The Formation and Early Development of Architecture in Northern China

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Introduction

In China, no ancient buildings survived from before the Tang dynasty (AD 618-907), despite Chinese architecture's long history. The study of architectural history has concentrated solely on extant historical buildings and written documents thanks to China having long traditions of making historical records and textual research. The ancient Chinese documents were attempts at historical records. Their authenticity is not doubted. However, they alone are not enough especially in explaining architectural and technical details. Only from the 1950s, especially after the 1970s, numerous archaeological discoveries have provided dramatic evidence relating to buildings that can be traced back to the Neolithic era.[1] These rich archaeological remains have not only enriched our knowledge of ancient architecture but also confirmed written records. This paper briefly summarises the large body of evidence on the ancient architecture that had long perished. By integrating the available information into coherent data, the paper tries to point out some important issues and attempts to reconstruct an architectural history in an important region of China – the Yellow River valley – one of the main regions where the Chinese civilisation was created. Ample archaeological evidence in this region reveals Northern China to have had its own distinct architectural form from that which prevailed in the Yangzi River valley since Neolithic times.[2] This study, which has been extensive in terms of time and location, does not pretend to be exhaustive. Although it is impossible to reconstruct the successive stages, the paper proposes a hypothetical sequence for the architectural development in the northern region: from caves through pit dwellings to above-ground houses and finally to platform buildings. The paper also suggests relationships between pit-dwellings and platform buildings, and between sunken dwellings (*yaodong*) and courtyard houses.

The origin

What kind of houses did the early Chinese inhabit? We have to accept that architecture alone may never be able to answer this question fully. Before pulling together the strands of archaeological evidence, let us cite the *Meng Zi* (The Book of Master Mencius, 290 BC), which provides us with important clues to the origin of Chinese architecture. The book reads: "building shelters on trees or piles where the land is low (marshy), and constructing caves where the land is high (loess and terrace)." That is to say, two building types emerged from two different physical environments and represented different architectural traditions. The former is the nest type called *chao* (lit. "bird nest") represented by dwellings of Youchao Shi (lit. "the tribe who has nest") who lived at the Yangzi River basin (present Chaoxian, Anhui province); and the latter, cave type, called xue (lit. "cave") represented by dwellings on the loess upland where the Yellow River runs through. Many man-made building remains of both types from prehistoric sites of Hemudu Culture in the south and Yangshao Culture in the north were excavated and appeared to be of equal antiquity.[3] Each type conferred a number of distinct advantages, and each type developed a whole range of variations. An obvious difference between the two systems is the material from which buildings were made. Thus, considering that the tradition of pile dwellings had been the mainstream in southern China, and the earth buildings of northern China have to be viewed as a conscious innovation. Understanding of this point at the outset is critical to an

explanation of the origin of the style of northern China. Surely this beginning determined the direction of an enormous flow of architecture in a style that is completely different from that of southern China. A unique and perhaps the strongest development in the art of architecture is to be found in Northern China.

Pit dwellings

In remote antiquity, people lived by fishing, hunting and gathering. They moved from place to place and rested on trees in summer (*xiachao*) and in caves in winter (*dongxue*).[4] According to the *Huai Nan Zi* (Compendium of Natural Philosophy, 120 BC), Emperor Shun was the first to design buildings to allow his people to move away from caves in about the 22nd century BC.[5] Houses were invented much earlier. What have survived of prehistoric house sites at Banpo (4800-4300 BC), Jiangzhai (4600-4400 BC) and Beishouling (4080-3790 BC), Shaanxi province, reveal that early buildings were mainly roofed semi-subterranean. As observed on the sites, the house boundary was marked by holes where pillars were standing. The dug space was in general about 0.4-0.8m below ground level of that time, which became shallower in the later times. The dwelling early units were circular or square (with round corners) in plan of 4-6m diameter or side rectangular plans of up to a hundred square meters appeared at later dates.

Owing to the development of stone tools and technology, people could live in areas where natural shelters were not available. The archaeological evidence from Banpo, Jiangzhai and Beishouling demonstrates that settlement patterns were characterised by agricultural villages of tribal society. For the settlement pattern analysis at the village level, two archaeological reports are useful: Jiangzhai and Beishouling. The former is especially good, as the excavation revealed almost the entire site. The Banpo site was excavated to half of the area – statistically a population of 50 per cent is quite large in representing the main feature – the building sites and the village pattern were clearly uncovered.[6] More than forty houses were found at Banpo, more than forty houses at Beishouling, and over one hundred and forty houses at Jiangzhai. Hence, enough information was collected to restore the sites to their original plans.

