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Zheng He's voyages as catalyst: Gemstones, craftsmanship, and global aesthetics in Ming imperial goldwork

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Abstract

The lavish, gem-encrusted goldwork of the Ming dynasty (1368–1644) represents a pinnacle of Chinese decorative arts, emerging concurrently with the seven maritime expeditions of Admiral Zheng He (1405–1433). While traditional research has treated the maritime history of the voyages and the art history of courtly gold as parallel but separate narratives, this study argues for their intrinsic interdependence. This study posits that Zheng He's voyages acted as a direct and dynamic catalyst for the transformation of Ming imperial goldsmithing. This transformation was dual: first, an aesthetic revolution prompted by the influx of overseas gemstones, shifting the paradigm from the understated elegance of jade to vibrant polychromatic splendor; second, a technical synthesis facilitated by contact with Islamic traditions, leading to the refinement of indigenous filigree (*huasi*, fine wirework) and granulation techniques for mounting these new stones. Integrating historical texts, archaeological evidence from the Tomb of Prince Liangzhuang, and recent comparative studies of Indian Ocean trade, this paper traces the feedback loop between imported materials and adapted techniques. The findings challenge the view of Ming art as a self-contained tradition, demonstrating instead that the "imperial style" was a globalized product of cross-cultural exchange.

Keywords: Zheng He's voyages; Ming dynasty goldwork; Gemstone trade; Cross-cultural craftsmanship; Material culture

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1. Introduction

The imperial goldwork of the Ming dynasty (1368–1644), particularly objects sumptuously inlaid with precious stones, is celebrated as a pinnacle of Chinese decorative arts.¹ Artifacts such as the gem-encrusted phoenix crowns (*fengguan*) from imperial tombs epitomize a level of technical virtuosity and opulent visual splendor that is widely regarded as the zenith of a long tradition.² This efflorescence, however, did not occur in isolation. Its most dramatic phase coincided with one of the most ambitious maritime endeavors in pre-modern history: the seven voyages of Admiral Zheng He (1405–1433) across the Indian Ocean. Commissioned by the Yongle Emperor (r. 1403–1424), these expeditions projected Ming power, institutionalized a vast tributary network, and

facilitated extensive long-distance trade.^{3,4}

Previous studies on Ming material culture have produced exemplary analyses of gold and silver wares, meticulously cataloguing forms, styles, and their social symbolism. Yang's¹ foundational work has established the typological and aesthetic frameworks for understanding these objects. Similarly, Clunas² has insightfully decoded the rhetoric of power and prestige embedded in Ming luxury goods. Concurrently, the Zheng He voyages have been extensively debated by historians, with analyses focusing on their political ideology, economic dimensions, and geopolitical impact.^{3,4} More recent studies have begun to reconstruct the specific material and navigational tools of these voyages, providing a clearer picture of the technical and cultural exchange that occurred.⁵ However, a distinct interpretive gap persists between these two robust fields of inquiry. While the voyages are often acknowledged as a backdrop, there has been insufficient systematic effort to connect the macro-historical narrative of maritime expansion to the concrete, micro-level transformation of a specific courtly craft. Precisely, how did the influx of foreign commodities and the encounters with distant artistic traditions directly alter the material composition, technical repertoire, and aesthetic language of the Ming imperial workshop?

This study aims to address this issue. It argues that the Zheng He voyages acted as a direct and dynamic catalyst, fundamentally transforming Ming court goldwork and propelling it to its creative apex. This transformation was dual in nature. First, the expeditions secured an unprecedented and diverse supply of overseas gemstones, which precipitated a decisive aesthetic revolution, shifting elite taste from the subtle, monochromatic elegance associated with jade to a vibrant, polychromatic brilliance centered on rubies, sapphires, and other colored stones. Second, they enabled a crucial technological dialogue with the sophisticated goldsmithing traditions of the Islamic world, particularly evident in the refinement and innovative application of fine filigree (*huasi*, fine wirework) and granulation techniques within Ming workshops. Recent studies emphasize the active role of state-sponsored maritime trade and diplomatic exchange across the Indian Ocean during the early Ming dynasty, situating Zheng He's voyages within broader patterns of cross-regional commodity flows and political control across Asia and Africa.⁶ By tracing the journey of materials and techniques from the Indian Ocean world to the Forbidden City, this paper presents a concrete case of artistic globalization in the early 15th century, contending that the celebrated Ming imperial style was, in significant part, shaped through cross-cultural exchange.

