

Article

Beyond Ritual Vessels: Artistic Innovation, Casting Technology, and the Social Life of Bronze Boxes in China during the Late Western Zhou to Early Spring and Autumn Periods

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Abstract: Through a comprehensive review of the bronze boxes dating from the late Western Zhou to the early Spring and Autumn period, this study analyzes the societal context that gave rise to the emergence of these vessels, including transformations in the social power structure, the decline of the Zhou royal house, and the rise in the power and status of the regional lords. As the powerful regional states grew wealthy, the spiritual demands and aesthetic pursuits of the regional lords and the aristocrats correspondingly transformed. The bronze boxes of this period thus functioned as non-ritual daily-use objects of the aristocracy and afforded spiritual pleasure to the regional rulers, satisfying their pursuit of beauty in everyday life. Because these square boxes predominantly employed animal sculptures and human figures as decoration, the required level of craftsmanship was exceptionally high; consequently, their production techniques remained a regional casting technology, circulating primarily in the royal domain centered on southern Shanxi, where the handicraft industry was relatively well developed.

Keywords: bronze boxes; bronze art; bronze casting technology; aesthetic transformation

1. Introduction

During the Chinese Bronze Age, bronze ritual vessels were produced in large quantities, were of numerous types, and were adorned with highly complex decorative motifs. Driven by political development, religious culture, social aesthetics, and casting techniques, the decorative styles of bronze ritual vessels underwent continuous transformation and innovation from the Erlitou period to the Eastern Zhou. During the Erlitou period, bronze ritual vessels with standardized assemblage patterns gradually replaced their ceramic counterparts, becoming prominent symbols of religious and political authority. Although the craftsmen during the era had acquired a mature command over sectional mold casting technique to produce bronze ritual vessels, the manufactured vessels were decorated rather simply and were relatively small in size [1]. However, decorative techniques for bronze vessels advanced rapidly during the Shang dynasty. The sectional molds enabled sharper, more refined ornamentation, while the casting-on technique integrated separately cast elements to create three-dimensional decorative effects. The artistic style of Shang bronze ritual vessels also exhibited a clear departure from the relatively crude appearance of the vessels from the Erlitou period. In a culture steeped in primitive religious beliefs, fierce and elaborate animal-mask motifs and three-dimensional zoomorphic bronzes became prevalent [2]. During the Western Zhou period, the Zhou royal house emphasized the creation of "cultural memory" through bronze inscriptions. Bronze ritual vessels, with inscriptions recording the official appointments and honors received by the vessel's owner and his ancestors from the Zhou king, were

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deposited in the ancestral temples and used only on ritual occasions, thus serving as material embodiments reinforcing the political order of the Western Zhou state [3]. The artistic style of Western Zhou bronzes also underwent a significant transformation from that of the Shang period, due to changes in political institutions and ritual contexts. Thus, abstract and streamlined geometric patterns became prevalent, and the vessel shape became more elegant. Bronze ritual vessels were manufactured on a large scale in a highly organized and standardized manner during the Western Zhou period. Moreover, the hierarchical system strictly regulated the types of bronze ritual vessels permitted for each social rank [4]. With the progressive collapse of the Western Zhou political order and with the advent of the Spring and Autumn period, a substantial number of utilitarian and ornamental bronze vessels were produced, in addition to bronze ritual vessels [5]. This period also witnessed significant innovations in bronze casting techniques. Separate casting and welding techniques became widely adopted, whereas elaborate openwork and three-dimensional zoomorphic motifs emerged as new decorative themes and were extensively applied to bronzes [6].

In contrast to the simple and elegant bronze ritual vessels, the utilitarian bronze vessels of the aristocracy exhibited a stylistic preference for compactness and delicacy, from the late Western Zhou to the Spring and Autumn period. The bronze box serves as a typical representative of this aesthetic inclination. While the majority of these bronze boxes are relatively small, they are elaborately crafted by combining a square box body with three-dimensional zoomorphic or anthropomorphic components. Typical examples feature monkey or tiger knobs on the lid, standing birds or punished figures serving as decorations on the lid or as feet. Others have wheels functioning as feet, designed as cart models that could be rolled forward. Due to the distinctive ornamentation of these bronze boxes, a number of researchers have undertaken investigations pertaining to their typology and function. Some reports suggest that these boxes should be regarded as models of the funeral carts used to convey the corpses of the deceased. Because these funeral carts were pulled by the deceased's closest relatives using white whisks, they required neither a shaft nor horse-yoking fittings; instead, four wheels were used to ensure stability [7]. This interpretation, however, is problematic in a number of ways. First, while the main body of the vessel is nearly identical to that of the cart-shaped square boxes, the feet shape is highly variable, including tiger-shaped feet, human-shaped feet, or ring feet. To label them entirely as funeral carts would thus be unreasonable. Second, actual excavations have revealed that some of these bronze boxes contained small jade objects or fatty substances when unearthed, indicating a clear utilitarian function for storage. Based on the archaeological contexts and the contents discovered inside these bronze boxes, some scholars have argued that the boxes were objects used by women for storing ornaments, cosmetics, and aromatics. Those specifically intended for storing pearls, jades, and other precious objects are tentatively identified as *Du*, a type of container recorded in ancient textual sources [8]. Based on the currently available evidence, the author accepts this interpretation that these bronze boxes were daily-use utilitarian vessels for storing various items.