Buildings either round or square, a few of them being comparatively large houses, were erected around an open central square, and this "complex" was surrounded by a big trench. The trench might be the mark of the domain or aimed at preventing wild animals and draining rainwater. It is obvious that these houses belonged to a single tribe as the entrances of the buildings are all facing the central square. In a circular house, there were two inner walls attached to the entrance as an "air lock" to shelter the room from wind and rain (Figure 1). No remains of door leaves were found but there was an earthen threshold to protect against rainwater. Judging from the marks of pillar holes left on the sites and from excavated terracotta building models of that era (Figure 2), the roof would have consisted of an umbrella-like structure of wood plastered with mud, with a skylight to let in light and allow smoke out. An ancient term, zhongliu (lit. "central raindrops"), describes the building's central part, for this is the place where rainwater dropped down.[7] The roof frame might be made by inserting tree trunks or branches into the ground and tying their ends together at the top. The length of the wood in effect limited the roof size and so the building. The umbrella-like roof structure perfectly matches the circular plan. Similar techniques

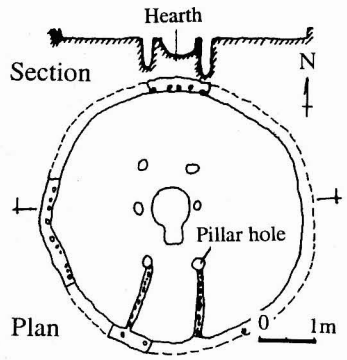

Figure 1 House F3, Banpo, Xi'an

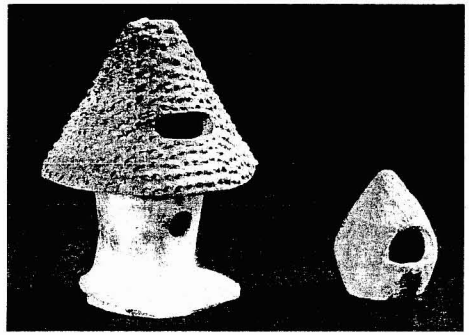

Figure 2 Model houses of clay Neolithic period (Yangshao Culture) Unearthed at Wugong, Shaanxi province

are still in use to build Mongolian yurts.

A square or rectangular house was entered by an inward ramp, and it might be covered by a front-gabled roof similar to that of construction the pyramidal shaped house (Figure 3). Closely examining the inside of building remains, such as F38 and F41 at Banpo, and F1 and F141 at Jiangzhai,[8] it can be seen that the floor on each side of the entrance rises by some 10cm above the ground level defining a space most probably for sleeping. On the opposite side, jars of millet and pots indicated a store area. The cooking place, evidenced by a hearth with a low front wall to keep out the direct blow of wind, was in the middle of the room slightly nearer to the entrance.

The main building materials were earth (*tu*) and wood (*mu*). Hence, *tumu* as a term means building construction, which has been used till the present day. The building remains at Banpo show that the pillars were sunk into the ground by about one meter, indicating that people had knowledge of walling. That is to say, timber-framed earthen buildings set directly on the ground might appear as early as around 4000 BC. Samples of pillar bases, relics of floor surface and remains of roofs or walls, from various building sites of ancient civilisations in northern China have been analysed. According to the laboratory reports, the pillar bases from Banpo and Majia Yao (3300-2050 BC) were made by pounding and compacting a mixture of clay, chalk and gravel. It was also found that floors were covered with a smooth and hard white plaster surface made mainly of powdered ginger-like stone, a type of lime nodule composed of $CaCO_3$ and SiO_2, which is still available in the region. Some floors appeared to have an overlay of mud, straw and sand, and were then levelled with the white plaster so that the floor became flat and smooth. Some surfaces, such as elevated sleeping places, were deliberately treated by burning, and the baked clay made an effective moisture barrier.[9] The building remains at Dahe Cun, Zhengzhou, dating back to about 3000 BC, show that the floors were built by laying a fine sand-mud mortar on the pounded straw-mud base, then igniting it into a continuous surface. It, appearing reddish or brown,[10] looks like modern brick in the form of an integrated structure. This has led to its historical name, namely "terracotta subterranean dwelling" (*taofu taoxue*).[11] Some archaeologists suggested that it could be considered as a direct antecedent of brickwork in China.[12] According to ancient records and archaeological evidence, the floors of imperial buildings were reddish, which might be the vestige of baked floors.[13]

