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Urban archaeology in Kaifeng, a capital city of dynastic China: progress and insights

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Abstract

Kaifeng is a well-known ancient capital in Chinese history. However, existing knowledge of its urban history derives primarily from historical documents rather than archaeology. In the last decade, archaeologists, including several authors of this article, have conducted many systematic excavations in Kaifeng city and unearthed large amounts of cultural material. Based on these materials, this article attempts to reconstruct the history of Kaifeng's urban development beyond text, explore the local depositional features and summarize experience of urban archaeology. Our investigation suggests that the urban space of Kaifeng has been continuously used for over 1000 years, while its city boundaries, political core zones and central axis have remained unchanged; the flood deposits make it possible to conduct fieldwork under the "Pompeii premise". Additionally, our experience suggests that a holistic design, applications of multi-disciplinary approach, and coordinating relations with city administrators, constructors and residents are key to successful urban archaeology programs.

Keywords: Urban archaeology, Kaifeng, the Yellow River, dynastic China

1. Introduction

Cities are large, populous, and permanent settlements that emerged alongside the origin and evolution of civilization (Yoffee 2015; Smith 2016). For more than a century, archaeological study of and in cities such as Uruk, Thebes, Mohenjo-Daro, and Tikal, has significantly contributed to expanding our knowledge of roles that urban centers have played in forming early civilizations (Haviland 1970; Jansen 1989; Algaze 2018; Smith 2020). Studies on the capital cities of territorial countries, such as Athens, Rome and London, have also enriched understandings of classical and pre-modern history beyond text documents (Gates 2011; Morel et al. 2017).

Chinese archaeologists have also devoted considerable effort to the study of ancient cities, particularly capital cities. In 1928, at the dawn of modern Chinese archaeology, the first generation of Chinese archaeologists conducted archaeological excavations of Yinxu site at Anyang, the capital city of Shang, ushering in urban archaeology in China (Li 2007). Since then, archaeological work on capitals or similarly important cities has yielded valuable findings at sites such as Erlitou, Zhengzhou, Yanshi, and Anyang Yinxu (Henan sheng wenwu kaogu yanjiusuo 2004; Zhongguo shehui kexueyuan kaogu yanjiusuo 2003, 2013; Zhongguo shehui kexueyuan kaogu yanjiusuo henan di'er gongzuodui 2006).

Compared to the great research attention and fruitful results on early cities in ancient China, archaeological investigations on later, more recent cities in the country, are less well known. There are several reasons for this disparity, but the first, and likely most significant reason, is the relative abundance of textual data on the late historic period, leading studies rooted in material culture to be somewhat discounted. Additionally, many of these historic cities are overlain by modern cities and field excavations are particularly challenging in these settings. Both practical and academic factors have constrained archaeological research of the late historic cities in China.

The city of Kaifeng is a physical manifestation of this circumstance of urban archaeology in China. Kaifeng is a renowned ancient city in Chinese history, having served as the capital or regional center of dynastic China for over a millennium since 10th century AD. During the Northern Song Dynasty (AD 960-1127), Kaifeng, as the capital, reached the zenith of ancient Chinese urban development. However, those above-mentioned constraints have a greater reliance

on historical texts and artwork than on buried physical materials for the study of Kaifeng's urban history. Furthermore, its special hydro-geological conditions, such as the higher water table and the thicker alluvial sediments than other regions, made urban archaeology at Kaifeng lag behind the excavations of other historically significant cities.

In the past decade, archaeologists have conducted numerous systematic excavations in Kaifeng city because of the emergence of favorable factors for excavation, such as the declining water table, the accelerated pace of urban construction, and the increasing amount of attention that both the state and local government have paid to cultural heritage. Based on these newly yielded physical materials, this paper attempts to investigate key issues about Kaifeng's urban history, i.e., how can the recent archaeological excavations inform the reconstruction of Kaifeng's urban layout and its historical transformations beyond historical documents? What insights do the urban archaeology at Kaifeng provide about the depositional feature around the city and its surrounding landscape? How can the experiences and methodologies of urban archaeology in Kaifeng contribute to the global practice of urban archaeology, particularly within the constraints of modern urban settings? By addressing these questions, we aim to provide a nuanced understanding of urban development in Kaifeng and offer methodological reflections for the broader field of urban archaeology.

2. Background

The present-day city of Kaifeng in Henan Province is located on the western edge of the North China Plain (figure 1(a)). Historically, Kaifeng served as the capital of the state Wei (named Daliang) during the Warring States period (475 BC - 221 BC) and the capital of the Later Liang, Later Jin, Later Han, Later Zhou during the Five Dynasties (named Dongdu, AD 907-960), Northern Song (named Dongjing, AD 960-1127) and Jin (named Bianjing, AD 1127-1234) dynasties. During the Yuan (AD 1279-1368), Ming (AD 1368-1644) and Qing (AD 1644-1911) dynasties, Kaifeng (named Bianliang) ceased to be a provincial capital, but remained a key center politically, economically, and culturally in the Central Plains for centuries.