Although scholars generally agree that the known bronze boxes date to the late Western Zhou and early Spring and Autumn periods and were recovered primarily from aristocratic cemeteries in regional states and lineage estates surrounding the royal domains, where they functioned as storage containers, their broader significance remains insufficiently understood. Unlike objects created solely for artistic purposes, Chinese Bronze Age vessels fulfilled intertwined political, religious, and ritual functions in addition to their practical and aesthetic roles. As handcrafted objects, their production and decoration were also shaped by contemporary casting technologies and the availability of raw materials.

Despite this consensus, little attention has been devoted to the stylistic development of bronze boxes or to the factors underlying their growing popularity among Zhou aristocratic elites during the late Western Zhou and early Spring and Autumn periods. Drawing on a comprehensive review of the archaeological contexts of these vessels, this

study investigates the reasons for their emergence and widespread adoption by examining changes in political and power structures, evolving aesthetic preferences in bronze art, advances in bronze casting technology, and broader socioeconomic developments.

2. The Archaeological Contexts and Stylistic Features of the Bronze Boxes

About archaeological contexts, except for the bronze box with nude figures unearthed from Juxian, Shandong, in the 1920s, which was bought by a museum and for which the specific contextual information is unknown, the excavated bronze boxes dating from the late Western Zhou to the early Spring and Autumn period presumably come from aristocratic burials of the same period.

Based on the locations of the burial boxes and the other objects unearthed along-side, the state to which these bronze boxes originally belonged can be determined: six of these pieces belong to the state of Jin, seven to Zhou aristocrats who relocated to the territory of Jin, and one each to the states of Rui, Guo, Wei, Qin, and Xiao Zhu. The bronze boxes were primarily excavated from southern Shanxi, western Henan, and eastern Gansu---all areas located within the royal domain. A small number of these boxes were unearthed in Shandong. The identities of the box owners are clearly known for six pieces, all of which belonged to wives of the lords of the regional states: Wei Ling, the wife of the Lord of Xiao Zhu; Yang Ji, the primary wife of Lord Bangfu of Jin; a secondary wife of Lord Bangfu of Jin; Zhong Jiang, the wife of Lord Huan of Rui; Shu Jiang, the wife of Lord Wen of Wei; and Liang Ji, the wife of Lord Guoji. The bronze boxes found in other tombs do not yield direct evidence of the vessel owner's identity. However, based on the tomb structures, their locations within the cemeteries, and the accompanying goods, they appear to belong to high-ranking aristocrats of the regional states or lineage estates. These bronze boxes are intelligently designed and exquisitely crafted and are neither regarded as ritual vessels nor grave goods intended solely for burial. Their functions can be inferred from the contents found inside them at the time of excavation. The four boxes unearthed from the tombs of Wei Ling, Yang Ji, Shu Jiang, and Liang Ji contained small jade objects, beaded ornaments, and bone hairpins. The bronze box excavated from Tomb M6 at the Beibai'e cemetery in Yuanqu contained powdery residues and a small bronze spoon. It can thus be determined that the boxes were daily-use containers used by aristocratic women for storing small jewelry pieces, or for containing cosmetic powders and perfumed ointments.

The bronze boxes belonging to different regions and states share many features and characteristics in the vessel form and decorative style. These vessels are small, with lengths and widths of approximately 10 cm. A rectangular box body forms the main structure, with doors opened either on the top or on the side of the box. While the doors are predominantly double, a few have doors on the top or have a lid separate from the body (Figure. 1a, b, c, d). The feet generally comprise three-dimensional zoomorphic components, with four recumbent tigers or nude human figures placed at the four corners of the base (Figure. 1a), or wheels that allow rolling movement (Figure. 2a). Simpler forms have ring feet or no feet at all (Figure. 1b, 1c). Richly layered decoration is a characteristic feature of these bronze boxes. The most distinctive characteristic is the three-dimensional zoomorphic or anthropomorphic sculptures in the round as lid knobs and feet. The more elaborate box forms also feature three-dimensional creeping beasts and standing birds at the corners and edges of the lid and the vessel walls, which were integrated with the vessel body through separate casting and welding techniques (Figure. 1e, 1f; Figure. 2b, 2c, 2d, 2e). The flat surfaces of the box body and the lid feature ground patterns, providing a textural effect (Figure. 1a). The choice of ground patterns reflects the bronze artistry typical of the regional state in which the box was produced. Therefore, the boxes unearthed from Jin burials are mostly decorated with wave-scrolls, double-ring, and stylized phoenix, the patterns and motifs typical of Jin bronze vessels belonging to the late Western Zhou to early Spring and Autumn period. The boxes recovered from the Qin burial feature the most typical Qin-style interlaced serpent pattern. The distinctive

openwork decoration frequently seen on Rui bronzes is a characteristic feature of the boxes excavated from the Rui cemetery (As shown in Figure 1).