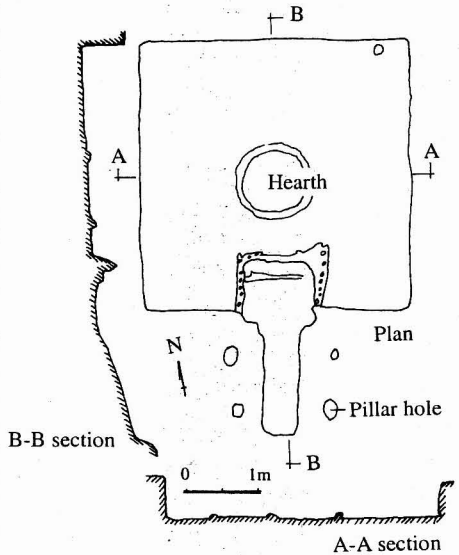

Figure 3 House F13, Banpo, Xi'an

The items on sites did not suggest the use of windows. However, there was an ancient funeral custom relevant to it. It is called *chai xibei fei*, which can be translated into English literally as "pulling down the north-western opening (*fei*)". According to the oldest Chinese dictionary, *Er Ya*, we are almost certain that this opening was a window.[14] The custom was taking wood from the northwest "*fei*" to heat water and to wash the dead body before carrying it out from the opening,[15] after which a commemorative object took the dead person's place. This northwest corner, called *wulou* (lit. "room leaking"), had been reserved for displaying ancestral plate since ancient times until probably the Qin (221-207BC) or the Han (206BC-AD220).

Large houses

The site of house F1 is the best-preserved large house from the first occupation period at Banpo.[16] It is square in plan measuring 10.8m by 10.5m and presumably enclosed by earthen walls embedded with timber pillars. There are four columns in the central part, each 45cm in diameter, to support its roof. The building faces east and is located by the central square in the village settlement. The ethno-archaeological interpretation is that it was a communal house for living, meeting and ceremony.[17]

Another noticeable house is F901 at Dadi Wan (4050-2950 BC), Gansu province, which is elevated by some 80m above the level of the Qingshui riverbed.[18] Some utensils for public uses, such as grain volume-measuring jars and levelling instruments, were found inside the building. This indicates that it was the seat of authority and official residence. Its plan could be restored based on the information obtained from the excavation. The building employs a rectangular plan, approximately 16m by 8m (proportion 2:1) with three doors each of 1.2m width. A small portico is attached to the central entrance. Eighteen external pillars are evenly distributed in front of the house, probably to support a roof over an extended space, which is likely to have been used as a ceremonial and ritual site. The interior space of the building is symmetrically divided: a fireplace, 2.6m in diameter, is located in the centre of the hall. There are five rooms in the rear part and a room at both ends of the building. These rooms might be private sectors used by the chieftain or as storage. Although from such archaeological evidence nothing can be deduced about its architectural appearance, structural reconstruction, an important tool for reasoning, judging and synthesising, can give us some important indications about its physical form. The 2:1 proportion of the building plan shows that the roof might be gabled or hipped (Figure 4). The proportion is pretty typical for hipped roofs. There is in fact some evidence that hipped buildings could have been a development of the late Neolithic times.

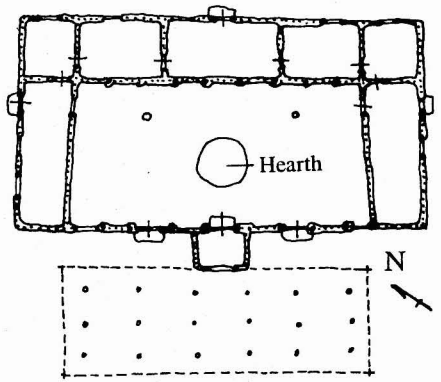

Figure 4 Reconstruction: Large house F901 Dadi Wan, Gansu province

Such a building plan - a front hall and rear rooms - continued and transformed into a general practice. From the Shang dynasty (sixteenth to eleventh centuries BC), this pattern applied to all palatial architecture, and later extended to city planning. In the Warring States period (453-221 BC), it was officially recorded as *mianchao houshi* (lit. "royal court in front and market behind") in the *Kaogong Ji* (Artificer's Record). This merely seemed a confirmation of the historical practice; in fact it was a distillation.[19] It was also equally applied with variations to imperial tombs, some time in the Western Han (206 BC-AD 8).

Courtyard houses

A courtyard house is formed by roofed walls or inward facing buildings on four sides with a main building in the courtyard, typically orientated to the north-south. The courtyard walls certainly meant protection.

Virtually no archaeological remains of the first dynasty, Xia (2070-1600 BC), have come to light. We know about a Xia palace through a written record, *Shi Ji* (Historical Records) compiled by the great historian Sima Qian at the beginning of the first century BC. About new architectural development and building technology, to go on quoting *Zhou Li*: the Xia people established their ancestral temples, and the Yin (Shang) people, their double-eaves buildings with hip roofs.