The geomorphological environment around Kaifeng is closely related to the Yellow River. Prior to the 12th century AD, the main channel of the Yellow River flowed from Zhengzhou to the

northeast and into the Bohai Sea. After the 12th century AD, the Yellow River shifted south, bringing it much closer to Kaifeng (figure 1(b)). The flat topography around Kaifeng reduced the river's carrying capacity and caused sediments to be continuously deposited in the river channel and elevate the riverbed, forming the so-called “hanging river on the ground (地上悬河)” landscape in Kaifeng (figure 1(c)). During the Yuan, Ming, and Qing dynasties, Kaifeng was repeatedly flooded by the Yellow River, and the urban area was submerged for multiple times. This unique environmental history has resulted in the cultural remains in Kaifeng city being typically deeply buried beneath the present ground surface, making excavations quite challenging. Therefore, there were no large archaeological excavations within the city until early 1980s. In 1981, facing tough conditions, local archaeologists began conducting surveys and trial excavations within Kaifeng. These pilot investigations confirmed the distribution of the outer and inner walls of the Dongjing city in the Northern Song dynasty as well as the locations of ancient rivers and bridges such as Bianhe, Caihe, and Zhouqiao, and revealed the stratigraphic relationship among the imperial palace in Northern Song, the imperial palace during the Jin dynasty and the palace of Prince Zhou in Ming dynasty (Kaifeng Songcheng kaogudui 1992, 1996; Qiu 1999; Liu 2005). These efforts have laid a solid foundation for us to investigate the urban layout of Kaifeng and its development history over the centuries using the most recent unearthed materials.

3. Urban archaeology at Kaifeng: recent progress

In the last decade, archaeologists have carried out larger and more systematic field excavations within the city of Kaifeng. More than 10 sites with a total area of 25,000 m² have been uncovered. Among them the most clearly dated and defined in nature are the Shuntianmen, Zhouqiao, Xiaosongcheng, Zhou Wangfu, Yongning Junwangfu, Dianyisuo, Datingmenjie, Yulongwan, and Shuanglongxiang sites (figure 1(d)). Several authors of this paper directed or co-directed the excavations of these sites.

3.1 Shuntianmen (Shuntian Gate)

Shuntianmen was the main gate on the western wall of the outer city of Dongjing during the Northern Song dynasty. Local archaeologists discovered the gate site in coring surveys and conducted a trial excavation in early 1980s (Kaifeng songcheng kaogudui, 1992). From 2012 to 2017, we carried out a large-scale survey and excavation project at this site (Henan sheng wenwu kaogu yanjiuyuan and Kaifeng shi wenwu kaogu yanjiusuo 2019). Through the project, the specific location and depth, preservation status, structural layout, and architectural scale of the Shuntianmen site were discerned. The coring survey reveals that the gate site consists of two major parts: a *wengcheng* (瓮城) barbican and a moat. The barbican is composed of the main city gate, the barbican gate, and a rectangle of walls with 160 m north to south and 100 m east to west. The moat is located on the west side of the barbican (figure 2(a) & (b)).

The systematic excavation has recovered archaeological features and artifacts dated to the Five Dynasties and Northern Song dynasties. The Northern Song remains include the main city gate, walls, buildings, ground surfaces, roads, as well as grindings stones, building materials, coins, and so on (figure 2 (c)-(f)). The Five Dynasties remains include walls and roads on the west end of the Yingqiu Gate, along with some bricks. In addition, the excavation also cleared cultural layers from the Jin, Yuan, Ming, and Qing dynasties, among which large amounts of Qing dynasty rural remains were widely distributed, such as courtyards, houses, roads, farmlands, and wells (figure 2(a)).

3.2 Zhouqiao bridge

The Zhouqiao bridge is a landmark across the Bianhe river. It was initially built during the Tang Dynasty (AD 618-907), and repaired or rebuilt in the Jin, Yuan, and Ming dynasties for several times. Since 2018, archaeologists have conducted archaeological excavations at the Zhouqiao site, uncovering an area of 4,000 m², and discovering over 60,000 pieces of various artifacts, including porcelain, pottery, glaze, jade, gold and silver. The most impressive discovery at the site is the huge stone relief sculptures preserved on the Song Dynasty embankment. Engraved with horned horses on waves, cranes, and auspicious clouds, there are three groups of carvings found on each bank (figure 3(f)). The stone relief sculptures at both east and west of the bridge constitute a 100 meter long “scroll” with a total area of 400 m². It is the largest stone relief sculpture dating to the Northern Song dynasty.

In addition, the excavation unearthed remains and artifacts dated to Ming dynasty, including the rebuilt arc bridge, the river deity temple and residential houses (figure 3 (a)-(d)). We have also found several wooden planks at the bottom of the river, suspected to be from shipwrecks. There have also been scattered human skeletal remains found under a layer of silt sediment (figure 3(e)), which presumably indicates a late Ming Dynasty flood that destroyed the city.

3.3 Xiaosongcheng

The site of the Xiaosongcheng is located on the inner side of the western wall of the outer city of Dongjing, about 1 km north of the Shuntianmen site. The archaeological excavation at Xiaosongcheng started in 2020 and has so far unearthed an area of around 500 m² and mainly discovered a section of the Bianhe river and southern embankment along the river (figure 4(a)). The embankment dates to the Five Dynasties and Northern Song dynasty and is roughly 190 m long, with clear traces of wooden and stone structures on the northern side (figure 4(b)&(c)). Many large tree branches, mixed with rammed earth, were placed perpendicular to the embankment, suggesting they were piers being built into the river. In addition, a building foundation, a ditch, and four kilns were unearthed.

