

The excavation of the mirror-casting workshop site of the Qin and Han Dynasties at the Linzi City Site of the Qi State in Shandong

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Abstract

In 2012 and 2013, the Institute of Archaeology, Chinese Academy of Social Sciences, Shandong Provincial Institute of Cultural Relics and Archaeology and Bureau of Cultural Relics, Linzi District conducted excavation to the remains of a mirror-casting workshop located to the south of Kanjiazhai Village within the large city of the Linzi City Site of the Qi State in Zibo City, Shandong. The recovered remains included casting pits, house foundations, wells, ash pits, kilns, paths and infant burials, the dates of which were mostly the Warring-States Period through the Qin and Han Dynasties; the ones related to the mirror-casting were casting pits, house foundations, wells and some ash pits. The pottery molds unearthed in the excavation were the face molds and back molds of mirrors. The stratigraphy, spatial structure and accumulation status as well as the large amount of mirror molds unearthed from the site all reflected that this site was a mirror-casting workshop site. The stratigraphic relationships and the unearthed artifacts showed that the date of this workshop was the Western Han Dynasty. The excavation of this mirror-casting workshop site provided valuable materials for the development of the relevant researches and can be seen as a great breakthrough of the researches on the bronze mirror-casting industry and technique of the Qin and Han Dynasties even the entire ancient China.

Keywords: Bronze mirrors—China—to 618; Linzi City Site of the Qi State (Zibo City, Shandong); molds (shaping tools); Western Han Dynasty; workshops (work spaces)

Outline of the site

The Linzi City Site of the Qi State in Shandong was the capital of the Qi State in the Western and Eastern Zhou Periods, the Linzi Commandery capital in the Qin Dynasty and the capital of the Qi Commandery and Qi Feudatory Kingdom in the Western Han Dynasty. During the Warring-States Period and the Qin and Han Dynasties, the industry and commerce of Linzi were highly flourishing, which made the city a great metropolis in the

then East. Since 1950s, quantities of handicraft remains, including those of metal smelting and casting, have been discovered in the ruined Qi Linzi City, which has drawn broad attention in the academic circles. To promote the scientific researches on bronze smelting and casting and iron industry in the Warring-States Period and the Qin and Han Dynasties, to deepen archaeological excavation and study of metallurgical remains in this ancient city, and to provide academic support for the protection of the Linzi City Site of the Qi State as a large-scale site, since 2011, the Institute of Archaeology, CASS and the Shandong Provincial Institute of Cultural Relics and Archaeology, in cooperation with the Bureau of Cultural Relics of Linzi District, Zibo City, carried out subject archaeological investigation, coring test and excavation, which obtained important data. Among them an outstanding accomplishment is the excavation and clearance of the bronze mirror-casting site to the south of Kanjiazhai Village within the large outer city of the Linzi City Site of the Qi State in the autumn of 2012 and the spring of 2013, which is to date the first discovery of this type in metallurgical archaeology both at home and abroad, and has extremely important academic values.

Stratigraphy

This mirror-casting workshop site is located a little to the east of the center of the large outer city in the Linzi City Site of the Qi State, lying at the juncture of the southern Kanjiazhai and Liujiiazhai Villages, at the geographical coordinates of long. 118° 21'44" E by lat. 36° 52'22" N (Figure 1). Presently the site has been occupied by farmland with a flat terrain. The excavation covered an area of 276.5sq m (Figures 2 and 3).

The stratigraphical condition can be represented by the excavation grid T3796.

The first layer: cultivated soil, 0.2–0.35m thick.

The second layer: grayish-brown soil, relatively spongy, 0.25–0.5m thick. It contains potsherds, tile and brick debris, burnt clods, charcoal dust, etc. It was formed after the Han Dynasty.

The third layer: grayish-brown soil, relatively dense, 0.3–0.7m thick. It contains potsherds, burnt clods, charcoal dust, brick debris, etc. This is a cultural layer of the Han Dynasty. Beneath it are ash pits of the Qin-Han period and rammed-earth remains of still earlier periods (Figure 4).

The rammed-earth layer measures above 2.5m in maximum thickness. It can be divided into a dozen of ramming courses, which are varied in thickness and shape.

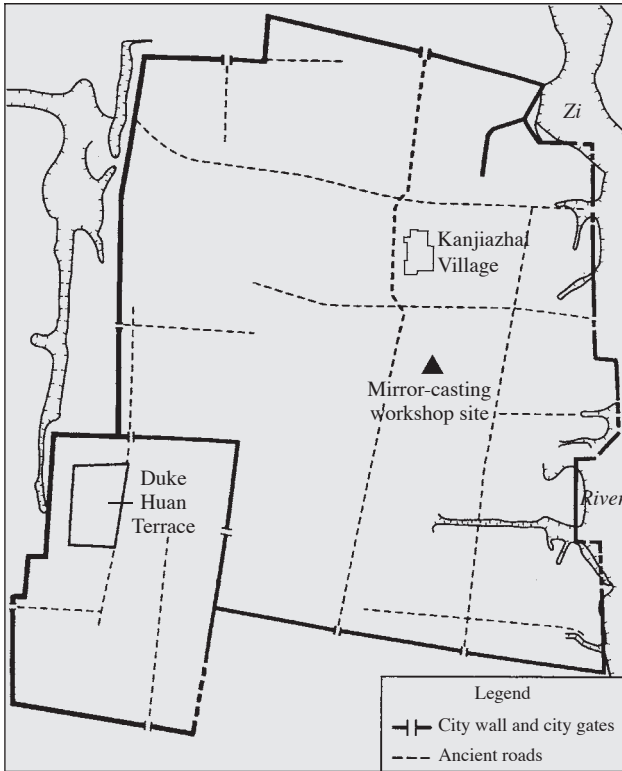


Figure 1 The plan of the Linzi City Site of the Qi State and the location of the mirror-casting workshop site.