2. Framework and methodology

This study adopted an interdisciplinary methodology integrating historical textual analysis, archaeological evidence, and comparative visual and technical examination. This tripartite approach is designed to triangulate evidence from disparate sources, moving beyond stylistic assumptions to a grounded material historical argument.

First, the research employed close critical reading of the primary historical texts generated by the voyages themselves. The accounts of Ma Huan (*Yingya Shenglan*, The Overall Survey of the Ocean's Shores) and Gong Zhen (*Xiyang Fanguo Zhi*, The Annals of Foreign Countries in the Western Ocean) are treated as fundamental records of observed material culture and trade.^{7,8} These texts are mined not merely for lists of commodities, but for specific descriptions of gemstone sources, local craftsmanship, and the objects acquired as tribute or trade, which provide a documentary baseline for the influx of foreign materials and models.

Second, the analysis is anchored in the material evidence from key Ming archaeological sites. The excavation reports and scientific studies of tombs such as the Dingling Mausoleum of the Wanli Emperor and the Tomb of Prince Liangzhuang are indispensable.⁹⁻¹¹ These sources provide the concrete objects for analysis. Crucially, this study incorporates the results of gemological analyses conducted on these findings, which have identified the geological origins of many stones, thereby offering scientific corroboration for the textual records of long-distance import. The formal and technical analysis of selected artifacts, such as hairpins, crowns, and belt ornaments, forms the core of the visual argument.

Third, the methodology engages in systematic cross-cultural comparison. To assess the nature and extent of technical influence, the construction and decorative techniques of Ming goldwork are compared with contemporaneous metalwork from the Islamic world, notably from regions documented as ports of call for the treasure fleets, such as the Arabian Peninsula and the Timurid Empire.¹²⁻¹⁴ The goal is to identify specific technical parallels and divergences, moving from general resemblance to diagnostic features that suggest transmission, adaptation, or independent development. By interweaving these three strands of evidence, this research framework aims to construct a nuanced narrative that connects the global circulation of goods and knowledge in the early 15th century to the localized, workshop-based innovations that defined a new era in Chinese goldsmithing. Comparable material culture studies demonstrate how

Chinese luxury goods established long-distance exchange networks across the Indian Ocean, functioning as global commodities in early maritime trade systems.¹⁵

3. The pre-voyage baseline: An aesthetic of restraint

Prior to the early Ming dynasty, the aesthetic of Chinese elite goldwork was predominantly defined by the subtle interplay of gold with indigenous materials, primarily jade. This produced a more restrained, tactile beauty rooted in long-standing East Asian traditions.¹ For centuries, the combination of lustrous gold and cool, translucent jade was not merely a decorative choice but a profound cultural statement, embodying concepts of purity, nobility, and eternity. This aesthetic valued the warm glow of the metal and the intrinsic qualities of the stone over dazzling polychromatic effects.¹⁶ This preference was not merely a stylistic convention but was deeply rooted in the moral cosmology of the Confucian elite. In traditional Chinese thought, jade was metaphorically linked to the virtues of the superior man (*junzi*), such as benevolence, rectitude, and wisdom. Gold, while valuable, carried associations of commerce and worldly wealth. Therefore, the marriage of gold and jade in the Song (960–1279 CE) and Yuan (1271–1368 CE) dynasties was a carefully calibrated hierarchy: the metal served the stone. The gold mounting was often kept minimal or worked into matte textures to avoid outshining the unctuous, subtle luster of the jade. To surround a piece of jade with a profusion of glittering, high-refractivity gems would have been considered not just aesthetically garish, but morally suspect, a betrayal of the “inner virtue” that the object was meant to symbolize. Understanding this deep-seated cultural psychology is crucial to appreciating the shock of the transition that followed. The shift to gemstones in the 15th century was not just a change in fashion; it represented a fundamental reorientation of courtly values from the introspection of the scholar-official to the outward-projecting magnificence of an imperial state asserting its global reach.