Figure 1. Photos of the Typical Bronze Boxes with Three-Dimensional Zoomorphic Components or Anthropomorphic Sculptures Unearthed from the Beibai'e Cemetery in Shanxi, China (a, from Tomb M4; B, from Tomb M6; C-F, from Tomb M9) [9].

3. The Social Background and Causes for the Prevalence of the Bronze Boxes

The widespread presence of bronze boxes in aristocratic graves from the late Western Zhou through the early Spring and Autumn periods is a reflection of developing trends in Zhou social life. It coincided with a new political organization of the elite, new aesthetic preferences of the aristocracy, and advances in the economic and technological capacity of regional bronze-casting techniques.

3.1. Political Crisis, Social Power Restructuring, and the Expansion of Regional Lords' Power

Authors should discuss the results and how they can be interpreted from the perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted.

During the late Western Zhou to the early Spring and Autumn period, the social power structure underwent drastic transformation, shifting from the supreme political

authority held by the Zhou king to the independent exercise of power by powerful regional lords. This shift in turn gave rise to multiple local political centers. The uprising of the capital populace in the late Western Zhou resulted in the Zhou royal house facing increasing political crises. The regional political forces grew ever stronger, and the royal authority was progressively undermined. On multiple occasions during the reign of King Li, the Zhou royal house launched large-scale military campaigns against political enemies in the Yangzi River region and along the northwestern frontier. The outcomes were variable for the contending parties [10]. Although the military strength and resources of the Zhou royal house were greatly depleted by these external wars, they failed to resolve the external threats completely. King Li also implemented an economic policy during the same period that claimed all products of ownerless lands for the Zhou royal house, further deepening the divisions within an already fractious aristocracy and intensifying the conflict between the regional states and the central court. Regional lords no longer paid regular tribute to the Zhou king [11]. Thus, the Zhou central court was beset by crises within and without. There was a brief revival during the reign of King Xuan that temporarily strengthened royal authority, yet regional rulers within the royal domain began to migrate eastward to establish new states. By the time of King You, the Quanrong, northwestern invaders, breached the Zhou capital, forcing King Ping to relocate the royal court eastward to Luoyi [10]. From this point, the traditional Zhou political order underwent a fundamental transformation as the king's supremacy and the royal house's dominance eroded, allowing regional lords to establish increasingly independent governance systems. The social power structure was thus transformed from a centralized political order under the Zhou king to a coexistence of multiple power systems centered on the regional lords. This downward shift of the power centers resulted in the regional lords becoming the *de facto* supreme rulers within their respective spheres of authority.

3.2. The Emergence and Expansion of Secular Aesthetic Demands among the Aristocracy

The changes in the social power structure were accompanied by transformations in the regional states in both material and spiritual realms. On the material level, the accumulation of wealth became easier for the regional lords, and their economic strength increased. As the power of the Zhou royal house declined in the late Western Zhou, the house could no longer maintain the established political and fiscal order. As Regional lords ceased to offer regular tribute to the Zhou king, the king distributed lavish rewards to the regional lords and aristocratic officials in order to win them over [12]. This in turn translated into a twofold gain for the regional states whose expenditures on tribute to the royal house were reduced, whereas the revenues from royal rewards substantially increased. By the early Spring and Autumn period, the powerful regional states were no longer constrained by the Zhou royal house. They encroached upon or even completely annexed smaller states by imposing wars on them, acquiring more land and population. This resulted in a massive increase in their domestic economic production and generated wealth. As territorial expansion continued, hegemonic states accumulated an ever-greater share of available resources, strengthening their economic capacity and consolidating their dominance [13].

At the spiritual level, the mentality of the regional lords and the aristocrats underwent significant changes. As their political power and social status increased, regional lords developed a heightened sense of identity and prestige. At the same time, growing economic prosperity resulted in a greater demand for luxury goods and refined lifestyles among regional rulers and the aristocracy. The emergence of utilitarian bronze vessels and the innovation of bronze artistic styles followed in tandem.