Between 1959-1964 and 1972-1973, important archaeological excavations of a palace were carried out at Erlitou, Henan province. There is a debate among archaeologists upon the Erlitou palace whether it was made in the Xia or the Shang (or Yin), the second dynasty (1600-1046 BC). The site reveals that the courtyard layout of the palace at the time of the completion of the work dated back to the early Shang, or late Xia.

Located on a vast plain, the plan is characterised by a house within a large enclosed courtyard of 100 by 108m. The house is facing south and sets back toward the north from the geometric centre of the courtyard, leaving a wider forecourt. Although partially damaged, double galleries were clearly identifiable by the pillar bases and stone pieces. They were attached to either side of the courtyard walls and connecting a large gateway and an entrance set up in the south and east portions respectively. The house was built on a rammed-earth platform measuring about 36m by 25m. The house walls were made by compacting earth within frameworks (*banzhu qiang*). Pillar bases discovered at the site inform us that the house had eight longitudinal bays and three transverse bays. The actual size of the building is 30.4m by 11.4m and each bay is a 3.8m-side square. The layout of the building appears to conform with the standard pattern: an audience hall at the front and retiring chambers at the rear. The hall is six by two bays and the living sector has five separated rooms with four flanking bays to either side of the longitudinal axis (Figure 5). The bay number of this house is even. Archaeological discoveries of ancient building sites and existing historical evidence suggest that even numbers were widely used in ancient architecture. A traditional custom related to it: there were two staircases set parallel to each other leading to a main building facing south, the east stairs (*dongdao*) was used for the host, while the west one was for guests. Since ancient times, the host in Chinese has been called Dongdao Zhu (lit. "the host at east stairs"). This term has existed since the Spring-and-Autumn period (722-482 BC).[21] This two-staircase tradition was depicted in Chinese paintings.

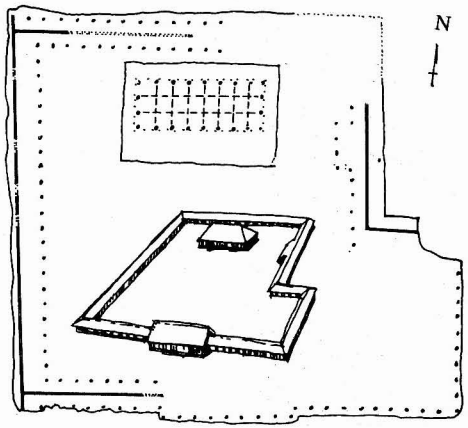

Figure 5 Excavation and reconstruction Courtyard house (ca. 16th C. BC) Erlitou, Henan province

Chinese architecture, no doubt, employed a magical numbering system related to Chinese cosmology. We do not know exactly from when the cosmology was conveyed symbolically in numbers. In Chinese philosophy, everything in the world consists of two aspects: *yin* and *yang*. They are regarded as parts of one thing and complement

each other. In the *Yi Jing* (The Book of Changes, Western Zhou dynasty), we read that the odd numbers represented *yang*, and even numbers *yin*. It is not very clear to us when the change from even number bay to odd number bay started, but we know that it was completed around the sixth century. The imperial encyclopaedia, *Taiping Yulan*, records the palace design in Jiankang:[22] The main hall of the palace has 12 bays to symbolise 12 months. In year 512, it was rebuilt with an additional bay to represent the intercalary month. Jiankang was the capital city of both Western and Eastern Jin (265-419), and the Southern dynasty (420-587), inherited the Wei tradition. Since then, the odd numbering system has been applied in palace design: the main hall of the imperial palace of the Sui and Tang dynasties was 13 bays,[23] the Song and Yuan dynasties 11 bays, the Ming 9 bays, and the Qing 11 bays. The bay number is odd in all extant historical buildings, except libraries.[24]

We understand that the change is much more than mere difference in numbers, but indicates the