The craftsmanship of this era reflected this aesthetic focus. Techniques such as hammering, chasing, and repoussé were used to shape the gold and create intricate surface textures, often depicting auspicious motifs like dragons, phoenixes, or floral scrolls. Early forms of filigree were present, but they often served primarily as structural elements or created relatively simple patterns compared to the elaborate constructions that would appear later. The primary artistic goal was to showcase the inherent beauty and form of the materials themselves. In a typical high-quality gold and jade hairpin from the Song or Yuan period, for instance, the goldsmith’s skill would be evident

in the fluid lines of the metalwork that elegantly secured a masterfully carved piece of white jade.¹ The overall impression was one of understated luxury, designed for close appreciation rather than distant spectacle.

An exemplary case is a gold and jade hairpin unearthed from a Yuan dynasty context. In such a piece, a meticulously carved white jade element, perhaps shaped as a bird or a flower, serves as the undeniable focal point. The goldwork, though skillfully executed with sinuous lines and delicate texturing, plays a fundamentally subservient role. Its function is to provide an elegant and secure mount, its warm luster creating a pleasing harmony with the cool tones of the jade. The filigree, if present, tends to form simple scrolls or borders that frame the jade, rather than creating a complex, light-capturing structure in its own right. The overall aesthetic value is derived from this masterful balance of materials and the appreciation of each component’s intrinsic qualities: the tactile smoothness of polished jade and the malleable form of gold. This design philosophy, prioritizing material harmony and sculptural form over optical brilliance, established the baseline of restraint and tactile sophistication. It was precisely this long-standing paradigm that the massive influx of new materials would soon challenge and transform.

4. A maritime catalyst: The treasure fleets and the imperial court

The seven maritime expeditions commanded by Admiral Zheng He were state undertakings of unprecedented scale and ambition.⁴ While their political and diplomatic functions have been extensively analyzed, their role as a colossal engine for the acquisition of global luxuries is unequivocally documented.^{17,18} The famed “treasure ships” (*baochuan*) carried imperial largesse, such as silk and porcelain, to affirm Ming suzerainty. In return, they came back laden with a vast array of tribute and traded goods from polities across Southeast Asia, the Indian subcontinent, the Middle East, and East Africa.^{7,8,19}

Crucially, this systematic procurement was directed by and for the imperial court. The Directorate of Imperial Accoutrements (*Neifu Jianju*) and its associated palace workshops were the ultimate recipients of these exotic commodities, tasked with transforming them into objects befitting the emperor.²⁰ Artisans in these workshops were responsible for creating objects that embodied dynastic power and prestige, a visual rhetoric meticulously analyzed by Clunas.² The Yongle court, in particular, displayed an insatiable appetite for novel and spectacular luxuries to legitimize its rule and affirm the emperor’s cosmic centrality. The voyages, therefore, did not merely bring back curiosities. They established a direct supply