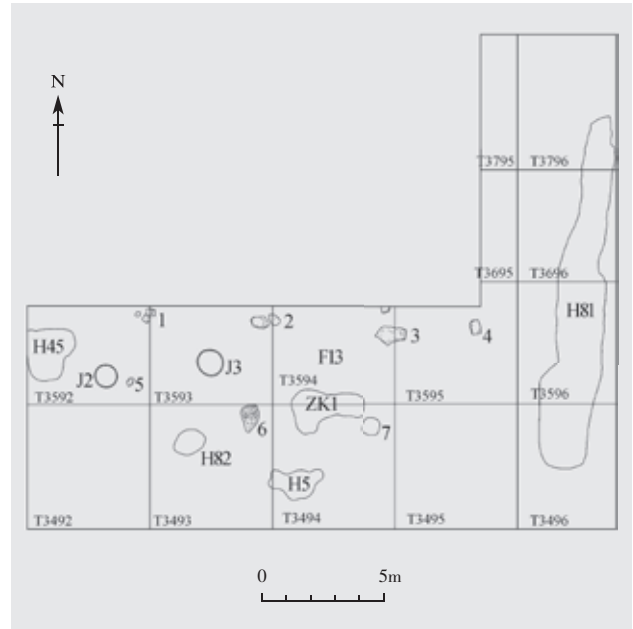


Figure 2 The arrangement of the excavation grids and the revealed vestiges.

1-5. Stone post bases of house foundation F13; 6 and 7. Post base pits of house foundation F13.



Figure 3 The excavated area of the mirror-casting workshop site (SE-NW).

It may have been a patch of building foundations, which is unknown in form and exact date owing to the limitation of the excavated area. Beneath the rammed earth is a yellow pure sandy deposit layer related to a river.

Vestiges

The excavation revealed quite rich vestiges, among which

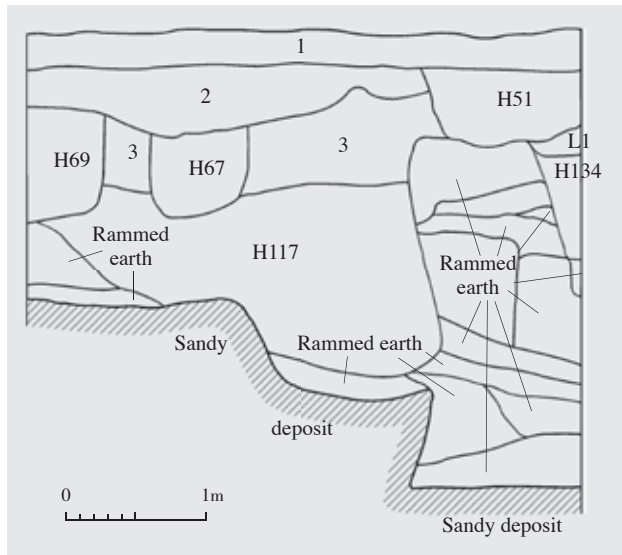


Figure 4 The elevation of the north wall of excavation grid T3796.

1. Cultivated soil; 2. Grayish-brown soil; 3. Grayish-brown soil.

the main types related to the mirror-casting workshop are the casting pit, house foundation, well, ash pit, etc.

1. The casting pit, one unit (ZK1). It is situated in the excavation grids T3494 and T3594, has an irregular plan and an east-west sloping bottom, and measures 3m in length, 0.9–1.8m in width and about 0.3m in depth. In the pit is relatively spongy grayish-black soil, which contains a small quantity of red burnt clods, charcoal dust, potsherds, tile debris, bronze and iron slag, mirror molds and so on. A spot was discovered to have a pile of bronze slag accumulations. In the center a little to the east, there is a roughly oval sand pit, which measures 0.42m long, 0.25m wide and about 0.2m deep, and contains grayish-yellow sand. On the southern side of the sand pit, some red burnt earth was discovered to be uneven in distribution and thickness; it covers an area a little larger than that of the sand pit. At the northern wall of the casting pit, a spot of greenish-gray soil seems to be traces of metal pollution. On the southern side of the pit mouth, the floor has been severely damaged, while the northern side has become rather flat and firm owing to treading for a long period of time and bears sparse sand grains (Figures 5 and 6).

2. The wells, two units (J2 and J3). They are situated in excavation grids T3592 and T3593 respectively. Their walls are built of gray pottery curbs. J3 is larger than J2 in both mouth diameter and depth and more complex in structure.

In well J3, the mouth is wider than the bottom, but has been damaged. The remaining cylindrical wall is disturbed by a pit, which has a depth of about 0.8m from the original ground, while the remaining well body measures 7.8m in depth, so the original well would have had a depth of about 8.6m. The outer walls of the pottery well curbs are roughly vertical while the inner ones

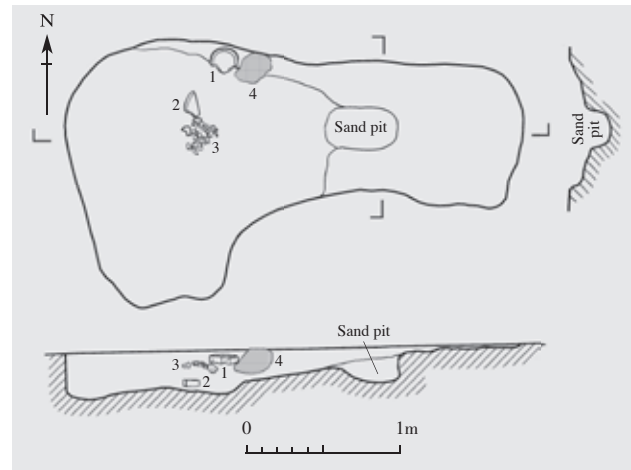


Figure 5 The plan and sections of casting pit ZK1.

1 and 2. Mirror molds; 3. Bronze slag accumulation; 4. Greenish-gray soil.