Bronze ritual vessels from the early Western Zhou period are important material embodiments of the ritual and hierarchical order of the Zhou period. Their vessel assemblages and decorative motifs underwent significant changes in comparison to those of the Shang dynasty. In the Shang period, emphasis was predominantly on wine vessels rather than on food vessels, which were characterized by complex, mysterious, and

imaginary zoomorphic designs, with the animal-mask motif being the most representative. The refinement of casting technology during the late Shang period made increasingly sophisticated three-dimensional ornamentation possible. Animal motifs, particularly the taotie (animal mask) and dragon, were modelled with greater dimensionality, and anatomical features such as horns, fangs, and claws were accentuated through increasingly intricate and expressive treatment. These motifs, set against the backdrop of cloud-and-thunder ground patterns, appeared extraordinarily mysterious and ferocious, reflecting the Shang people's deep reverence for spirits and ghosts [14]. Although bronze vessel crafting in the early Western Zhou continued to adopt the decorative styles of the late Shang, the status of food vessels had already been elevated in terms of vessel assemblages. By the middle Western Zhou, bronze ritual vessels, influenced by the codification of the Zhou ritual system, underwent significant transformations. Food vessels became the principal component of the ritual assemblage. Three-dimensional ornamental techniques largely disappeared, and imaginary animal designs were significantly simplified, relegating animal motifs to a subordinate position on the vessel body. Vessel decoration transitioned towards a geometric style, with abstract and streamlined patterns including the crooked-grain motif, descending-scale motif, double-ring motif, and ribbed pattern emerging and gaining popularity [15]. This shift resulted in the transformation of the overall decorative style of bronze ritual vessels from ferocious and mysterious to solemn, elegant, and dignified, suited to the ritual environment of ancestral temples and altars. The vessels not only served as adjuncts to rituals but also served as markers of hierarchical status.

This stylistic trend continued into the early Spring and Autumn period. However, as discussed above, the regional lords and the aristocrats, with the expansion of their power and the accumulation of wealth, developed new spiritual demands during this period, pursuing even greater luxury and refined aesthetic tastes in their lives. They required more refined bronze vessels to satisfy their aesthetic demands and to bring pleasure to themselves. Thus, the originally austere decorative style of bronze vessels was no longer able to satisfy their evolving spiritual needs. Yet, since bronze ritual vessels stood as material reflections of the ritual system, their decorative styles could not be easily altered. Consequently, the non-ritual utilitarian bronze vessels evolved and became the subject of innovation, with their overall decoration being enhanced to incorporate more entertaining attributes and aesthetic appeal. The bronze boxes dating from the late Western Zhou to the early Spring and Autumn period exhibit a remarkably sophisticated level of craftsmanship. Their most distinctive feature is the frequent use of three-dimensional zoomorphic and anthropomorphic ornaments, which include nude human figures in a kneeling posture, creeping beasts, and standing birds. Such decorative components are realistically and skillfully portrayed and introduce a vivid sense of movement and vitality: crawling beasts clinging tenaciously to the vessel body (Figure. 1a), recumbent tigers striding with powerful limbs (Figure. 1e, 1f; Figure 2d, 2e), and monkeys or standing birds poised alertly atop the lid (Figure. 2b, 2c). The anthropomorphic figures were represented with scientifically proportioned bodies, natural attitudes, and smooth muscular lines, e.g. a person in a kneeling posture or persons who had suffered foot amputation as a punishment (Figure. 1b, 1c, 1f). It is evident that the square boxes not only incorporated high-quality three-dimensional imagery but also featured remarkable design ingenuity. Besides being decorative, the anthropomorphic and zoomorphic figures also serve as functional components of the vessels and functioned as lid knobs, lid fasteners, or feet, combining practicality with visual appeal. One particularly distinctive variant is equipped with wheel-shaped supports and towing attachments fixed to the vessel sides, enabling it to be drawn along the ground as a miniature cart (Figure. 2a). This inventive design combines functional engineering with a playful aesthetic, making it one of the most unusual forms of bronze box.