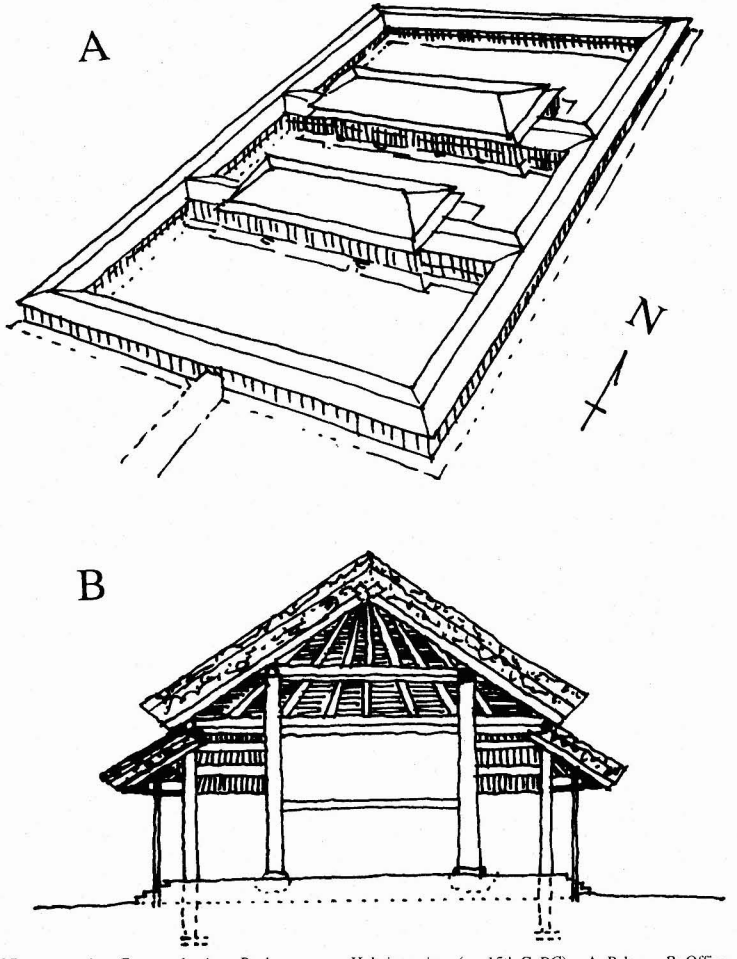

Figure 6 Reconstruction: Courtyard palace Panlo ɪ, Hubei province (ca. 15th C. BC) A: Palace B: Office

establishment of geometric plans with axial lines. We are also conscious that the change was a complex occurrence both in design and planning. The building facing one direction with one conspicuous entrance is a system suitable to main buildings where important ceremonies took place, especially to imperial palaces because the emperor must have sat in the middle of the building and faced in one direction. If the main hall had even bays, there must be a column in front of the emperor to block his frontal view. The arrangement of odd-bayed buildings is a way to emphasise the focus at the centre. With the central column cleared, symmetry was created, and the feeling of powerfulness was added. The centrality of the emperor was acknowledged in architectural design.

Double-eaves buildings

A double-eaves building is one having an additional eaves due to a minor structure built around or attached to the building proper. In the 1970s, a palace site dated back to mid-Shang (around 1500 BC) was excavated by archaeologists at Panlong Cheng, Hubei province. Panlong Cheng reveals fundamental similarities in plan to Zhengzhou Cheng (early Shang) and An'ang (late Shang). Although it was much smaller in size than the others, it indicated the great development of Shang architecture in layouts, forms and techniques. The palace was an enclosed compound of 84m south-north and 60m east-west. The most immediately noticeable feature of the compound was that two centrally located buildings formed three courtyards (Figure 6).[25] From this compound, we can see that the Shang palace matured in three ways in architectural planning, building structures and construction techniques.

The front building of the two was an office whereas the one behind it was a residence. The office was open to provide a good view from and into the interior, except for its back and a small resting room on either side. The rear building was partitioned by solid walls into four separated rooms, each with its own doorway towards the mid- and the back-courtyards. The two buildings were orientated axially north-south and surrounded by a gallery with a small doorway in the front. This layout should be viewed as a development of the pattern of 'front hall and rear room'. In other words, the front hall and the rear room extended to separate buildings lined up on the axis. The axis of the building complex runs north-south functioning as a structural spine, to which all parts are connected. In China, it has been a tradition to build south-facing houses wherever possible to make good use of sunlight giving rise to the ideal that south facing was the most respectable orientation. The overall courtyard is formed by a geometrical gallery, and each courtyard is partitioned and connected by a roofed passageway. The site plan was much more diverse and complex than before. However, it was a kind of intermediate stage from the earlier pattern of one enclosure precinct to the later multiple courtyards. The front courtyard was used entirely for official activities, and the rear courtyard, family activities. The layout expressed the relationships between men and women in general and the social roles of the emperor and the empress in particular: the former governed the front court while the latter managed the domestic domain. Probably, the last application of this principle was the Forbidden City in Beijing. It demonstrates the application of visual symmetry in palace design and city planning.

The marks of pillars arranged in double parallel rows suggest that the official and residential buildings were both surrounded by additional eaves. All pillars, rising from the rammed platform to support the roofs, have gravel footings. The pillar marks at corners suggest that the roof was hipped. The roof and its additional eaves were designed to protect the wall and the platform from rain. This type of building was recorded as the "double-eaves house of the Yin people" in the book *Kaogong Ji*. Many tortoise shells and bronze vessels bearing inscribed or incised depictions of the double-eaves hip house (,) have been preserved to the present day to give picturesque evidence of the architecture.