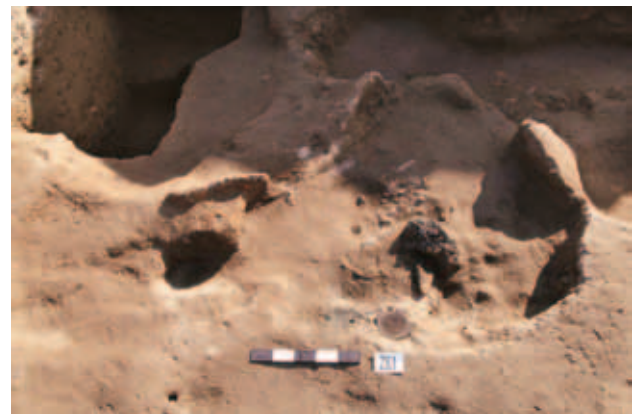


Figure 6 Casting pit ZK1 (N-S).

slightly sloping, and the thicknesses are varying from the upper part to the lower one. Presently there remain 29 wall curbs in three groups, which differ in size, decoration and building manner. The first group consists of 19 curbs; each measuring about 1.14m in outer diameter, 20.5–26cm in height and 2–4cm in thickness. Their outer walls are decorated with cord marks, while the inner walls bear three courses of concentric circles each. These curbs are built up with the thicker mouth upward. Between the 10th and the 11th layers of curbs are two courses of livid-gray bricks laid in stretcher bond. The second group consists of seven curbs, each of which measures about 1.03m in outer diameter, 23.5–27cm in height and 2–3cm in thickness. The decoration of the outer wall is indiscernible; the inner wall is adorned with concentric circles. In building manner, they are piled up with the thicker mouth upward and downward alternately. The third group consists of three curbs, each measuring about 84cm in outer diameter, 26.5–29cm in height and 2–4cm in thickness. The outer wall is decorated with cord marks; the inner one, with concentric circles. They were piled up a little carelessly

in comparison with those in the above two groups but the same as the first group in building manner (Figure 7). The earth fill in Well J3 comprises two layers. The upper layer embraces the accumulations from the remaining well top down to the depth of 6.8m. It is grayish-brown spongy earth and contains a large amount of tile and brick debris, burnt clods, charcoal dust, stones, etc. The lower layer is formed of spongy grayish- and yellowish-brown earth mixed with coarse sand, and contains a lot of tile debris, burnt clods, charcoal dust, rotten wood, iron slug, shells and so on. The unearthed artifacts include pottery, bronzes, iron ware, jades and mirror molds, which are yielded from the well bottom and the lower earth fill for the overwhelming majority.

3. House foundations. There have been discovered quantities of rammed-earth remains, floors, stone post-bases and other vestiges and objects related to house building. Nevertheless their detailed conditions could not be clarified owing to serious damage and the limitation of the excavated area.

House foundation F13 is located in excavation grid T3594 (see Figure 2). Only a part of floor and stone post bases remain in situ. Judged by the condition and distribution of these post bases, the house foundation measures about 14m in length from east to west and about 5m in width from north to south; the northern part was not revealed by the excavation. Seven post bases were discovered. They are arranged in two east-to-west rows, four in the northern row and three in the southern one, each roughly pairing with the opposite one. The northern post bases and the westernmost one of the southern row are stones laid on the ground. They are livid-gray or grayish-white in color and largely irregular in shape, some being bedded or surrounded with fine sand. In the southern row, the eastern two posts have no stone bases, which were replaced with rammed earth bases in correspondingly dug pits, and the western post pit was reinforced with a layer of pebbles in the upper part. As these post bases are made simply and rowed somewhat carelessly, F13 may have been a work-shed or another simple building.

4. Ash pits were discovered quite a lot. Below will be a description of three units (H5, 45 and 81).

H5 is located in excavation grids T3493 and T3494, to the south of casting pit ZK1. It is irregular in shape, looks like a pocket and has a slight convex at the center of the bottom. The mouth is 2.2m long and 1.18m wide; the depth is 1.12m (Figure 8). In the pit is spongy grayish-black soil, which is mixed with adhesive reddish-brown earth in its lower part. The contents include an amount of tile and brick debris, potsherds, stones, burnt clods, charcoal dust, iron slug and some animal bones, as well as fragments of pottery molds, furnace wall and tuyeres. Among the pottery molds are a number of mirror molds.

H45 is situated in the excavation grid T3592, close to the western side of well J2. Its northwestern corner lies beyond the excavated area. This is an irregular-shape pit with a sloping wall and a roughly flat bottom, which is slightly