A total of more than 400 artifacts of various types were excavated at the site, dating from the Five Dynasties to the Jin-Yuan period. The majority of artifacts were excavated from the cultural layer within the Bianhe river channel and dated to the mid/ late Northern Song dynasty and Jin dynasty. These included a large number of white porcelain pieces, a small number of glazed porcelains, bronze coins, chess pieces, and dice (figure 4 (d)&(e)). Building materials such as bricks and tiles were mainly excavated near the kiln features.

3.4 Zhou Wangfu (The Palace of Prince Zhou)

Zhou Wangfu was the palace of the prince Zhou in Ming dynasty. Most of the site is located beneath the lake in present Longting Park. Archaeologists had conducted extensive surveys and trial excavations in the 1980s, uncovering a large rammed-earth platform, houses, and ponds (figure 5(a)). The excavation revealed that the Zhou Wangfu walls were superimposed on the Jin Dynasty Imperial City's walls and the Imperial palace city of Northern Song Dongjing ([Kaifeng songcheng kaogudui, 1999](#); [Liu 2005](#)). In 2019, archaeologists conducted new excavations with

the Zhou Wangfu and cleared the site of a suspected kiln for firing glazed tiles, and related materials are still being processed (figure 5(b)&(c)).

Artifacts unearthed from Zhou Wangfu include green or blue glazed architectural elements decorated with dragon and chrysanthemum patterns, wooden furniture such as tables, chairs, beds, and windows, as well as over 100 pieces of blue-and-white porcelain, bronze, jade, pottery, and other household items. The shapes of the blue-and-white porcelain include bowls, plates, dishes, vases, and cups. The dragon-pattern decorations and production dates marked on the foot rims help confirming the nature and age of the site (figure 5(d)&(e)).

3.5 Yongning Junwangfu (The mansion of Commandery Prince Yongning)

The Yongning Junwangfu was the mansion of Commandery Prince Yongning, the sixth son of Prince Zhou. Excavations from 2017 to 2018 revealed the middle courtyard, 200 m long from north to south and 115 m wide from east to west. The architectural structure of the mansion is clearly uncovered, composed of the main gate in the south end, the ceremonial gate, the front hall, the back hall, and the rockery garden in the north end (figure 6(a)&(b)).

The site is rich in artifacts, including porcelain, pottery, jade, bronze, gold, silver, iron, tin, wood, bone, shell, pearl, and coral. The porcelain is mainly celadon and is richly decorated. A wooden plaque was unearthed with inscriptions, providing crucial information regarding the nature of the site (figure 6(c)-(j)).

3.6 Dianyisuo (Ceremonial and ritual office for Palace of Prince Zhou)

The site of Dianyisuo is located on the southwest of the Palace of Prince Zhou. Excavated in 2014, it covers an area of 600 m² and only one courtyard was unearthed, including five collapsed house structures with beams, rafters, tiles, and rubbles. The largest single structure sits on top of a pedestal of 0.6 m high and consists of a front hall, a back room, and a western wing-room (figure 7(a)&(b)).

The unearthed artifacts at Dianyisuo include stone and wooden building materials, lacquered wooden furniture, along with bonsai stones, alabaster tea sets, and nautilus cups. Other artifacts include bronze, ironware, pottery and over 90 blue-and-white porcelains with various forms and decorative patterns (figure 7(c)&(d)). All these exquisite artifacts indicate the high status of the

compound owner or user. In addition, the production dates marked on the foot rim of porcelains, plus a wooden seal with the inscription of “Zhou Palace Ceremonial and Ritual Office for Palace of Prince Zhou” (figure 7(e))(Kaifeng shi wenwu kaogu yanjiusuo 2017)

3.7 Datingmenjie (Government Office for Palace of Prince Zhou)

Excavated in 2018, the Datingmenjie site covers an area of around 1700 m² and two courtyards were unearthed. The western one is poorly preserved, so the structure is not clear. The eastern one is better preserved in the traditional quadrangle layout (figure 8(a)). The collapsed brick roof is in a typical gray ceramic texture with decoration of the chrysanthemum pattern (figure 8(b)&(c)); dragon pattern or glazed components are not seen. Inside the house structure, wooden floors and a red lacquer woven mat were identified besides the commonly seen brick floors (figure 8(d)). The largest single building is 17 m from east to west, and 8 m from north to south with a corridor in front and a hut at the back. The large scale of the compound and the high stand of the building show the high rank of the site.

More than 1000 pieces of artifacts were excavated from the Datingmenjie site, including various types of architectural components as well as porcelain, pottery, bronze, stone, and bone tools, plus well-preserved wooden/lacquer wares, such as furniture, carved plates, and plaques. Over 130 pieces of blue-and-white porcelain were excavated, in the form of bowls, plates, dishes, cups, and jars, with a rich decoration and base marks.

Based on the scale and grade of the building structures, the unearthed artifacts, and the geographical location of the site, we speculate that it was a government office affiliated with Palace of Prince Zhou.