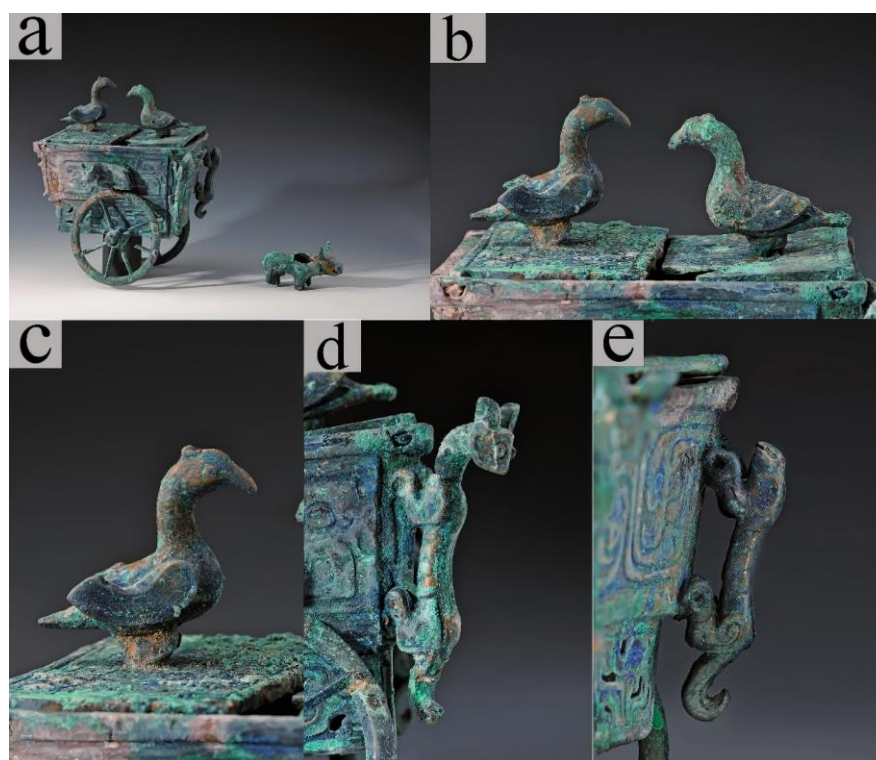


Figure 2. Photos of the Typical Bronze Boxes Which Wheels Allow Rolling Movement Unearthed from the Beibai'e Cemetery in Shanxi, China (A-E, from Tomb M6) [9].

Looking at the archaeological contexts, it is evident that the bronze box in non-ritual burial contexts, such as in Tomb M7 at Shangguocun, was placed together with a small yi-pitcher inside the coffin above the head of the occupant. This suggests that it was an object cherished by the deceased during his(her) lifetime. In highly ritualized burials, such as Tombs M62 and M63 at the Beizhao Jin cemetery, bronze boxes were placed alongside ritual vessels in the outer coffin chamber. However, their contents, including small jades, bead ornaments, and cosmetic powders, indicate that they served as personal belongings in everyday life. The refined craftsmanship and imaginative design reflect the aristocratic appreciation of aesthetic refinement in daily life, as well as an emerging taste for individual luxury and personal enjoyment.

3.3. *The Outcomes of Economic and Bronze-Casting Handicraft Development in the Regional States*

As discussed above, the material and spiritual transformation of the regional lords and the aristocrats within their states resulted in new aesthetic aspirations. These factors provided both a driving force and a favorable foundation for the development and innovation of the handicraft industry. The states of Jin, Guo, Rui, and Qin, where bronze boxes have been excavated, were all powerful states during the period ranging from late Western Zhou to the early Spring and Autumn. Jin, since its establishment, had close relations with the Zhou royal house, shouldering the responsibility of defending against the Rong people and guarding the royals, and had considerable military strength [11]. Moreover, Jin was also rich in natural resources such as salt lakes and copper mines, which contributed to its socioeconomic development. During the Spring and Autumn period, Jin continued to expand outward despite internal strife within the ducal house, and became the regional hegemon centered on southern Shanxi. Qin, located on the northwestern frontier of the Zhou realm, had fully occupied eastern Gansu and western Shaanxi by the end of the late Western Zhou, and expanded its territories towards the east and west. Lord Xiang of Qin formally established the state in the early Spring and Autumn period, elevating Qin's political status. Its subsequent political alliance with Jin gave rise to a new political configuration in the middle and upper reaches of the Yellow River region,

wherein Jin and Qin jointly exercised hegemony [10]. Although the states of Guo and Rui did not become regional hegemonies during this period, their lords were members of the Zhou royal house. Moreover, the Lord of Guo also served as a high minister of the Zhou court. These two states also enjoyed high political standing among the regional states during this period. Due to the aristocratic burials of Jin, Guo, Rui, and Qin dating to this period, the tombs of lords and ministers contain an astonishing variety and quantity of complete sets of ritual vessels, other kinds of bronze vessels, jade pendant sets, and bead ornaments. The burial chambers are also elaborately decorated, featuring outer coffin ornaments comprising strings of cowrie shells and beads, and beautifully patterned funerary curtains. These elaborate material investments in aristocratic burials, along with the associated human and resource costs, point towards the stable financial condition of these states during this period, due to which they were able to maintain strong control over domestic handicraft production.

Despite the miniature size of the bronze boxes dating from the late Western Zhou to the early Spring and Autumn period, the three-dimensional anthropomorphic and zoomorphic ornaments featured on them were designed and affixed with remarkable ingenuity and precision. Some of the three-dimensional components could even rotate freely, a characteristic that required exceptionally high casting skills and substantial production costs. The excavation of these bronze boxes from the regions occupied by states of Jin, Guo, Rui, and Qin in the vicinity of the royal domain during this period, can be attributed precisely to the fact that these states, possessed a well-developed bronze-casting handicraft foundation, an established technical tradition, and a stable supply of raw materials, which was made possible by the state's political stability and economic prosperity.