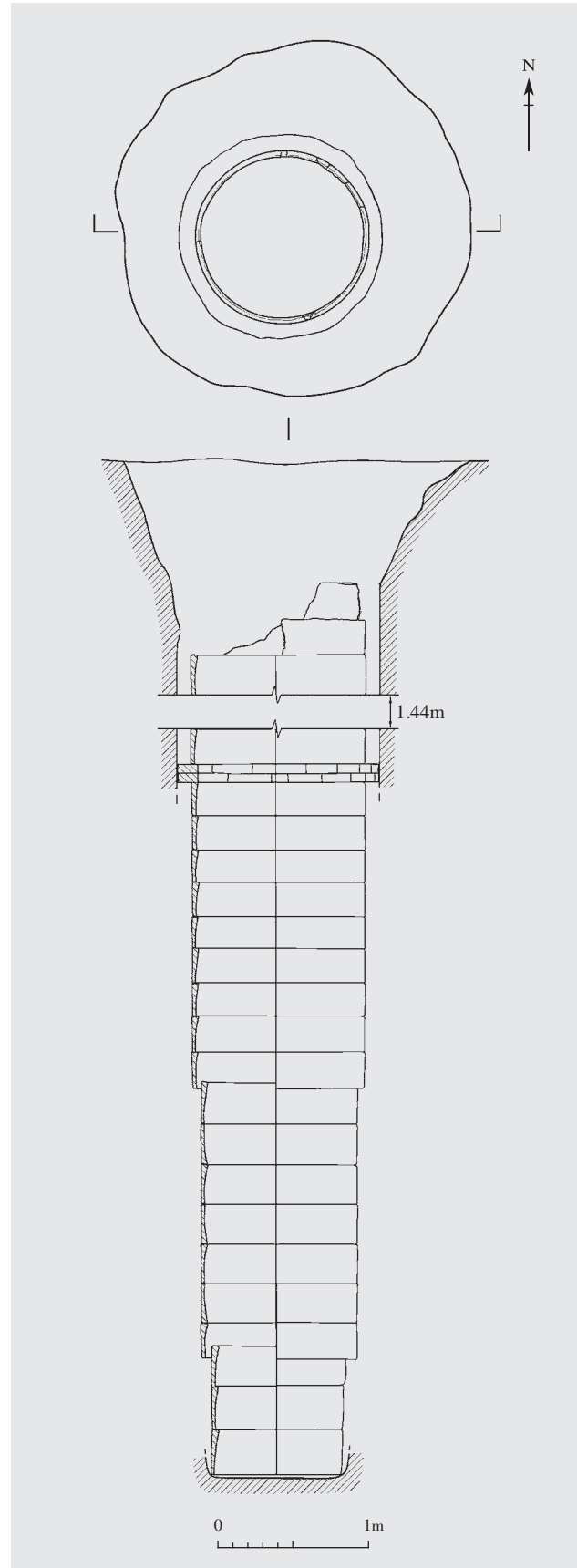


Figure 7 The plan and section of well J3.

higher in the north. The length measures 2m, the width 1.92m for the excavated part, and the depth about 0.56m (Figure 9). In the pit is relatively spongy grayish-brown soil, which contains a small amount of tile and brick debris, potsherds, burnt clods and charcoal dust. In the middle of the bottom, excavators revealed a yellow earthen ridge, which is fine in texture and measures about 1m in length, roughly 0.38m in width and approximately 0.1m in height. In the southwest and west of the bottom, there remain two small-sized heaps, either of which is formed of extremely pure white sand-like earth. The artifacts unearthed from the pit include the mirror molds, iron ware, tile-ends, fragments of tuyere or furnace wall, ox horn, etc.

H81 lies in the east of the excavated area, spanning T3496 and other three excavation grids and being superimposed by the road L1 and intruded by a child burial. It has a

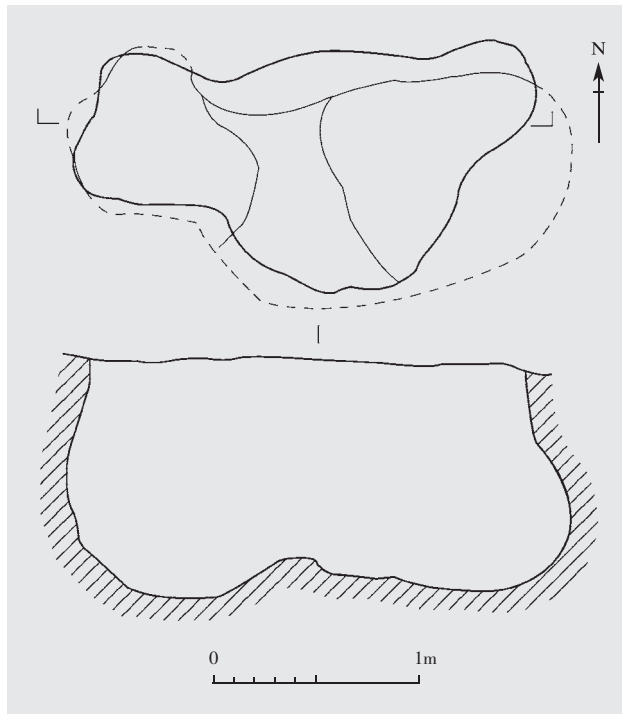


Figure 8 The plan and section of ash pit H5.

long narrow plan, with the major axis basically pointing to the north and south but the northern section slightly slanting to the east. The bottom is uneven and narrower than the mouth. The opening measures 15.2m in length and 1–2.34m in width, and the bottom 0.5m in depth. On the walls were discovered 14 round holes, i.e. 11 on the western wall and three on the eastern one, which are arranged in two vertical rows, mouth generally sloping downward, leftward or rightward. These holes are roughly the same in size, measuring about 0.1m in diameter and 0.2–0.5m in depth. They contain black earth, maybe traces of wooden rods (Figures 10 and 11). The contents in the northern part of the pit are relatively simple, including spongy black soil, as well as plant ash, charcoal dust and burnt clods. The southern section is more complex, containing spongy grayish-brown soil, tile and brick debris, potsherds and some animal bones. The unearthed artifacts from the ash pit are mainly pottery, iron ware, stone implements, bronze coins and bone implements, as well as mirror molds and some stone molds for casting elm-pod coins. They were largely yielded from the southern section of the pit.



Figure 9 Ash pit H45 (S–N).

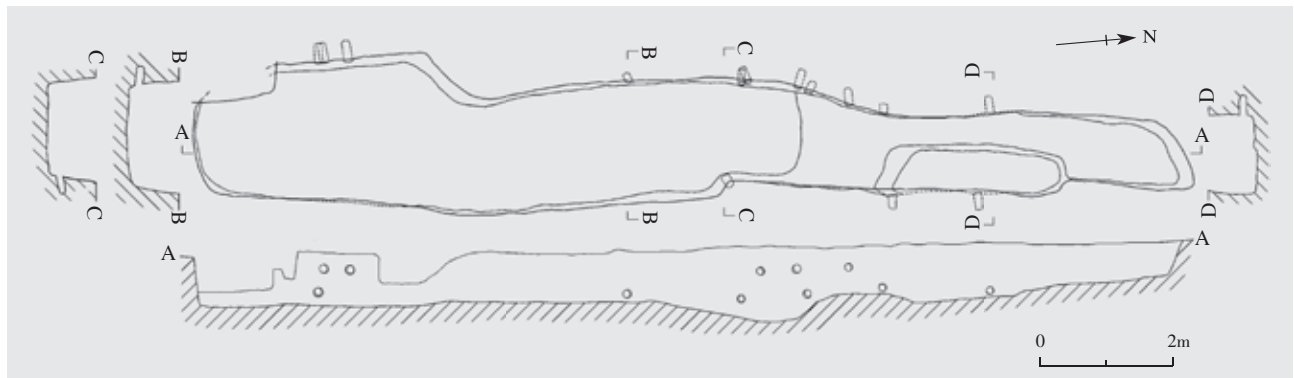


Figure 10 The plan and sections of ash pit H81.