3.8 Shuanglongxiang

The Shuanglongxiang site was excavated in 2017 and covers an area of 1450 m². It sits on a platform 1 m above the ground. Two courtyards have been cleaned out. The north courtyard is 48 m from east to west and contains several house structures, ditches and drainage facilities (figure 9(a)); the south courtyard is poorly preserved, with only part of the remnants of the foundation with grooves and walls. Various kinds of artifacts, including porcelain, pottery, bronze, iron, stone, bone, as well as many building components and some wood/lacquer wares, were unearthed (figure (c)&(d)). The household utensils include basic household items such as bowls,

plates, dishes, cups, and jars, offerings such as the Guanyin statue, entertainment items such as go, dice, and chess, and literary items such as inkstones, inkstone drops, seals, clay boxes, and pen holders (figure 9(b)). Compared to other architectural sites, the blue-and-white porcelains from Shuanglongxiang are basically lightly painted, and only a few exquisite ones have year marks on the bottom (figure 9c).

The site is overlain by thick layers of silty clay, likely suggesting the late Ming dynasty floods. The site's function is not clearly known; however, according to its location and scale, as well as the artifacts, it can be surmised that the owner/user of the courtyards were figures with a certain political or economic status, e.g. a local town official or a wealthy merchant. ([Henan daxue lishiwenhua xueyuan & Kaifeng shi wenwu kaogu yanjiusuo 2021](#)).

3.9 Yulongwan

The site of Yulongwan was excavated in 2016 and covers an area of approximately 970 m². The site is mainly composed a single quadrangular courtyard, including a front and a rear yard (figure 10(a)&(c)). No roof tiles were found at the site, leading us to speculate that the building was thatched. The scale and location of the buildings at the Yulongwan site are notably smaller than those of the royal and official sites. Nevertheless, the site is rich in artifacts, including over 3000 pieces of pottery, porcelain, copper, bone, shell, glaze, stone, jade, and wood (figure 10(b)(d)(e)). The porcelains were generally poorly made and exquisite ones were rare. Based on the scale and location of the site and unearthed artifacts, we suggest that Yulongwan was a common residential building, perhaps with a certain commercial use ([Henan sheng wenwu kaogu yanjiuyuan & Kaifeng shi wenwu kaogu yanjiusuo](#)).

4. Discussion

4.1 Kaifeng's city history revealed by urban archaeology

4.1.1 Tang and Five Dynasties (AD 618 – 960)

According to the historical records, Li Mian, the governor of Kaifeng (named Bianzhou at the time) during the Tang dynasty, built a new wall around the city in AD 781. During the Five Dynasties, the imperial palaces of the four dynasties (Later Liang, Later Jin, Later Han, and

Later Zhou) all followed the Tang Bianzhou City office, and the city pattern did not change much after the Tang dynasty.

Due to the depth of the remains and the superimposition of later remains, the urban archaeology of recent years has unearthed very few remains during the Tang and Five Dynasties. Limited archaeological clues come from the excavation at the Shuntianmen site, which suggests that the doorway of the Northern Song Shuntianmen Gate superimposes directly above the Yingqiu Gate foundation of Five Dynasties. In addition, early surveys and trial excavations identified layers of rammed earth with bricks and tiles below the foundation of the inner-city wall of the Northern Song Dynasty, dating back to the Tang Dynasty by subsequent typological analysis. These findings indicate that the scale and geographic range of Kaifeng City had been basically formed during the Tang and Five Dynasties.

4.1.2 The Northern Song (AD 960 – 1127)

As the capital city of the Northern Song dynasty, Kaifeng reached the peak of its urban developmental history. However, the prosperity of the city of Dongjing was primarily reflected in historical documents and artworks, and field-based excavations have yielded very limited material. The recent urban archaeology, however, has revealed the deeply buried Northern Song city of Dongjing from an archaeological perspective. At the Shuntianmen site, we have clarified the location of the outer city wall of Dongjing, explored the architectural structure and ramming-earth techniques of the city gate, revealed the layout of the gate, and discovered a large number of artifacts. At the Zhou Wangfu site, archaeologists discovered a large, rammed earth building base immediately beneath the Ming Dynasty remains, likely the Northern Song imperial palace. At the site of Zhouqiao and the site of Xiaosongcheng, excavations have revealed the remains of the Song dynasty Bianhe river channel and embankment. In particular, the stone relief sculptures on the embankment are a true reproduction of the prosperous scenery of the city center recorded in *Dongjing Menghualu (The Eastern Capital: A Dream of Splendor)*: "Near the two banks of the bridge, there are stone walls engraved with horned horses on waves, water animals, and flying clouds".

Overall, although the majority of the Northern Song Dongjing city remained deeply buried underground, our recent urban archaeological work, supplemented by previous drilling surveys

and trial excavations, as well as the surviving ancient structures on the surface, such as the Iron Pagoda and the Po Pagoda, have provided us a preliminary grasp of the basic framework, overall pattern, and landmark landscape of the city (figure 11).

4.1.3 Jin and Yuan (AD 1127 – 1368)

The decline in political status, warfare, and unfavorable environmental events such as floods, led Kaifeng into a retrogression of urban development during the Jin-Yuan period. Archaeological discoveries of this period have also been few. Limited pieces of evidence include the Jin-Yuan cultural layer at the Shuntianmen site ([Henan sheng wenwu kaogu yanjiuyuan & Kaifeng shi wenwu kaogu yanjiusuo 2019](#)), remains of water conservancy facilities such as the wooden bank and white porcelains at the Zhouqiao site, and several brick kilns at the Xiaosongcheng site. In addition, early archaeological surveys and trial excavations have provided a preliminary grasp of the location of the imperial palace of Bianjing city in Jin dynasty. In general, much more work is to be done to obtain a clearer understanding of Kaifeng during the Jin-Yuan period.

