

Pagoda as Grottos: Rethinking the Architectural Form of Cave 4 of Maijishan Grottoes

Weixiao Zhang*

The Experimental High School Attached to Beijing Normal University, Beijing 100032, China

*Corresponding author: Weixiao Zhang, Zhangwx2006@outlook.com

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Abstract: This paper mainly explores the architectural form of the interior of Maiji Mountain's Cave 4 and the spiritual realm it establishes. Previous research holds the view that the niche within Cave 4 is architecturally modeled after a tent-like structure. However, after in-depth research, this paper suggests that the niche in Cave 4 is more of an imitation of an embedded stupa, or rather, it reconstructs the stupa in an embedded form within the cave. In prior studies, analysis historical background and architectural details of Cave 4 remains inadequate, thus, this paper aims to take a thorough investigation on this point, and further clarify the significance of the form of the Buddha niche in Cave 4, as well as its construction design origins. Specifically, the octagonal wooden-imitating column, lotus-shaped clamp, inverted lotus pedestal, five lotus petals, and shadow sculptures within the niche, the shallow-relief ceiling and small platform outside the niche, as well as the banana leaf decorations, all suggest that the architectural form Cave 4 imitates is likely a single-story wooden stupa. In this way, the connection that this embedded stupa creates between the Buddha and the faithful, is more direct and intimate, especially compared to the one built in traditional Buddhist activities. Moreover, by coordinating with various visual materials inside the cave, such as the layout of the Dharma assembly and the exquisite details of the Buddha images, it reconstructs the "realm of the mind" in Buddhism, reinforcing the faithful's dual experience both in physical and spiritual fields. The Master Teacher Studio of basic education came into being with the new curriculum reform, which has become a new mechanism for the construction of teaching staff in social situations in China. As a brand-new way in the construction of teaching staff in the new era, through reviewing the relevant research, it is found that the focus of academic circles on Master Teacher Studio is mainly in four aspects: clarifying the conceptual boundary, seeking theoretical support, defining the functional orientation, and exploring status quo of development. The exploration of the research process is not only a process of summary but also a process of reflection. By reviewing relevant research, reflecting on the problems that have appeared in the process of building the Master Teacher Studio in basic education, clarify the development path of the Master Teacher Studio and further affirm its advantages to the construction of teaching staff in the Chinese context.

Keywords: Fourth grotto of Maiji Mountain; Four-gabled pyramid roof structure; Pagoda; One-floor wooden pagoda; Embedded pagoda; Grotto as pagoda; Topography of mind

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1. Introduction

Maijishan Grottoes is located in Qin State, where Tianshui, Gansu province is nowadays. The mountain is named by its unique, wheat, stack-like shape. The Grottoes has 221 caves and niches. Cave 4 was first recorded in an inscription by Xin Yu. It was sponsored by Yunxin Li, the grand commander of Qin State, to commemorate his father's death. The construction of Cave 4 was approximately from 570 B.C.E. to 574 B.C.E. ^[1]. In February 2024, after a field study in Maijishan Grottoes, the author found that the origin of the design of niches in Cave 4 was yet not a consensus between researchers.

The researchers studying Dunhuang Research and Architecture believe that the seven niches of Cave 4 imitate Dou Zhang, an ancient tent-like piece of furniture. Mo Xiao pointed out that the architectural form of Cave 4 imitates a tent ^[2]. He further concluded, based on the description of Dou Zhang in Shiming by Xi Liu, an author from the Han dynasty, that Cave 4 imitates Dou Zhang. Xinian Fu believes that Cave 4 imitates Buddha's Tent. He, however, equates Buddha's Tent with Dou Zhang in his description and believes that Buddha's Tent consisted of elements of Dou Zhang and drapery ^[3]. Researchers, like Jie Wang, Guangqiang Dong, and Yuexin Chen follow the theory of imitating Dou Zhang in their study and some classify Cave 4 based on this hypothesis.

Chunyang Dai, however, proposes a different perspective in his study. He observed the evident difference in thickness between columns in Cave 4 and the excavated rods of tents from Southern and Northern Dynasties. He then pointed out that Cave 4 more likely imitates wooden architecture ^[4].