Unearthed artifacts

The unearthed artifacts are widely varied in type and rather great in quantity, so we have no enough time to sort them out for the moment, and the present report accounts mainly for the pottery molds related to bronze mirror casting. Such molds were unearthed more than 80 pieces, all damaged. They were largely yielded from casting pits, wells and ash pits and belonging to the types of mirror face and back molds. The material is commonly pottery clay; the shape is usually like a flat bowl with a trapezoidal outline with a curvy bottom. In color they are largely livid-gray; some finds assume yellowish-brown on the obverse and upper side. The surface is even and smooth and the mirror cavities measure largely a dozen centimeters or so in diameter. The specific gravity of more than 60% of the molds is less than 1, and those surpassing 1.5 are very few. The face molds are generally even, the parting surfaces and the cavities are on the same level. On the back molds, the parting surfaces are higher than the mirror cavities, and the upper parts of the cavities are furnished with a pouring sprue and a venting channel. In decors of the castings, part of the back molds bear interlaced-hydra, dragon, four-nipple plus bowstring, grass-leaf and some other patterns, most of which are commonly seen on the bronze mirrors of the early Western Han Dynasty. Plain back molds were also encountered in some cases.

1. The mirror face mold can be represented by two samples.

H81:12, only right half remains. It measures 12.7cm in length, 6.5cm in width and 3.1cm in thickness; its specific gravity is 1.11. The body assumes livid-gray color. On the section are varying-sized pores, which are oval with the major axis extending horizontally. The pouring sprue wall assumes black on the surface and measures 2.7cm in remaining length and 1.6cm in remaining width. The parting surface is yellowish-brown, even and smooth, measures 0.8–2.3cm in width, and bears a vertical black strip on the upper part, near the pouring sprue, which must be a trace of the venting channel. The parting surface and cavity are on the same level. They assume black and form an even and smooth plane with a concavity of about 0.08cm occurring in a space of 0.8cm (Figures 12:1 and 13).

H5:59 is the lower half of a mirror face mold and measures 11.85cm in length, 17.35cm in width, 5.25cm in thickness and 1.11 in specific gravity. It is livid-gray with reddish-brown color occurring in some spots. In the section are some varying-sized pores, the larger ones of which contain tiny convex matter. The parting surface and the mirror cavity are on the same level, forming an even and smooth plane, whose edge assumes black and gradually transforms into livid-gray towards the center. On the section occurs an about 0.3cm thick black permeating layer (Figures 12:2 and 14).

2. The mirror back mold can be represented by six samples.

A mirror back mold with interlaced-hydras design left



Figure 11 Ash pit H81 (S–N).

over the right half (T3594 ③ :1). The remaining part measures 17.8cm in length, 6.8cm in width and 5cm in thickness and 1.1 in specific gravity. It assumes livid-gray color. The section shows some varying-sized pores. The parting surface and the surface of the right venting channel bear a thin yellowish-brown coating; near the pouring sprue are black spots. The right venting channel measures 7–9cm in length, 0.7cm in width and about 0.1cm in depth; and the parting surface, 0.4–2cm in remaining width. The pouring sprue left over its right half with the outer part (close to the pouring cup) deeper than the inner one (close to the mirror cavity); and the surface is even and smooth and assumes livid-gray and grayish-black colors. It is 5.5cm in length, 1cm in remaining width and about 1cm in maximum depth. The mirror rim is curved; its outmost part sinks by 0.3cm. The parting surface and the mirror cavity differ by 0.1cm in height. The mirror cavity is grayish-white, even and smooth. The main decor zone bears an interlaced-hydras design against the background a short line and whorl patterns. There remains traces of the circular knob base, but the knob is unknown (Figures 15 and 16).

H118:2 is the right half of a mirror back mold with

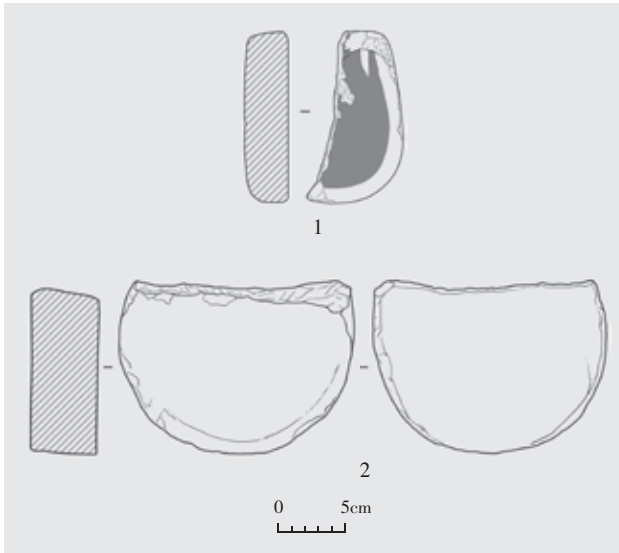


Figure 12 Mirror face molds.

1. H81:12; 2. H5:59.

dragon design. It measures 18.4cm in length, 7.1cm in remaining width, 4.1cm in thickness and 0.95 in specific gravity. The color is livid-gray, the section shows some varying-sized pores. The right venting channel measures 7cm in length, 0.7cm in width and about 0.1cm in depth. Its surface is gray, even and smooth. The pouring sprue left over its right half, which is 6.2cm in length, about 2.8cm in remaining width and about 1cm in maximum depth. Its surface assumes grayish-white. The mirror cavity bears a yellowish-brown coating. The mirror cavity is 0.1cm lower than the parting surface. The mirror cavity is also yellowish-brown, even and smooth. The mirror rim is curved; its outmost periphery sinks by 0.3cm. Inside the rim is a circle of bowstring pattern. The main decor zone bears a looking-back dragon design against the whorl pattern background. The knob is a three-ridged knob with a ring enclosed base (Figures 17:1 and 18).

