. 0.5 hour).
2. Dry surface clean with a cosmetic sponge (est. 0.25 hours).
3. Solvent clean to reduce surface grime and potential non-original surface accretions (est. 0.25 hours).
4. Reassemble the largest six fragments with adhesive based on the established order. Dry clean. Consolidate break edge with a thin B-72 solution then join fragments piece-by-piece with a thick B-72 adhesive. Clear remaining adhesive with scalpel or acetone, if needed (est. 2.5 hours).
5. Fill gaps with a reversible material (est. 1 hour).
6. Inpaint the fill (est. 2 hours).
7. Reduce surface accretions, if deemed necessary following testing and curatorial consultation (est. 1 hour).
8. Complete AT photo documentation and treatment report (est. 1 hour).

Estimated treatment time: 8.5 hours

Treatment Summary

1. Completed before treatment photo documentation (0.5 hours).
2. Dry surface cleaned with a cosmetic sponge (0.25 hours).
3. Cleaned the interior and exterior of the bowl with 1:1 ethanol:deionized water to reduce remaining greases and soiling (0.25 hours).
4. Reassembled the six fragments. Dry cleaned fragments with a small soft-bristled brush. Consolidated break edge with a thin Paraloid B-72 solution (5% w/v in acetone). Joined fragments piece-by-piece with a thick Paraloid B-72 adhesive (~40-50% w/v in acetone) based on the established order (fig. 10). Remaining fragments that were not reassembled are saved in a small bag for potential future reference (2.5 hours).
5. Filled gaps with Flügger (acrylic spackle composed of butyl methacrylate and calcium carbonate). Shaped fills with a microspatula and scalpel (1.5 hours).
6. Inpainted with Golden Fluid and Golden Heavy Body Acrylics diluted with Acrysol WS-24 gloss medium and deionized water to match the color and reflectivity of the glaze. The extent of inpainting was determined during curatorial consultation with Zoe Kwok and Kit Brooks (see “Treatment Justification,” 3 hours).
7. At this time, surface accretions were not reduced (see “Treatment Justification,” 0.5 hours).
8. Completed AT photo documentation and treatment report (0.5 hours).

Total treatment time: 9 hours

Treatment Justification

This treatment was successful and followed the proposed procedure. Consultation with Zoe Kwok and Kit Brooks established the inpainting approach to prioritize guiding the viewer's eye to the object rather than to the damage, while still allowing modern restorations to be distinguished from the original object. The appropriateness of reducing the surface accretion was evaluated after solubility testing; stereomicroscopy; as well as consultation with Elena Torok, Zoe Kwok, and Kit Brooks. Initial tests in polar solutions (deionized water, ethanol, and acetone) were unsuccessful, which would have indicated some kind of loosely attached organic matter more likely to be non-historical. Upon further investigation with stereomicroscopy, it was determined that the brown surface material is likely embedded in the glaze layer, and consistent with smaller areas of glaze variation. In consultation with Elena, Kit, and Zoe following this surface examination, it was agreed upon that the variation in gloss and dark brown surface accretions are likely related to fabrication or the archaeological history of the object, rather than from its time in a private collection. Collectively, it was determined that the surface accretions did not require active intervention and further tests and reduction were not pursued at this time.

Before Treatment Photo Documentation

Images captured with a Phase One IQ4 280 by Jeff Evans on June 14th, 2024 (figs. 13-16). All metadata is included in TIFF files in PUAM image records.

Figure 13. Before treatment, ½ view of interior and exterior.

Figure 14. Before treatment, ½ view of interior and exterior.

Figure 15. Before treatment, overall interior.

Figure 16. Before treatment, overall exterior and underside.

After Treatment Photo Documentation

Images captured with a Phase One IQ4 280 by Jeff Evans on July 23rd, 2024 (figs. 17-20). All metadata is included in TIFF files in PUAM image records.

Figure 17. After treatment, ½ view of interior and exterior.

Figure 18. After treatment, ½ view of interior and exterior.

Bibliography

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Lee, Soyoung. "Goryeo Celadon." *The Met's Heilbrunn Timeline of Art History: Essays*, The Metropolitan Museum of Art, Oct. 2003, www.metmuseum.org/toah/hd/cela/hd_cela.htm.