During the Western Zhou period, specialized state agencies and individuals managed the circulation of raw materials for bronze casting. This included mining, smelting, sale, and recycling of copper and tin resources within the royal domain. The regional states and their aristocrats were not permitted to deal in bronze raw materials. Compositional analyses have shown a high degree of similarity in the sources of raw materials used for vessels cast in the royal workshop and those produced in regional states; Yan and Jin. This suggests that the royal house supplied smelted copper to regional states, maintaining close ties with the Zhou house. The Zhou royal house, however, granted special permission to certain regional states with abundant metal resources to utilize their local bronze resources to a certain extent. The state of Jin, for instance, produced a portion of its bronze vessels using copper ores from the Zhongtiao Mountains, which were located within its own borders [16]. With the decline of the royal house by the late Western Zhou, resource-rich states such as Jin were not only able to utilize raw materials from their own copper mines, but also acquired copper, tin, and lead through trade. The inscriptions found on the Jin Jiang ding cauldron and the Rong Sheng bell show records of events in which Jin, carrying large quantities of salt, proceeded to Fantang to exchange it for copper and tin from the state of Chu. Furthermore, trace element analyses indicate that, from the late Western Zhou to the early Spring and Autumn period, Jin obtained part of its copper through trade with Chu [17]. By the Spring and Autumn period, Jin, a major power, acquired bronze vessels and casting materials from defeated adversaries or from allied smaller states as spoils of war or bribes through its military campaigns. Thus, from the Western Zhou onward, Jin benefited from multiple copper sources, including local mining, royal allocations, salt-copper trade, and acquisitions through warfare as spoils and bribes. For the states of Guo, Rui, and Qin, direct evidence regarding copper sources during the late Western Zhou and early Spring and Autumn period, however, remains unavailable. Guo and Rui had close relations with the Zhou royal house and had reliable access not only to copper but also to tin and lead from the south, because of their strategic location along the principal route by which southern copper was transported to Luoyang and subsequently to Zongzhou the western capital [18]. The aristocratic burials of Guo, Rui, and Qin dating to this period further support this inference, wherein the abundance, diversity, and fine craftsmanship of the bronze vessels point towards sufficiency of copper

supplies amongst the elite during this period. Archaeometric analyses have further indicated lower proportions of copper and higher proportions of tin and lead in the bronze vessels of the Spring and Autumn and War-ring States periods in comparison to the vessels dating to the Shang and Western Zhou periods. This shift presumably occurred because the vessels of this period with thinner walls, elaborate shapes, and finer decorative patterns imposed higher demands on casting technology. An increase in the tin and lead content could potentially lower the melting point and improve the fluidity of molten bronze, thus improving the quality of thin-walled castings [19]. In this way, the cumulative capacity to secure sufficient quantities of all three metallic raw materials, copper, tin, and lead, enabled the innovation of decorative techniques in bronze production.

Although the royal house exercised strict control over copper supply and bronze vessel casting during the Western Zhou period, the available evidence indicates the existence of state-owned workshops in most regional states by late Western Zhou. As early as the early and middle Western Zhou periods, some Ji- and Jiang-surnamed regional states closely associated with the Zhou royal house may have established state-owned foundries with assistance from the royal court. As the royal house lost power, the scale of bronze production in the regional states steadily expanded [16]. The excavation of workshop remains and the examination of bronze objects also demonstrate that Jin, Guo, Rui, and Qin each possessed high-level bronze-casting workshops and had developed corresponding technical traditions by at least the late Western Zhou. The majority of the pottery molds unearthed in excavation area J7 at the Tianma-Qucun site of Jin date to the early Spring and Autumn period, though a few small fragments, as depicted by their decorative patterns, may date to the middle to late Western Zhou [20]. This observation points towards the engagement of Jin in independent bronze-casting activities within its own territory at least by the middle to late Western Zhou, such that it possessed a solid technical foundation and well-developed foundry facilities. Bronze vessels dating to the late Western Zhou to early Spring and Autumn period and bearing inscriptions associated with the states of Guo, Rui, and Qin have been unearthed within their respective territories, and both the vessel type and decorative motifs display regional characteristics. This suggests that these states presumably possessed sophisticated bronze-casting workshops by the late Western Zhou, and were capable of producing large, finely crafted bronze vessels.