H115:8 is the upper half of a mirror face mold. It measures 11.9cm in remaining length, 11.2cm in width and 3.85cm in thickness, and has a specific gravity of 1.02. The body is livid-gray, the section shows some varying-sized pores, which contain spangling ore matter. The venting channel is about 5.2cm long, 0.35cm wide and about 0.1cm deep, and has a yellowish-brown surface. The pouring sprue measures 4.1cm in length, 2.5–3.3cm in width and 0.6cm in maximum depth, and has a black, even and smooth surface. The parting surface is yellowish-brown and bears an even and smooth coating. The mirror cavity is 0.1cm lower than the parting surface. The mirror cavity is black, even and smooth. The mirror rim is curved with the outmost periphery sinking by 0.2cm. Along the rim is a ring of bowstring pattern. The main decor zone bears two nipples surrounded by coiling dragon design against the whorl pattern background. The knob has been damaged, but its ring base is discernible on



Figure 13 Mirror face mold (H81:12).



Figure 14 Mirror face mold (H5:59).

the mold (Figures 17:2 and 19).

The sample H118:4 is the left half of a mirror back mold with four-nipple and bowstring patterns. It measures 21cm in length, 10.85cm in remaining width, 5cm in thickness and 0.89 in specific gravity. The body is livid-gray; the section shows some varying-sized pores, which contains spangling ore matter. The left venting channel is preserved in a good condition: the surface assumes yellowish-brown, remains even and smooth, and has a length of about 7.5cm, a width of 0.8–1cm and a depth of 0.1cm. The pouring sprue left over its left half, which is livid-gray on the surface and partly assumes black color. The body measures 6.4cm in length, about 4cm in remaining width and 1.4cm in maximum depth; the left

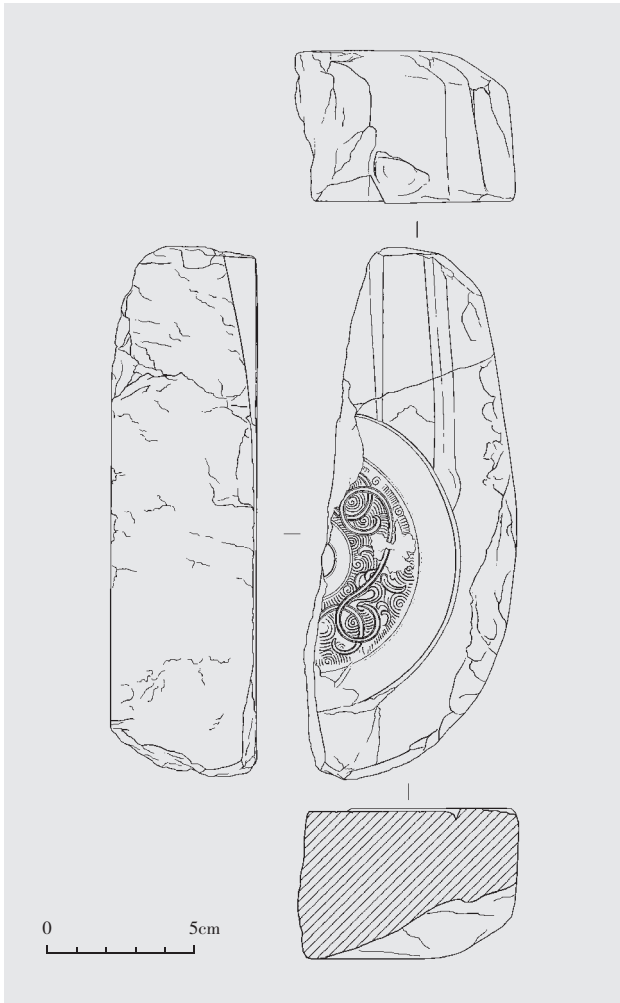


Figure 15 Mirror back mold with interlaced-hydra design (T3594 ③ :1).

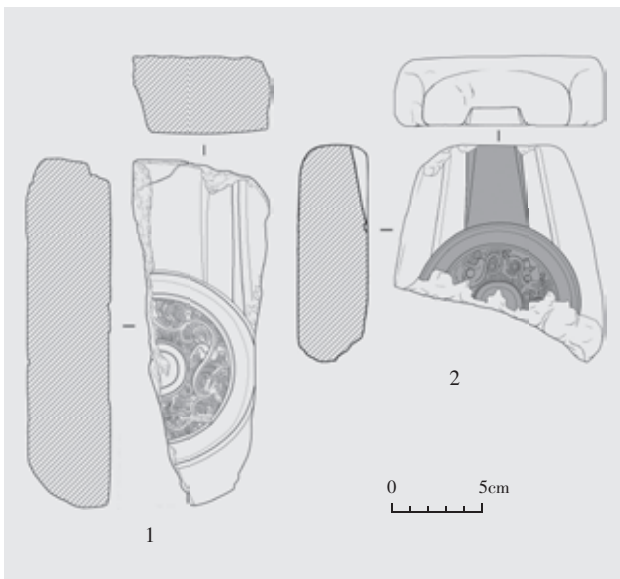


Figure 17 Mirror back molds with dragon design.
1. H118:2; 2. H115:8.



Figure 16 Mirror back mold with interlaced-hydra design (T3594 ③ :1).



Figure 18 Mirror back mold with dragon design (H118:2).



Figure 19 Mirror back mold with dragon design (H115:8).

edge has been slightly damaged. The parting surface is even and smooth, assumes yellowish-brown color, and has been slightly damaged on the left edge. The mirror cavity is 0.1cm lower than the parting surface. The mirror cavity is even and smooth, and also assumes yellowish-brown but the center has blackened. The mirror rim is curved with the outer periphery sinking by 0.3cm. 1cm apart from the mirror rim, there is a ring of bowstring pattern, which surrounds a ring of inward linked arcs pattern (nine units remain). In the main decor zone are nipples (two remain) and two rings of bowstring pattern. The knob is a three-ridged knob with a ring base (Figures 20 and 21).