The *Kaogong Ji* also recorded the rammed-earth techniques in detail. In this palace remains, column footings were prepared by ramming the earth and gravel or crushed terracotta to form

sound foundations. Archaeological excavations also exposed rammed-earth foundations having paved aprons to disperse rainwater at several building sites dating at the earliest to around the 11th century BC.[26]

High-platform buildings

In the early Bronze Age (twenty-first to fifth centuries BC), the architecture was represented by massive structures built upon high platforms in grand scales as recorded in historical documents and literature. Detailed evidence of high-platform buildings was obtained from excavations carried out, for example, in the late 1970s at the site of a Shang city in Zhengzhou, Henan province. It is a remnant of a mid-Shang palace platform of more than 10 meters long and one meter high with pillar bases. The palace itself is not extant. The archaeological evidence together with the vivid depiction of buildings inscribed on tortoise shells () enable us to restore its entire configuration. This building is surmised to have had a solid rammed-earth platform with timber frames built around and upon. The buildings of this type are traditionally called high-platform architecture. This type of architecture appeared only in the Yellow River valley region from the Eastern Zhou (770-476 BC) till the late Warring States (475-221 BC). The yellowish earth blown from the vast Gobi desert in northwest China resulted in the yellow-earth plateau and plain in the middle and lower reaches of the river (present Gansu, Shaanxi, Shanxi and Henan provinces) where the ancients settled. To avoid attack by rain and ground moisture, it was better for the ground floor level to be elevated, as Mozi (468-376 BC) said "building houses upon high platform to avoid excess moisture."[27] The loess is strong enough to bear heavy loads when dry, but excess of water may cause it to expand and even sink or slide under load leading to building collapse. This problem was solved by ramming the earth and paving it. The rammed-earth foundation represents an important development of Chinese architecture in mastering materials. Functionally, the high-platform building offered a way to construct large architecture accorded special significance. Spiritually, the height and size of buildings represented power and wealth as they required large labour forces. The high-platform was also built as a structure of prime military significance to deter the enemy from making attack.[28] Probably that was the reason why this type of building flourished in the second half of the Warring States period. Indeed, literature of this period records numerous magnificent high-platform buildings of incredible height.

Research on structure and construction has established that the high-platform building was made of a number of independent structural units, each self-sufficient with its own roof system integrated with the help of the rammed-earth platform. Strictly speaking, this type of building was a combined earth and timber structure. Due to the actual need for lighting and ventilation, the central part of the complex was usually built upon a higher level than the surroundings. The higher platform also served to add structural stability. Several such terraces might be employed according to the required building size and height. This gave the appearance of a great storied building ensemble. The high-platform buildings must have been quite spectacularly imbued with spatial and symbolic intensity. Architecture found its most monumental expression (Figure 7).

There was a strong desire to build high buildings. To achieve height, the technique of high-platform and timber frame was combined, which was later used to build pagodas of multi-storeys. Written records documented the Yongningsi Pagoda (AD 516): about 100m in height, square in shape, 39m on each side on the ground floor. It was built with a central rammed-earth core reinforced with wooden piles, the upper part of the central core consisted of a cluster of pillars to form a massive mast to support the wooden superstructures and the roof.[29] On the site, all wooden structures have disappeared; only the earth mound has survived since it was first built in the Sui dynasty.[30] We might even speculate that these great buildings became part of an imperial strategy to consolidate central authority, such as the ancient mingtang recorded in the *Li Ji* (Record of Rites, ca. 60 BC) and the *Kaogong Ji*.