4.1.4 Ming (AD 1368-1644)

At the beginning of the Ming Dynasty, Kaifeng was once the secondary capital of the empire; shortly afterwards, it became the fiefdom of the fifth son (Zhu Meng, with the title of Prince Zhou) of the founding emperor Zhu Yuanzhang. Prince Zhou and his descendants form a large feudal lineage in Kaifeng. The management by the Zhou lineage and the geographical location as a water transport center made Kaifeng recover from the declining state at the end of the Yuan Dynasty.

Archaeological excavations at several Ming Dynasty sites have yielded the most remarkable achievements. Among them, Zhou Wangfu was the palace of Prince Zhou, Yongning Junwangfu was the palace of the son of prince Zhou, Dianyisuo and Datingmenjie were government offices, Shuanglongxang was associated with the upper class, and Yulongwan was a residence for ordinary citizens. These six sites are clearly differentiated in terms of scale, building volume, pedestal height, and building material, forming a remarkable sequence of architectural hierarchy, which in turn visually reflects social classification in Kaifeng during the Ming dynasty. At the Shuntianmen site, excavations have shown that the outer city walls of the Song and Jin dynasties were abandoned by the Ming dynasty, while the gateway continued to be used as a major

transportation route. At Zhouqiao, it is seen that the Ming Dynasty bridge was built directly above the Song dynasty bridge foundation, suggesting that the central axis of Kaifeng City in Ming remained unchanged from that in the Northern Song. All these threads of physical evidence go beyond historical texts, enabling a deeper understanding of the urban layout, architectural style, and social hierarchy of Kaifeng during the Ming dynasty.

4.1.5 Qing (AD 1644 - 1911)

Our urban archaeological work has provided clues for reconstructing the urban development of Kaifeng during the Qing dynasty. The excavation at the Shuntianmen site revealed several courtyards and houses dating to the Qing dynasty, with agricultural tools such as stone grinding pads visible inside the courtyards and farmlands and wells outside (Chen et al. 2022). These findings indicate that the outer city gate, which once served as the boundary between urban and rural Kaifeng during the Northern Song dynasty, had become a small village by this time. Early excavations showed that the Qing dynasty wall was directly overlaid on top of the Ming dynasty wall and has been in use to this day, reflecting that the spatial scale of Kaifeng during the Qing dynasty remained the same as that of the Ming dynasty (Liu 2019). However, fewer archaeological features and artifacts compared to that of Ming indicates the less intensive land use in the urban area during the Qing dynasty.

4.1.6 Beyond texts: archaeological reconstruction of Kaifeng's urban history

The archaeological significance of historical periods, comparing with that of prehistory or proto-history, has been underestimated due to the relative abundance of textual documentation. Our urban archaeology, however, demonstrates that field archaeology remains invaluable for exploring the urban development, even for a city like Kaifeng that is richly documented in historical texts.

Firstly, physical materials from field archaeology corroborates certain accounts found in historical records. For instance, the vividly detailed stone carvings on either side of the Zhouqiao embankment confirm the descriptions found in the *Dongjing Menghualu*, bringing the textual depictions to life. Secondly, the field materials provide substantial supplements to the documentary records, clarifying previously vague accounts. Examples include the perimeter of the Northern Song Dongjing, and the manner and extent to which the Ming Dynasty's Zhou

Wangfu reused the Dongjing urban space. Lastly, the field excavations, particularly on the common residential courtyards such as Yulongwan and Shuanglongxiang, fill the gaps of historical accounts by providing a wealth of information about the lives of ordinary citizens and the social stratification of the time.

4.2 Kaifeng's depositional features revealed by urban archaeology

“City stacking city (城摞城)” is a proverb passed down by residents of Kaifeng and has become one of the most recognizable cultural labels of Kaifeng. However, it is a typical stratigraphic phenomenon for urban remains from various eras to be found stacked on top of each other. What are the unique depositional features in Kaifeng? How can the “city stacking city” be understood archaeologically? And what may be deduced about the intertwined dynamics between the city and its surrounding environment and the Yellow River? Our urban archaeology at Kaifeng offers hints for better comprehending the questions to these issues.

4.2.1 Cultural deposits and the “urban stacking” phenomenon

A distinguishing feature of the cultural deposits at Kaifeng is the continuous usage of urban space over a long period of time. Ancient urban remains are frequently layered beneath modern cities all around the world. Zhengzhou, the current capital of Henan Province and Kaifeng’s neighbor, was nearly entirely built on Zhengzhou Shang City, the capital of early Shang dynasty. However, for nearly 3000 years following the Western Zhou and prior to its modern urban growth, Zhengzhou was neither a capital nor a major regional center, leaving a glaring gap in stratigraphic deposits. Our work at Kaifeng, on the other hand, reveals that the remains of walls, gates, roads and other urban facilities have been found in successive strata since the Five Dynasties period in the tenth century AD, and the remains of high-ranking buildings such as palaces and royal mansions have been found in several historical periods, archaeologically indicating that the city of Kaifeng existed as a capital or regional center for over one thousand years without any significant cultural interruptions in between.