The mirror back mold with grass-leaf pattern T3696 ④ :1 is the left half of the original implement. It measures 15.6cm in remaining length, 7.2cm in remaining width and 4.3cm in thickness, and has a specific gravity of 1.03. The body is livid-gray; the section shows some varying-sized pores. The left venting channel preserves the lower half, which assumes yellowish-brown color and measures 3.8cm in remaining length, 0.8–1cm in remaining width and 0.1cm in depth. The pouring sprue preserves the left half, which assumes also yellowish-brown color and has a length of 5cm, a remaining width of 2.2cm and a maximum depth of 1.1cm. The parting surface has been badly damaged; the remains are 1.3–2.2cm wide, shows an even smooth yellowish-brown surface and a flattened edge. The mirror cavity is roughly a plane, assumes yellowish-brown and measures about 0.1cm lower than the parting surface. The mirror rim is adorned with a ring of inward linked arcs pattern that is concaved by 0.2cm and left over eight units. In the main decor zone are intaglio grass-leaf pattern, which is flanked with double-petal design. The knob base is surrounded by a double-line square, beyond which the character “*fu* 富 (rich)” remains at the top and the inscription “*jian ri zhi guang* 见日之光 (reflecting the sunshine)” is preserved on the left side. The knob has been

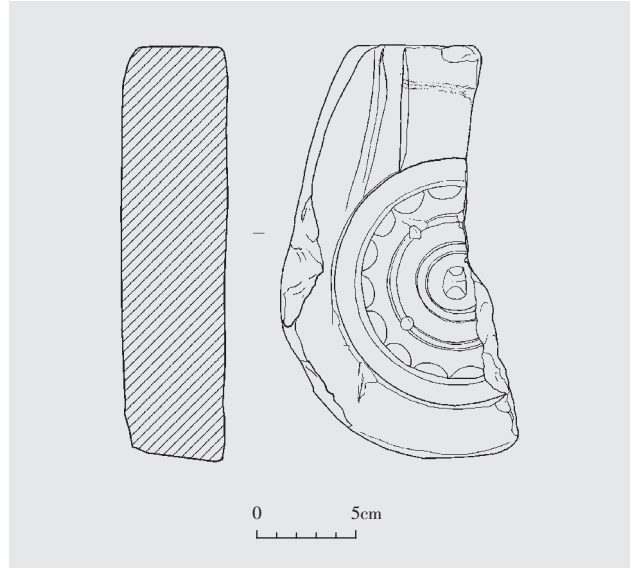


Figure 20 Mirror back mold with four-nipple and bowstring patterns (H118:4).



Figure 21 Mirror back mold with four-nipple and bowstring patterns (H118:4).

damaged; originally it might have been a semi-spherical one (Figures 22:1 and 23).

The plain mirror back mold H82:1 is the right half of the original implement. It has a length of 13.5cm, a remaining width of 9.65cm, a thickness of 3.75cm, and a specific gravity of 0.98. The body is livid-gray, the section shows some varying-sized pores, which are largely oval with the major axis lying in a horizontal position. The right venting channel remains in quite a good condition:

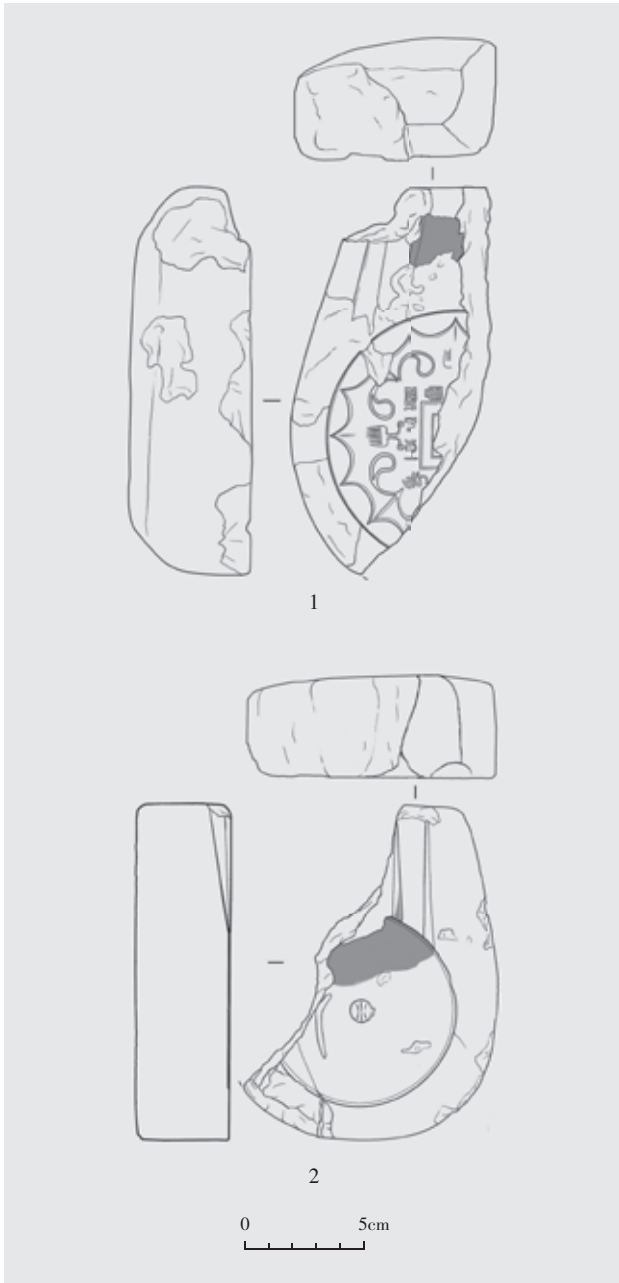


Figure 22 Mirror back molds with decors.