The emergence of bronze boxes during the late Western Zhou to early Spring and Autumn period represented an innovation in the bronze-casting handicraft industry, which relied upon the ample supply of copper, tin, and lead as well as the maturity of casting technologies in the regional states, along with a continuation of the established technical traditions of the regional bronze industries. Although the casting techniques of the bronze boxes have not been subjected to an archaeometric analysis, technical studies of the Zi Zhong Jiang pan, a bronze vessel from the state of Jin dating to the early Spring and Autumn period and sharing a similar decorative style, show that the three-dimensional ornaments were attached to the vessel body using highly complex joining techniques (Figure. 3a, 3b). The three-dimensional sculptural decorative attachments were each cast onto the main body through a pivot shaft. The pivot shaft was cast first during casting, followed by casting of the three-dimensional sculptural decoration onto it, leaving a gap that enabled free rotation. Finally, as the main body was cast, the pivot shaft with its pre-cast sculptural decoration was cast into the corresponding position on the box. Multiple cast-on tenons are also used on the body of the crawling beasts and the feet of the tiger-shaped feet. These decorative elements were first cast independently and then attached to the casting of the vessel body, forming hidden, structural joints (Figure. 3c, 3d, 3e) [21]. The manufacturing process in this case provides an example of technical sophistication. It required multiple casting stages to fabricate the individual components, along with precise control to preserve the hollow pivot mechanisms while ensuring that the joints remained secure as well as effectively concealed (As shown in Figure 3).

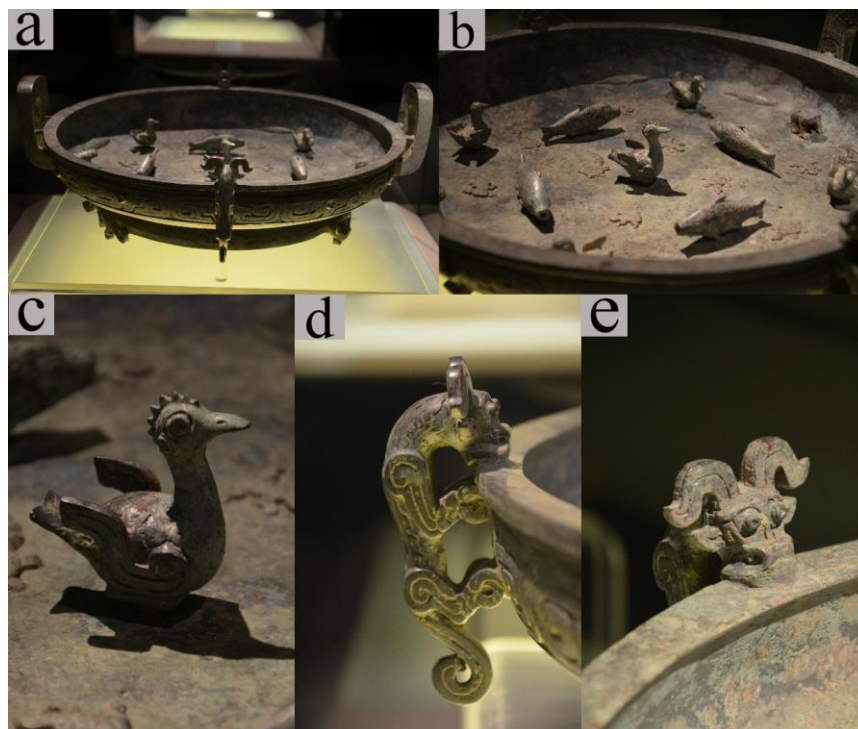


Figure 3. Photos of the Zi Zhong Jiang Pan. Photograph by the Author.

The casting of these square boxes failed to gain widespread popularity during the late Western Zhou to early Spring and Autumn period, presumably because of the lack of quality craftsmanship required. Thus, these vessels circulated and were favored only within a certain region. The bronze boxes unearthed from the Xiaozhu Cemetery in Zaozhuang and from Juxian County, Shandong, differ in casting techniques and decorative styles from other bronze vessels of the Western--Eastern Zhou transition found in the same region [22]. In fact, the decorative style and the casting techniques of both these types closely resemble their counterparts of the same period unearthed in the royal domain. Based on the identity of its owner, the author suggests that the bronze box was brought by Wei Ling from her natal state near Jin to Xiaozhu as dowry and later buried with her.

4. Conclusions

The bronze boxes from the late Western Zhou to early Spring and Autumn period are a reflection of the changes in the social power structure, shifts in aesthetic preferences, and development of regional economies and handicraft techniques, illustrating the intricate relationship between bronze art and political, cultural, and economic forces. Besides inheriting the established casting techniques and decorative styles of their primary area of distribution, southern Shanxi, these vessels also initiated a flourishing tradition of freestanding three-dimensional sculptures depicting human and animal figures, which in turn laid down the aesthetic and artistic foundation for the vivid, realistic, and highly expressive Jin bronzes of the Houma bronze industry.