Another stratigraphic feature at Kaifeng is the spatial overlap of the cultural deposits. The Zhouqiao bridge across the Bianhe River and the imperial street in the Northern Song dynasty marks the center and central axis of the capital (figure 11); during the Ming dynasty, the bridge was rebuilt and changed from a flat to an arch shape, but its position remained the same. When

the Bianhe River silted up at the end of the Ming dynasty, the bridge was transformed into a city street; however, it continued to serve as an urban center throughout the Qing dynasty and into present. The overlapping feature is also embodied in the superimposition of the city walls in different periods: the doorway of the Shuntian Gate during the Northern Song Dynasty was superimposed directly on the foundation of the Yinqiu Gate during the Five Dynasties; the Ming and Qing city walls were built on the foundation of the Northern Song and Jin inner-city walls. The Ming-dynasty Prince Zhou's palace city was totally overlaid on the palace city of Dongjing in the Northern Song dynasty. This widely visible superimposed relationship clearly demonstrates the city boundaries (reflected by inner-city walls and gates), political core zones (reflected by the palace cities), and urban center/central axis (reflected by Zhouqiao bridge and Imperial Street) have remained constant for over a millennium since the Five Dynasties.

4.2.2 Flood deposits and "Pompeii Premise"

Another depositional feature in Kaifeng, primarily natural, is the pervasive presence of flood deposits in its strata. According to our geoarchaeological investigation, flood deposits of reddish-brown clay are deposited on top of practically all Ming Dynasty remains, and deposits of yellowish-brown silt with horizontal laminations is vastly discovered above the cultural strata and remains of the Qing dynasty (figure 12). Radiocarbon dating suggests that the two layers of deposits match the two recorded Yellow River floods, which occurred in AD 1642 and 1841, respectively (Storozum et al., 2020). The widespread presence of flood deposits is unusual in an urban setting; it constitutes a unique feature of Kaifeng's strata and provides empirical data for the study of the complicated interactions between the city and its surrounding environment: its flourishing and decline were both closely related to [the Yellow River](#). For urban archaeology, the most significant relevance of flood deposits is, on one hand, they have made cultural deposits generally deeply buried, rendering field excavations extremely difficult; however, on the other hand, they seal the urban scene of a certain period almost intact, making it possible to be uncovered under the condition of the "Pompeii premise" in its true sense. In fact, several recent archaeological discoveries beneath flood deposits in northern and eastern Henan Province ([Jing et al., 1997](#); [Kidder et al. 2012](#); [Storozum et al. 2018](#); [Qin et al., 2019](#)), among others, have clearly suggested that mega river floodplains, including the Yellow River floodplain, may have

very well preserved cultural remains instead of being gap zones of archaeological sites as some pedestrian surveys display (Qin et al., 2022).

4.3 The broader significance of urban archaeology at Kaifeng

In my opinion, urban archaeology has two meanings. One is "archaeology of cities," which emphasizes the archaeological study of spaces and lives of ancient cities as well as their evolutionary processes; the other is "archaeology in cities", which stresses the archaeological practices in modern urban contexts (O'Keeffe 2014; Baugher et al. 2017). Our urban archaeological work in Kaifeng over the past decade has been a targeted investigation of the city *per se* as well as a field practice within a contemporary urban setting *in situ*. Therefore, the expertise gained from our study may be informative for both archaeology of cities and in cities.

Regarding "archaeology of cities", we argue for a holistic design and approach aimed at the constructing the city's spatial and temporal framework. A typical ancient city is several or tens of square kilometers in size, yet a single excavation project can only cover hundreds or thousands of square meters. Therefore, it is vital for each project to clarify the stratigraphic relationship through rigorous fieldwork process and establish its chronological sequence using both relative and absolute dating. Strata, features and artifacts found at separate sites but with common characteristics should be properly documented and incorporated into the local archaeological database and summarized by means of "jigsaw" to determine the urban structure and layout of a certain dynasty or historic period. Through long-term accumulation of findings, it will be possible to establish the development history of the entire city.

Methodologically, we advocate for multidisciplinary collaborations. Multidisciplinary studies have become the basic paradigm in prehistoric archaeology, yet in historic archaeology they are still less incorporated. In our urban archaeology in Kaifeng, we have extensively implemented multidisciplinary methods, substantially expanding the depth and scope of our research. For instance, historical geography studies based on historic documents, local chronicles, and ancient atlases have provided basic background information on the city's layout (Wu and Deng, 2014); geoarchaeological analysis has greatly assisted us in understanding the complex interactions between the city and surrounding natural environments, especially the Yellow River floods (Storozum et al. 2020; Liu et al., 2023); ongoing macro-botanical and stable isotope analyses

have given us a glimpse into the dietary structure of Kaifeng's urban residents during the Ming dynasty; while spatial information science (3D modelling, remote sensing, GIS) has been crucial in the reconstruction of ancient landscapes, the evolution of the urban layout, and the preservation and integration of spatial data of features and artifacts (Chen et al., 2022). Besides, geophysical techniques such as [geomagnetics](#) and [ground-penetrating radar](#) have been scheduled in our work plan to explore the deeper history of Kaifeng, including the Warring States Daliang city.