1. Mirror back mold with grass-leaf pattern (T3696 ④ :1);
2. Plain mirror back mold (H82:1).

it keeps an even and smooth surface, assumes yellowish-brown color and measures 5.4cm in length, 0.2–0.5cm in width and about 0.1cm in depth. The pouring sprue left over traces of the right side, which are 4.5cm in remaining length, 0.5cm in remaining width and 0.5cm in maximum depth. The parting surface keeps an even and smooth surface and seems to have a thin yellowish-brown coating. The mirror cavity is also even and smooth, assumes yellowish-brown color, and has no decors. The mirror rim is concaved by about 0.15 cm. The knob is a



Figure 23 Mirror back mold with grass-leaf pattern (T3696 ④ :1).



Figure 24 Plain mirror back mold (H82:1).

three-ridged one (Figures 22:2 and 24).

Conclusions

The presently excavated vestiges related to the mirror-casting workshop are all in the same stratum. They are built on or in earlier rammed-earth building foundations; some remains, such as casting pit ZK1, wells J1 and J2 and house foundation F13, are on/in the same floor of activities. All vestiges are distributed according to some

rules and relatively close to each other: ZK1 and J3 are both in the limits of F13, and the ash pits are mostly in the periphery of F13. Judged by the stratigraphical position, structure and accumulation of the vestiges, with the analysis results of the unearthened numerous mirror molds and other artifacts taken into account, it can be concluded that the excavated area was a bronze mirror casting workshop. The casting pit ZK1 must have been a copper smelting and bronze mirror casting place. The small sand pits to its east must have been facilities for placing and fixing mirror molds, the burnt clods on the southern side of the sand pits were probably related to furnaces, and the pits in the west were mainly for discarding garbage and the like. Wells J2 and J3 may have belonged to the same time and functioned as water supplying facilities. House foundation F13 is unknown as to its limits but can be attributed to the type of work shed auxiliary to a mirror-casting workshop of that time. The ash pits can be roughly classified into two types. The first was for discarding production and daily life garbage, such as H5. The second type, such as H45, H81 and the like, may have been for storing materials of production as these pits were discovered to contain clay with peculiar color and texture, which might have been the materials related to making pottery molds and other implements of production. Owing to the limitation of the excavated area and the damage of remains that happened in later times, it is difficult for the time being to reveal and research the whole mirror-casting workshop site. But the presently discovered various vestiges and artifacts already preliminarily exhibit the aspect of the remains as an ancient mirror-casting site.

Concerning the date of this mirror-casting workshop, judged by the stratigraphical relationships and the unearthened artifacts, it must go back roughly to the Western Han Dynasty. The unearthened mirror molds, especially those back molds with decorative patterns, even further point to the early Western Han. As there have been a number of discoveries of bronze mirror molds similar to their counterparts from Qi Linzi City Site in shape and decoration, especially some finds among them have exact dates, the presently reported batch can be relatively reliably dated by means of comparative study. Some scholars have discussed the mirror molds collected from Qi Linzi in the past. According to relevant study, the presently unearthened mirror molds with interlaced-hydras, dragon and four-nipple and bowstring designs all belong to the earlier stage of Western Han or the early Western Han, some of them went back as precisely as to the beginning of Western Han. It is noteworthy that concerning the mirror back mold with grass-leaf pattern generally attributed to a relatively late period, only one sample appeared this time. Besides, a dozen of mirror molds had been previously collected from the vegetable shed to the west of the presently excavated locality, among which the mirror back molds discernible in decors were all adorned with interlaced-hydras or dragon designs

and belonged to the earlier stage of Western Han. To sum up the above statements, the presently excavated mirror-casting site can be dated cardinally to the earlier stage of Western Han Dynasty, its *terminus post quem* may be traced as early as to the Qin Dynasty or even to the end of the Warring-States Period, while the *terminus ante quem* might be in the mid western Han as a mirror mold with grass-leaf pattern appeared in this batch of finds.

The present fieldwork on the bronze mirror-casting site in the Qi Linzi City Site is the first scientific excavation for the ancient bronze mirror-casting workshop site both at home and abroad, and has important academic value and significance. It not only evidenced that Linzi was one of the bronze mirror casting centers in the Qin-Han period, but also provided valuable data for researches on the then bronze mirror casting technology, production places and product circulation. Therefore this is a great breakthrough in the study of the bronze mirror casting industry during the Qin-Han Period and even in the whole antiquity.

References

- Bai, Yunxiang 白云翔 and Guangming Zhang 张光明 . 2005. 山东临淄齐国故城汉代镜范的发现与研究 (Discovery and study of the Han Period Mirror-molds from the site Qi State capital Linzi, Shandong). *Kaogu* 考古 (Archaeology) 12:68–83.
- Bai, Yunxiang 白云翔 . 2007. 临淄齐国故城汉代镜范及相关问题研究 (Study of the Han period mirror molds from the site of the Qi state capital Linzi and related issues). In [China] Shandong Provincial Institute of Cultural Relics and Archaeology 中国山东省文物考古研究所 and [Japan] Archaeological Institute of Kashihara, Nara Prefecture 日本奈良县立橿原考古学研究所 . 2007. *Shandong Sheng Linzi Qiguo gucheng chutu jingfan de kaoguxue yanjiu* 山东省临淄齐国故城出土镜范的考古学研究 (Archaeological Study of the Han Period Mirror-molds from the Site of the Qi State Capital Linzi in Shangdong Province, China). Beijing: Kexue Chubanshe. pp. 95–133.
- Wang, Huitian 王会田 2007. 临淄齐国故城阚家寨铸镜作坊址调查 (Survey of the Kanjiazhai Mirror-casting workshop site within the Qi state capital Linzi). *Ibid.*, 260–72.
- Wei, Chengmin 魏成敏 and Xue Dong 董雪 . 2007. 临淄齐国故城的汉代镜范与山东地区的汉代铜镜 (Han period mirror molds from the site of the Qi state capital Linzi and Han period bronze mirrors from the Shandong region). *Ibid.*, 150–73.

Postscript

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