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References

1. R. Y. Su, *Chinese Bronze Art and Technology*, 1st ed. Shanghai, China: Shanghai Classics Publishing House, 2019, pp. 1–14.
2. R. Bagley, "Anyang Mold-Making and the Decorated Model," *Artibus Asiae*, vol. 69, pp. 39–90, 2009.
3. M. Khayutina, "The Beginning of Cultural Memory Production in China and the Memory Policy of the Zhou Royal House During the Western Zhou Period," *Early China*, vol. 44, pp. 19–108, 2020.

4. Y. Sun, "Bronze vessels: Style, assemblages, and innovations of the Western Zhou period," in *The Oxford Handbook of Early China*, E. Childs-Johnson, Ed. Oxford, UK: Oxford University Press, 2020, pp. 451–570.
5. L. von Falkenhausen, *Chinese Society in the Age of Confucius (1000–250 BC): The Archaeological Evidence*. Los Angeles, USA: Cotsen Institute of Archaeology, UCLA, 2006, pp. 169–203.
6. F. Cao, *The Compilation and Research of Chinese Ancient Bronzes: Decorative Art of the Western and Eastern Zhou Period*, 1st ed., M. R. Zhang, Ed. Beijing, China: Science Press, 2023, pp. 217–236.
7. J. Wang, "A Preliminary Analysis of the 'Punished Man Guarding the Enclosure' Funeral Cart and Related Issues," *Journal of Chinese Antiquity*, no. 1, pp. 45–47, 2007.
8. "A Discussion of the Du: Women's Items in Early China—Boxes for Headgear, Makeup and Perfumes," *Palace Museum Journal*, no. 143, pp. 69–86, 2009.
9. J. Y. Yang and J. Cao, "Bronze he—food container Unearthed at the Beibai'e Cemetery in Yuanqu County, Shanxi Province," *Jiangnan Archaeology*, no. 2, pp. 38–45, 2021.
10. F. Li, *Landscape and Power in Early China: The Crisis and Fall of the Western Zhou*. Cambridge, UK: Cambridge University Press, 2006, pp. 102–107, 141–192, 262–276.
11. K. Yang, *History of Western Zhou Dynasty*. Shanghai, China: Shanghai People's Publishing House, 2003, pp. 395–414, 592–599.
12. C. F. Kim, D. M. Wu, and Y. Sun, "The Western Zhou Economy: A Missing Puzzle in the Economic History of Bronze Age China," *Archaeologies: Journal of the World Archaeological Congress*, vol. 21, pp. 314–324, 2025.
13. M. Fujita, P. Krugman, and A. J. Venables, *The Spatial Economy: Cities, Regions, and International Trade*. Cambridge, USA: The MIT Press, 1999, pp. 1–24.
14. X. Wang and Y. J. Zhong, "The Ritual Performance and the Power Connection: The Mediated Construction of Bronze Ware and Shang Dynasty Politics from a Political Communication Perspective," *Journal of Journalism & Communication Studies*, no. 33, pp. 102–117, 2026.
15. Y. Wang and X. W. Fu, "The Aesthetic Standard of Wen: A Comparative Study of Chinese and Western Early Artworks," *Asian and African Studies*, no. 1, pp. 3–18, 2011.
16. H. C. Li, J. L. Chen, J. F. Cui, X. H. Wu, Y. L. Yang, F. C. Huang, and T. J. Xu, "Production and circulation of bronzes among the regional states in the Western Zhou Dynasty," *Journal of Archaeological Science*, vol. 121, p. 105191, 2020.
17. H. C. Li and J. F. Cui, "Circulation of Copper between the Jin and Chu States: A Synthetical Analysis of Technologies, Bronze Inscriptions, and Archaeological Remains," *Archaeology and Cultural Relics*, no. 2, pp. 96–101, 2018.
18. D. S. Yi, "A Study on Southern 'Jindaoxihang' in Zhou Dynasty—Concurrently Discuss the Formation of Bronze Raw Materials Trading Center 'Fantang'," *Journal of Social Sciences*, no. 1, pp. 146–154, 2018.
19. L. H. Qiu, "A Preliminary Study of the Characteristics of Metallurgical Technology in Ancient China," in *Chinese Studies in the History and Philosophy of Science and Technology*, F. Dainian and R. S. Cohen, Eds. New York, USA: Springer, 1996, pp. 219–241.
20. X. S. Lei, "A Newly Identified Bronze Casting Tool Belong to the Culture of Zhou System," *Cultural Relics of Central China*, no. 6, pp. 73–78, 2008.
21. Z. M. Ding, Y. Zhou, and L. M. Wu, "X-CT computed tomography studies on the manufacturing techniques of Zi Zhong Jiang Pan," *Sciences of Conservation and Archaeology*, no. 29, pp. 12–25, 2017.
22. J. Q. Huang, "Kun in the Inscriptions of Various Bronzes Unearthed in Xiaozhu Cemetery of Zaozhuang and Handed Down," *East Asia Archaeology*, no. 17, pp. 125–130, 2020.

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