As for “archaeology in cities,” the key issue is how to cope with the seemingly paradoxical link between urban construction and the excavation and preservation of cultural heritage. This includes securing sufficient excavation space within city settings filled with modern buildings, as well as obtaining ample excavation time under the pressure of municipal construction schedules. A decade of urban archaeological practice at Kaifeng has provided us with experience in tackling these challenges. Our experience implies that archaeologists must cultivate productive relationships with three groups of stakeholders: urban administrators (the government), urban constructors (real estate companies, infrastructure builders, etc.), and urban residents. Archaeologists must connect with administrators to push for support at the policy and finance level. We should coordinate with the constructors to organize survey/excavation plans logically and guarantee sufficient space and time for fieldwork. Archaeologists should also propagate value and significance of cultural heritage to urban residents through public archaeology and enable them to benefit from archaeological excavations and research by constructing cultural facilities like museums, exhibition halls and heritage parks. These experiences have been applied throughout the undergoing excavation of the Zhouqiao site and produced positive effects; they not only mitigate the challenges posed by the modern urban context but also foster a collaborative environment where archaeology and urban development can coexist, contributing to the sustainable conservation of cultural heritage.

5. Conclusion

As one of the capital cities and major regional centers of late dynastic China, Kaifeng has played a key role in China's political, economic, and cultural landscape since at least the Five Dynasties.

The prosperity of Dongjing during the Northern Song dynasty, in particular, left a lasting impression on the collective memory of the Chinese people along with the widespread dissemination of historical documents and artworks such as *Dongjing Menghualu* and the *Qingming Shanghe Tu (Along the River During the Qingming Festival)*. Our urban archaeological excavations and study in Kaifeng provides physical material for the history of the city's evolution from an archaeological perspective and a greater knowledge of the depositional features of Kaifeng both culturally and naturally.

It is expected that as urbanization rates increase globally, archaeologists will increasingly face the challenge of “excavating ancient cities in modern urban settings”. Our urban archaeology presented in this study offers a valuable inquiry and attempt to address this issue from the perspective of overall design, multi-disciplinary approach, and practical application. However, how can the urban history be studied within a broader social and environmental context? What benefits may the thriving multi-disciplinary methods bring to the field-based archaeology? And how do archaeologists reconcile the disparate concerns of urban administrators, constructors, and residents? These issues are yet to be discussed, explored, and practiced by urban archaeologists across the world to find better answers.

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References

Algaze, G. 2018. "Entropic cities: The paradox of urbanism in ancient Mesopotamia." *Current Anthropology* 59: 23–54.

Baughner, S., Appler, D.R., and Moss, W. 2017. "Planning Archaeology in World Cities: Looking at London." In Baughner, S., Appler, D.R., and Moss, W. (eds.), *Urban Archaeology, Municipal Government and Local Planning*. Cham: Springer, pp. 1-16.

Charles Gates. 2011. *Ancient Cities: The Archaeology of Urban Life in the Ancient Near East and Egypt, Greece and Rome*. London: Routledge.

Chen, P. P., Lu, P., Yang, R. X., Storozum, M. J., Zhang, Y. Z., Ge, Q. F., . . . Zhai, H. G. 2020. "3D modeling of the impact of ancient Yellow River floods on urban landscapes: A new look at the late imperial landscape at the Shuntianmen Site of Kaifeng City, Henan Province, China." *Geoarchaeology*. doi:10.1002/gea.21931

- Haviland, W. A. 1970. "Tikal, Guatemala and Mesoamerican urbanism." *World Archaeology* 2(2): 186-198. DOI: 10.1080/00438243.1970.9979473
- Henan daxue lishiwenhua xueyuan 河南大学历史文化学院 and Kaifeng shi wenwu kaogu yanjiusuo 开封市文物考古研究所. 2021. " Henan kaifeng shuanglongxiang mingdai jianzhu yizhi fajue jianbao 河南开封双龙巷明代建筑遗址发掘简报. " *Wenwu* 04: 41-57+1.
- Henan sheng wenwu kaogu yanjiusuo 河南省文物考古研究所. 2004. " Zhengzhou shangcheng waiguocheng de diaocha yu fajue 郑州商城外郭城的调查与发掘. " *Kaogu* 03: 40-50+103+2.
- Henan sheng wenwu kaogu yanjiuyuan 河南省文物考古研究院 and Kaifeng shi wenwu kaogu yanjiusuo 开封市文物考古研究所. 2019. " Henan Kaifeng beisong dongjingcheng shuntianmen yizhi 2012~2017nian kantan fajue jianbao 河南开封顺天门遗址 2012~2017年勘探发掘简报. " *Huaxia kaogu* 01: 13-41.
- Henan sheng wenwu kaogu yanjiuyuan 河南省文物考古研究院 and Kaifeng shi wenwu kaogu yanjiusuo 开封市文物考古研究所. 2019. " Kaifeng yulongwan xiaoqu mingdai jianzhu yizhi de fajue 开封御龙湾小区明代建筑遗址的发掘. " *Huaxia kaogu* 02: 53-80.
- Jansen, M. 1989. Water supply and sewage disposal at Mohenjo-Daro. *World archaeology* 21(2): 177-192.
- Jing, Z., Rapp, G., and Gao, T. 1997. "Geoarchaeological aids in the investigation of Early Shang Civilization on the floodplain of the lower Yellow River, China." *World Archaeology* 29(1): 36–50. doi.org/10.1080/00438243.1997.9980362
- Kaifeng shi wenwu gongzuodui 开封市文物工作队. 2005. " Henan Kaifeng ming zhouwangfu yizhi de chubu kantan yu shijue 河南开封明周王府遗址的初步勘探与试掘. " *Wenwu* 09: 46-58.
- Kaifeng shi wenwu kaogu yanjiusuo 开封市文物考古研究所. 2017. " Henan Kaifeng xinjiekou ming zhouwangfu guanshu yizhi fajue jianbao 河南开封新街口明周王府官署遗址发掘简报. " *Wenwu* 03: 39-72.
- Kaifeng songcheng kaogudui 开封宋城考古队. 1992. " Beisong dongjing waicheng de chubu kantan yu ceshi 北宋东京外城的初步勘探与测试. " *Wenwu* 12: 52-61.
- Kaifeng songcheng kaogudui 开封宋城考古队. 1996. " Beisong dongjing neicheng de chubu kantan yu ceshi 北宋东京内城的初步勘探与测试. " *Wenwu* 05: 67-76.
- Kaifeng songcheng kaogudui 开封宋城考古队. 1999. " Ming zhouwangfu zijincheng de chubu kantan yu fajue.明周王府紫禁城的初步勘探与发掘. " *Wenwu* 09: 46-58.