chain that fed a state-sponsored project of magnificent display. To facilitate this transformation, the Ming court restructured its production capabilities. The raw materials brought back by the treasure fleets did not enter a free market; they were funneled directly into the imperial household agencies, specifically the Directorate of Imperial Accoutrements. Within this structure, the Silver Bureau (*Yinzuoju*) played a pivotal role. Unlike the localized workshops of previous dynasties, the *Yinzuoju* under the Yongle and Xuande emperors was a centralized, state-run factory system supervised by powerful eunuchs. These eunuch-supervisors, who were often deeply involved in the maritime logistics of the voyages themselves, ensured a seamless transfer of technological knowledge and materials from the ports to the palace. They mobilized the finest artisans from across the empire, creating a “hothouse” environment where foreign materials (gems) and foreign techniques (filigree models) could be experimented with freely, unrestricted by the cost constraints that limited private commercial workshops. This centralized control explains the rapidity and uniformity of the stylistic shift observed in the archaeological record. The primary chronicles of the voyages read like gemological catalogues: Ma Huan records Java’s abundance of precious stones, while Gong Zhen details Ceylon (Sri Lanka) as a world-renowned emporium producing rubies, sapphires, topaz, and amethyst.^{7,8}

This convergence of a global maritime supply aligned with the institutionalized demand of the court created a unique historical moment. It occurred within a broader context, as Brook²¹ has shown, where early 15th-century Ming China was experiencing a profound expansion in the circulation of goods and ideas, fostering an elite culture with an emergent taste for the foreign and the exquisite. It is within this specific context of state-sponsored maritime acquisition meeting courtly artistic production that the transformation of Ming goldwork must be understood. The stage was set for an unprecedented material and technical revolution.

5. The great transformation I: A material and aesthetic revolution

The textual evidence from the voyages is powerfully corroborated by archaeology. The sheer quantity, chromatic intensity, and scale of imported gems found in Ming princely and imperial tombs dating to the period after the expeditions enabled a dramatic stylistic revolution. The most compelling evidence comes from the tomb of Prince Liangzhuang of the Ming, located in Zhongxiang, Hubei province. The prince, Zhu Zhanji, died in 1441, just eight years after the final voyage of Zheng He’s fleets. His

tomb yielded an astonishing hoard of over 5,300 precious objects, including more than 700 pieces of gold, silver, and jade, and a staggering trove of some 5,000 individual gemstones.^{10,22} Scientific examination of this vast gem hoard confirms that a significant portion of the rubies and sapphires are of Southeast Asian and Sri Lankan origin, perfectly matching the geological profiles of the regions visited by the treasure fleets.²³

Objects such as the spectacular gold belt set with gemstones from the Liangzhuang tomb were no longer isolated marvels but exemplars of a new imperial norm.²² The design prioritizes the gems themselves, with the goldwork serving as a brilliant framework. Dozens of large, deeply colored rubies and sapphires are meticulously arranged in box settings, their collective visual impact creating a glittering mosaic of red and blue. This design represents a radical departure from the pre-voyage aesthetic baseline. If the Yuan hairpin celebrated the singular beauty of jade complemented by gold, the Liangzhuang belt celebrates the collective power of gemstones orchestrated by gold. Here, the individual identity of each stone is subsumed into a larger, vibrant color field. The goldwork’s primary role shifts from being a co-star to becoming a structural grid, a luminous lattice whose main purpose is to manage and present a field of color and light. The aesthetic focus moves from the appreciation of form and texture to the creation of overwhelming optical vibrancy. This is not a quiet dialogue between two materials but a dazzling chorus of many, designed to be seen from a distance and to communicate imperial splendor through sheer chromatic and luminous intensity. The very concept of surface decoration was re-engineered. It was no longer about carving or chasing a surface, but about constructing a surface out of light itself, using gems as tesserae in a mosaic of power. The shift was absolute: from the haptic appreciation of solid, beautiful materials to the optical perception of a brilliant, almost immaterial facade of light.

This new aesthetic, born from the material influx of the early 15th century, became the established standard for the remainder of the dynasty. The magnificent phoenix crowns excavated from the Dingling Mausoleum, the tomb of the Wanli Emperor (d. 1620), represent the culmination of this trend.⁹ On these crowns, hundreds of rubies, sapphires, and pearls are embedded within an intricate filigree structure of kingfisher feathers and golden phoenixes. The design ambition is clear: to create an object of almost supernatural luminosity, a testament to the inexhaustible wealth and global reach of the empire. This shift marks China’s deeper integration into the trans-Eurasian gem trade, a global connection materially encoded into the very fabric of its imperial regalia.