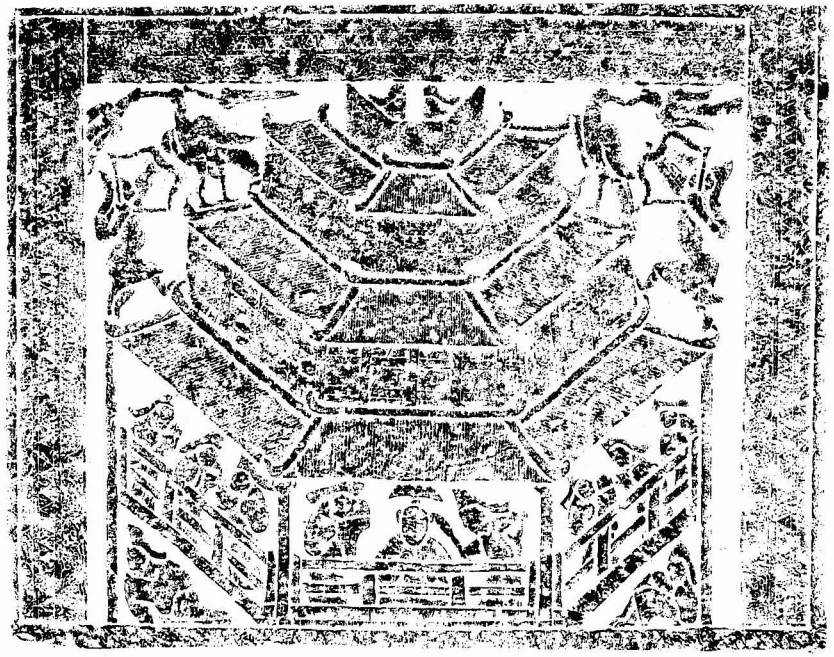

Figure 7 Three-storeyed building rubbing of carved stone from Feixian, Shandong provinve (Han dynasty)

The generic term mingtang refers to the hall of policy promulgation and ritual proclamation for emperors. Structurally, it might be a high-platform building. Mingtang had existed and perished before the Qin dynasty (221-207 BC). The study of the mingtang began as early as the Western Han dynasty and became a special subject, which has continuously attracted scholars both Chinese and non-Chinese not only in the field of the history of Chinese architecture, but also in other disciplines.[31]

The earliest textual record of a mingtang, made by scholars of the Han dynasty, was of the Yellow Emperor's mingtang:[32] it was an open hall with a thatched roof and was enclosed by a fencing wall and a moat. It was approached from the southwest by a covered staircase. The period of the Yellow Emperor was preliterate. It is believed that it was about the 26th century BC. One of the eight legendary ancient emperors, the Yellow Emperor and his tribe had another name documented as "xuanyuan" (lit. 'high cart') to describe their main characteristic feature – having carts and the like for production and war. There are many legendary stories about the Yellow Emperor and his sovereign, having no attempt to treat legend as history though many scholars believe that Chinese myth provides a reliable outline of Chinese history. The Yellow Emperor and his clan, doubtless were more warriors than the others, lived in the loess plateau (present northern part of Shaanxi province). Over a long period, these people ventured along the Wei River, crossed the Yellow River and extended toward the east ranging up to the present Hebei and Liaoning provinces. This tribal community has been considered as nomadic and agricultural. The mingtang was designed for the Yellow Emperor as a place to communicate with Heaven, to pray for a good harvest for his people, and to give thanks. In ancient time, it was essential to struggle against

hunger or starvation, so praying for fertility of soil was an important civil and ritual activity that made the mingtang a centre of power. Buildings of somewhat mingtang features can still be seen today in the Moni Hall of the Longxingsi Temple (1052) and in the Imperial College (Guozi Jian) of the Ming dynasty. The Wumen gate and the main hall of the Forbidden City (1407) are the "modern" representatives of the ancient high-platform architecture. The Longxingsi temple is in Zhengding, Hebei province and the latter two are both in Beijing.

Yaodong: Earth dwellings

Interestingly, many impressive cave-like dwellings are still in use today in the loess plateau. The fine earth, covering more than 530,000 square kilometres, was deposited to a maximum thickness of 200m. Some 40 million Chinese are living in such earth-sheltered dwellings, called yaodong (lit. "heated arched cave"), which dominate the rural area. The earliest man-made arched caves we know so far were found in settlement remains of Yangshao Culture of the middle Neolithic period.[33]

Although the varieties of yaodong are infinite, two types are usually seen in the region: the steep hillside yaodong and the sunken courtyard yaodong. It is said that throughout history there have been two basic ways of house building: either putting one block upon another or making a frame or skeleton to be covered by a skin. This theory is certainly incomplete. The yaodong is a type of arched dwelling without architectural form. It may be semicircular in shape, or parabolic or even nearly pointed. The dimensions of the yaodong vary, but are usually about 8m deep, 3.5m wide and 3.5m high.

The first type, the hillside yaodong, is dug into the vertical face of a loess hill to make arched rooms. In both history and design, the yaodong is a conscious creation based in natural caves. A family may have two or three separated caves for different functions, such as bedroom, kitchen and storage. The facade is established with a doorway, a window and an upper vent. The interior is smoothed with mud plaster except the floor. Dominating the bedroom is a big heated bed, called *kang*, usually located immediately inside and below the window, i.e. the living space is in front and storage to the rear. The *kang* is made of bricks or adobe in the form of a platform with channels underneath. A fire is set at the end of the *kang* and the heat travels through the channels and so warms the top. The *kang* is very important to the yaodong for without it the cave dwellings would not exist and survive from the ancient time. Outside the yaodong, there is a front yard usually defined by walls of dug earth. The courtyard wall gives security and privacy.