- Kidder, T. R., Liu, H. W., & Li, M. L. 2012. "Sanyangzhuang: Early farming and a Han settlement preserved beneath Yellow River flood deposits." *Antiquity* 86(331): 30–47. doi.org/10.1017/s0003598x0006244x
- Li Ji 李济. 2007. *Anyang*. Shanghai: Shanghai renmin chubanshe.
- Liu Chunying 刘春迎. 2019. *Kaogu Kaifeng*. Beijing: Kexue chubanshe.
- Liu, D. X., Gu, L., Wu, P. F., Pan, Y. F., & Ma, J. H. 2023. "Sedimentary records of palaeofloods during the late Holocene along the lower Yellow River, China: A comprehensive study based on multi-proxy." *Catena* 220. doi:10.1016/j.catena.2022.106690
- Morel, H., Flatman, J., and Stabler, K. 2017. "Planning Archaeology in World Cities: Looking at London." In Baugher, S., Appler, D.R., and Moss, W. (eds.), *Urban Archaeology, Municipal Government and Local Planning*. Cham: Springer, pp. 17-34.
- O’Keeffe, T. 2014. Urban Archaeology. In: Smith, C. (eds) *Encyclopedia of Global Archaeology*. Springer, New York, NY. doi.org/10.1007/978-1-4419-0465-2_1422
- Qin, Z., Storozum, M., Liu, H., Zhang, X., & Kidder, T. R. 2019. "Investigating environmental changes as the driving force of agricultural intensification in the lower reaches of the Yellow River: A case study at the Sanyangzhuang Site." *Quaternary International* 521: 25–34. doi.org/10.1016/j.quaint.2019.06.033
- Qin, Z., Storozum, M. J., Liu, H., & Kidder, T. R. 2022. "Holocene landscape evolution in northern Henan Province and its implications for archaeological surveys." *Geoarchaeology* 1–15. https://doi.org/10.1002/gea.21938
- Qiu Gang 丘刚. 1999. "Beisong dongjiingcheng yujie yizhi tanxi 北宋东京城御街遗址探析." *Zhongzhou xuekan* 06: 155-157.
- Qiu Gang 丘刚. 1999. "Kaifeng songcheng kaogu shulue 开封宋城考古述略." *Shixue yuekan* 06: 105-108.
- Smith, M. E. 2016. "How can archaeologists identify early cities? Definitions, types, and attributes." In Fernández-Götz, M., and Krausse, D. (eds.), *Eurasia at the Dawn of History: Urbanization and Social Change*. Cambridge: Cambridge University Press, pp. 153–168.
- Storozum, M. J., Qin, Z., Ren, X., Li, H., Cui, Y., Kui, F., and Liu, H. 2018. "The collapse of the North Song Dynasty and the Ad 1048–1128 Yellow River floods: Geoarchaeological evidence from Northern Henan Province, China." *The Holocene* 28(11): 1759–1770.

- Storozum, M. 2020. " Geoarchaeological evidence of the AD 1642 Yellow River flood that destroyed Kaifeng, a former capital of dynastic China. " *Scientific Reports* 10: 3765. doi:10.1038/s41598-020-60169-1.
- Wu Pengfei 吴鹏飞 and Deng Yuna 邓玉娜. 2014. Mingdai Kaifeng zhouwangfu de jianzhu buju ji dui chengshi jiegou de yingxiang 明代开封周王府的建筑布局及对城市结构的影响. *Chengshi shi yanjiu* (30):174-187.
- Yoffee, N. 2015. *The Cambridge World History Vol. III: Early Cities in Comparative Perspective, 4000 BCE–1200CE*. Cambridge: Cambridge University Press.
- Zhongguo shehui kexueyuan kaogu yanjiusuo 中国社会科学院考古研究所. 2003. *Zhongguo Kaoguxue: Xia and Shang*. Beijing: Zhongguo shehui kexue chubanshe.
- Zhongguo shehui kexueyuan kaogu yanjiusuo 中国社会科学院考古研究所. 2013. *Yanshi: erlitou*. Beijing: Kexue chubanshe.
- Zhongguo shehui kexueyuan kaogu yanjiusuo henan di'er gongzuodui 中国社会科学院考古研究所河南第二工作队 . 2006. " Henan yanshi shangcheng gongcheng chi yuan yizhi 河南偃师商城宫城池苑遗址. " *Kaogu* 06:13-31.