6. The great transformation II: A technical dialogue and synthesis

The impact of Zheng He's voyages extended beyond the provision of materials into the sophisticated realm of technique. The expeditions established direct, sustained contact with the premier goldsmithing centers of the early 15th-century Islamic world, notably Aden and Hormuz, which were vital nodes in a network extending to the Timurid and Mamluk empires.^{7,12} Islamic metalwork of this period was internationally celebrated for its mastery of micro-engineering in gold, particularly its extensive use of filigree and granulation (decoration with tiny soldered gold spheres) to create ethereal, lace-like structures.^{13,24}

The accounts of the voyagers themselves provide suggestive evidence. Ma Huan's famous observation in Aden, that the local artisans produced gold and silver jewelry that was "very exquisite, the best in the world," is more than a traveler's hyperbole; it is a record of recognized technical excellence.⁷ Even more pivotally, Gong Zhen's account from Guli (Calicut) describes its king commissioning a tribute gift for the Ming emperor: a treasure belt made by craftsmen who "make red gold into gold wire and knot it into pieces, and then set it with various gems and pearls".⁸ This passage is crucial, as it explicitly documents the importation of a finished, high-value object employing advanced wire-working techniques. This object would have served as a tangible model of foreign craftsmanship entering the Ming court. Beyond the macroscopic structure of wire weaving, a microscopic revolution was occurring in the form of granulation (*zhazhu*). This technique, involving the soldering of minute gold spheres (often less than 1 mm in diameter) to a background surface, had antecedents in China but reached new heights of precision in the 15th century, mirroring contemporary Timurid and Mamluk metalwork.

The challenge of granulation lies in the colloidal soldering process, joining the tiny spheres without flooding the delicate gaps with solder, which would ruin the texture. Examination of Ming imperial artifacts reveals a sudden mastery of this difficult chemistry. Artisans began using these granules not just as background texture, but to create three-dimensional relief patterns on the petals of flowers or the scales of dragons, a technique directly comparable to the heavy granulation seen on jewelry from the Islamic West. This simultaneous refinement of both the linear art of filigree and the granular aesthetic and micro-engineering of granulation suggests a holistic absorption of the West Asian technical repertoire, transmitted perhaps by the very craftsmen or technical manuals that accompanied the diplomatic gifts recorded in the voyage chronicles.²⁵

This exposure almost certainly triggered a process of technical emulation and adaptation in the imperial workshops. While direct "master-apprentice" proof is elusive, the circumstantial evidence is substantial. A direct comparative analysis between specific objects makes this technical dialogue tangible. Let us consider two contemporaneous examples: a golden phoenix hairpin from the Dingling Mausoleum, representing the pinnacle of Ming imperial craftsmanship, and a typical Mamluk-era gold earring from Egypt or Syria, a region connected to the maritime trade routes.^{9,26} At first glance, the technical kinship is striking. Both objects employ extraordinarily fine wires that are twisted or plaited to form more complex threads, which are then woven into intricate, openwork lace-like patterns. In both traditions, artisans mastered the difficult technique of soldering these minuscule components together to create a strong yet seemingly weightless structure. This shared technical vocabulary, the ability to create complex three-dimensional forms from fine wire mesh, points toward a common pool of advanced goldsmithing knowledge, with which the Chinese artisans demonstrably engaged in the post-voyage era. However, the divergence in their artistic application reveals the true nature of the Ming synthesis. In the Mamluk earring, the filigree is typically used to create abstract geometric compositions, such as interlocking stars, circles, or intricate arabesques of vegetal scrolls.^{13,26} The technique is an end in itself; the aesthetic beauty derives from the mathematical precision and ethereal quality of the abstract pattern. The structure is the art.