The author noticed that the theory of imitating Dou Zhang, proposed by both Xiao and Fu, has deficient evidence. Admittedly, the architectural form of Cave 4 is similar to Dou Zhang, but the similarity could also be led by the two objects that imitate the same subject. Furthermore, considering the formality and authority of Cave 4 as a Buddhist architecture, it is less possible that it imitates Dou Zhang, a temporary structure. Henceforth, it is improper to directly equate Cave 4 with Dou Zhang.

2. Doubts about the theory of imitating Dou Zhang

The theory of imitating Dou Zhang is based on the similarity of form between the objects. However, three clear doubts remain. Firstly, Cave 4, as a Buddhist architecture, is unlikely to imitate Dou Zhang as a secular object. Secondly, the formal and authoritative architectural structures in Cave 4 are largely different from Dou Zhang as a common daily use. Thirdly, at the time it was constructed, no evident pagodas existed in and around Cave 4. The second part of the paper will focus on elaborate analysis of these three doubts.

2.1. Drapery on the exterior of niches is not a tent despite their similarity

Dai classified the tent into three distinct categories: the canopy tent, Dou Zhang, and the sleeping tent ^[4,16,17]. Considering the architectural design logic, the seven niches are the core of the cave and are connected with the hip roof hall, which means it is unlikely to use the informal elements of a sleeping tent. Each of the seven niches has nine statues, including one Buddha, two disciples, and six Bodhisattvas. All statues together constitute the scenery of the Buddha preaching the Dharma.

Furthermore, the theme that the niches express is also not consistent with the application scenario of sleeping tents in daily life. Dou Zhang, designed to be a convenient resting space during trips, is mainly for secular daily use ^[4]. Cave 4 is a formal and authoritative space. It includes religious figures like Buddhas and Bodhisattvas and is led and protected by the Thousand Buddha Corridor and hip roof. The designers were

unlikely to place Dou Zhang, a daily use, in the center of the interior of the whole space they worship.

Cave 4 is unlikely to imitate the tents used by nomadic people as well. The design of the square body and the pyramidal roof in Cave 4 is different from the form of the design of nomadic tents in Northern and Western China. The latter, usually being yurts, have quite a distinct round body and cone-shaped roof. Emperor Xiaowen of Northern Wei led the royal family to popularize the Han culture and Buddhism. The trend of nomadic style is not found in the other Grottoes created in the late Southern and Northern Dynasties either. Henceforth, Cave 4 is unlikely to imitate the nomadic tent.

Among the three categories of tents, the canopy tent is the most formal. Yucai Duan notes in *The Rites of Zhou* that “The canopy tent has beams and pillars that can be moved”^[5]. From his note, it is evident that the canopy tent is also a portable, temporary tent-like Dou Zhang, though it has a greater formality. As furniture for daily use, both Dou Zhang and bed-curtain are unlikely to be juxtaposed with architectural elements like the hip roof in Cave 4.


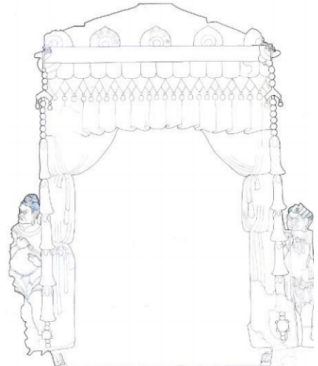
Since the Qin and Han Dynasties China has developed the tradition of decorating palaces and high-end architecture with drapery. “The giant bed-curtain—‘the canopy tent,’ is ‘the tent of the king,’...originated from a palace architecture—the courtyard house”^[4,16].

Being decorated by the canopy tent-like drapery on the exterior does not necessarily mean that the architectural form of the niche itself is a tent. For instance, *Notes to Luoyang Buddhist Temple* writes: “The wooden structures were decorated with silks and fabrics, and the wall was colored in a reddish hue”^[6].

This is a typical description of how wooden architecture in Buddhist temples were decorated with luxurious fabrics. People in central China started to decorate palaces with drapery in the Qin and Han Dynasties. Considering the record in Buddhist monographs, it is highly possible that important palaces and Buddhist architectures were still decorated with drapery in the late Northern Dynasty.

The existence of drapery decorations in ancient Buddhist architecture could also be proven by relics. The top of the tenth stele in niches at the North Wall of Tian Tong Cave and Cave 133 No.10, Maijishan Grottoes depicts a wooden architecture with a hip roof, which is decorated with elaborate drapery. The time Cave 4 was created is close to the time *Notes to Luoyang Buddhist Temple* was written. The drapery relief on the exterior of the niches in Cave 4 could also intend to be a company with a kind of wooden architecture.