The second type, the sunken-courtyard yaodong, appeared in many areas of the loess terrace where the land is flat. Its design might be developed out of pit dwellings; its transition will be discussed below. The sunken courtyard is dug into the ground, often 6-12m by 8-12m in plan and 6-10m deep. Into each face of the yard, two or three caves can be hollowed out (Figure 8). The different caves can be linked creating unique internal spaces. Main rooms are on the northern side of the courtyard facing south to receive more sunlight. A ramp is cut into the courtyard to provide access to the level land above. Very much like the common courtyard houses elsewhere in the country, the yaodong is a secure "walled" compound and consists of one or two courtyards to accommodate a large family. The open pit is particularly important not only because it makes it possible to build rooms but also because it serves as an outdoor living space whenever the weather permits. This type of yaodong requires more labour and time than the hillside yaodong.

From an architectural history view, the yaodong initiated a major architectural principle for constructing an ancient Chinese architecture. The hillside yaodong might be the archetype of arched structures both underground and above ground, such as tombs, bridges and buildings. The sunken courtyard yaodong has a long history, but we are not certain whether it was the prototype of above ground courtyard architecture. Since we can not prove it so far, the question arises, therefore, whether courtyard yaodong and courtyard houses, in fact, link on one architectural chain, or how far the tectonic nature of courtyard yaodong in rural areas is comparable with that of courtyard houses in

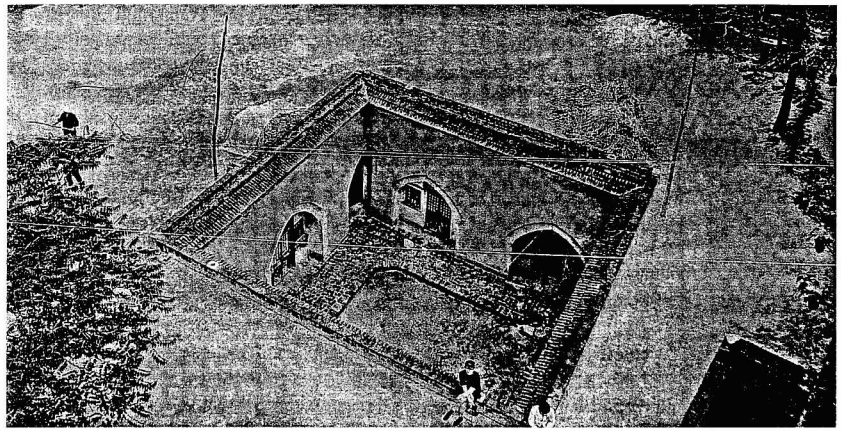

Figure 8 Sunken-courtyard yaodong Sanmenxia, Henan province

urban environments. An interrelationship between courtyard yaodong and the courtyard houses is quite conceivable, though all the intermediate links in the chain are missing.

Conclusion

The sunken-courtyard dwellings appeared as the antithesis of the high-platform building complexes. It is not surprising that one thing leads to the emergence of another, and they are organically related to and influenced by each other. That is, the initial process produces two different aspects: digging a pit into the ground while heaping up a mound. From this historical context of the relationship between the two, it can be surmised that the high platform buildings were generated by pit dwellings. It was natural and logical that the high-platform buildings were developed as a natural consequence out of initial semi-subterranean dwellings, as well as the sunken-courtyard dwellings. The pit dwellings split off at an early date to form two separate types in Chinese architecture: high platform and sunken courtyard, and these two coexisted for a long time.

Technically, huge rammed-earth platforms were difficult to make uniform and flawless. And, in some cases they were subject to disastrous consequences. Archaeological excavations indicated that the high rammed-earth platform of the splendid Hanyuan Hall (remaining plan size: 60m by 21.2m), a high-Tang palace, collapsed together with its long ramps, as recorded when it first occurred in the year 788. It was quickly reconstructed, but collapsed again.[34] Heavy rains, strong winds and earthquakes, as well as soil softening and deformation were responsible.

On the other hand, intensive construction of palace buildings, tombs, bridges and the likes brought together skilled workmen and facilitated development of the building technology. For instance, roofing tiles made of burned clay emerged with the demise of the Warring States. Since then, tiled roof and paved floor appeared in combination. The tradition of rammed-earth platform did not die out, but reduced size accordingly. Hence, a connection existed between declining platform of rammed earth and developing building technology of timber structure. After the Eastern Han, the united country was split up again into separate northern and southern dynasties. With reunification of China by the Sui in 589, the northern and the southern architecture were integrated, and this led to the incorporation of the two systems in architectural design. The architecture became much more diverse and complex than before. Storied buildings of solid timber stepped into its period of true maturity in Northern China in about the eighth century.

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Notes and References

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