The Ming goldsmith, by contrast, marshaled this sophisticated technique for a fundamentally different, representational purpose. On the Dingling phoenix hairpin, the intricate filigree is not used to create an abstract pattern but to construct the three-dimensional, zoomorphic form of the mythical phoenix itself. The fine, woven wires become the bird's feathers, capturing a sense of lightness and texture. The openwork structure allows light to pass through, dematerializing the solid gold into a shimmering apparition. Furthermore, this filigree framework was ingeniously designed to serve as a micro-architecture for securing dozens of tiny rubies and pearls, integrating the new material palette directly into the new technical repertoire. This comparison reveals a process not of imitation, but of brilliant, creative appropriation. Ming artisans recognized the potential of the sophisticated Islamic filigree technique, not to replicate its geometric aesthetic, but to solve a new set of artistic problems posed by their own evolving, gem-centric, and iconographically specific visual culture. They adopted a foreign technical language and used it to tell a distinctively Chinese story.

The delicate gold wire cage-work of hairpins from the mid-Ming period tombs exhibits a preference for complex openwork filigree that resonates strongly with contemporaneous Islamic pieces, while being less prominent in earlier Chinese goldwork.¹ The sudden flourishing and heightened sophistication of the “flower wire” (*huasi*) technique, encompassing the rubbing, pinching, weaving, and plaiting of fine gold wires, during the mid-Ming period, aligns chronologically and stylistically with this new era of maritime contact.²

The process was one of creative synthesis, not slavish imitation. Ming artisans integrated the perceived finesse of Islamic wirework with deep-rooted indigenous preferences for symbolic forms like dragons, phoenixes, and butterflies. The intricate, often geometric fluidity of Islamic filigree was adapted to become the perfect framework to secure and accentuate the brilliant hues of imported stones within traditionally Chinese iconographic schemes. This hybrid technical aesthetic, a fusion of foreign technique and local form, represents the most profound and subtle impact of the global connections forged by the treasure fleets. It was a transformation not just of what materials were used, but of how they were masterfully worked.

7. Conclusion

This study highlights that the widely regarded apex of Ming dynasty imperial goldwork was not a purely indigenous achievement but a creative genesis fueled by global connections. The seven maritime expeditions led by Zheng He acted as a decisive catalyst, fundamentally transforming the craft through two interconnected channels: a material revolution and a technical synthesis. By establishing a direct supply chain from the gem emporiums of Southeast Asia and the Indian Ocean, the voyages introduced an unprecedented quantity and variety of precious stones to the imperial workshops. This influx precipitated a profound aesthetic shift, moving the dominant courtly taste from the restrained, tactile beauty of the traditional gold and jade paradigm to a spectacular, light-filled polychromatic brilliance.

The archaeological evidence from the Tomb of Prince Liangzhuang, with its trove of overseas gems, provides a clear snapshot of this transformation in its nascent stages. This material revolution was paralleled by a technical dialogue. The sustained contact with the advanced goldsmithing centers of the Islamic world, documented in the voyagers' own accounts and evidenced by imported artifacts, spurred a creative adaptation of sophisticated wireworking techniques. Ming artisans did not merely imitate foreign models but integrated the finesse of Islamic filigree with indigenous forms and the newfound abundance of colored gems, creating a vibrant and distinctive hybrid style.

Ultimately, the case of Ming imperial goldwork offers a significant corrective to the notion of Chinese art as a hermetically sealed tradition. It demonstrates that even at the heart of the empire, in the closely guarded workshops of the Forbidden City, artistic creation was dynamically engaged with the wider world. The splendor of a Ming empress's phoenix crown, therefore, tells a story that is both imperial and global. It is a material testament to the ambition of the Yongle court, the courage of the treasure fleets, and the remarkable cross-cultural exchanges that shaped the globalizing aesthetic dynamics of the early modern world. Future research, perhaps focusing on the scientific analysis of more artifacts or tracing the stylistic diffusion to non-imperial workshops, can further illuminate the rich complexities of this maritime genesis.

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