Table 1. Comparison between drapery decorated Buddhist architecture from the Northern Zhou Dynasty and the Western Wei Dynasty

Grottoes	Drapery on statue tablet in Cave 133, Maijishan Grottoes, Western Wei Dynasty ^[7]	Drapery on the exterior of niches in Cave 4, Maijishan Grottoes, Northern Zhou Dynasty ^[8]
Pattern of drapery		

Henceforth, the author hypothesizes that Cave 4 might imitate an important Buddhist wooden architecture from the late Northern Wei Dynasty, rather than imitating the sleeping tent, Dou Zhang, the canopy tent, and nomadic tents.

2.2. The architectural logical mismatch of niches as the heart of the cave and the temporality of Dou Zhang

Researchers widely recognize that niches in Cave 4 imitate the look and structure of Dou Zhang after the late Northern Wei Dynasty. From the perspective of architectural logic, however, Buddhist architecture is not likely to imitate Dou Zhang which has a temporary use. Furthermore, as a daily use, Dou Zhang does not match the high status of the hip roof as a common element of the royal palace.

Dou Zhang is a seated canopy, widely used by the emperor, officers, and the general public ^[4,17]. Xinian Fu proposes that Cave 3 could be the corridor towards Cave 4 before it got corrupted. It has stone reliefs of thousand Buddhas and stone walls, which is similar to Cave 168. It is also widely known that Cave 3 and Cave 4 were constructed in the same period ^[9].

The Thousand Buddha Corridor in Cave 3 and the hip roof hall of Cave 4 together create a lead-in to Cave 4. From the perspective of worshippers, who experienced the whole space, the massive lead-in created by the corridor and the hip roof hall implies the importance of the elements behind them. The hip roof hall, hidden behind Cave 3, is an important component of the whole system, while the niches behind the hall are the heart of the caves.

The application of the hip roof represents the highest status in the system of ancient Chinese architecture and usually appears in the main hall of royal palaces and temples. The Buddha Hall of Cave 4 applies a permanent and high-status form and includes a hip roof, seven bays, and eight columns. The tents, however, usually represent temporality. The designers had no reason to lead the audience to Dou Zhang, a temporary daily use, with architectures of the highest status.

Henceforth, the author believes that the high-status elements of Cave 4, including the elaborate Thousand Buddha Corridor and the hip roof Buddha Hall, are more reasonable to lead the audience to a high-status Buddhist architecture with drapery decoration and form an architectural system consistent in status and purpose.

2.3. The mismatch of the eastward evolution progress of the pagoda and the missing pagoda during the creation of Cave 4

Throughout the development of Buddhism, pagodas have always been the heart of temples from the Eastern Han Dynasty to the Tang Dynasty. In the early Northern Wei Dynasty, the center pillar was still the core element of Grottoes.

Pagoda, the symbol of Shakyamuni, is of high standing in Buddhist worship. In ritual, it is also the center of contemplation, prayer, and chanting for early Buddhists. Circumambulation around pagodas is the key ritual in early Buddhism. At the time, Buddhists believed pagodas to be of supreme importance and irreplaceable in their belief. Pagodas had always been the center of temples and were widely built by Buddhists since Ashoka converted to Buddhism, to the transmission of Buddhism in China from the Eastern Han Dynasty to the Northern Wei Dynasty. Both pagodas in Yongning Temple and Songyue Temple are in the center of the temple they belong to. Pagodas were still one of the central architectures in these temples until the Tang Dynasty. The greatest pagodas created in the Tang Dynasty, including Great Wild Goose Pagoda, Small Wild Goose Pagoda,

and the pagoda in Huayan Monastery, are all located in the center of the temples' plans.

Considering the location of Maijishan Grottoes as the place of worship and of famous monks like Xuangao practiced Buddhism, sponsors and major designers of Cave 4 could barely ignore the pagoda in composition ^[6]. No records mention that the designers used the body of the pyramidal-like mountain as a symbol of the pagoda either.

Ignoring the pagoda in the design of Cave 4 is unreasonable, for the architecture was the heart of Buddhist worship at the time Cave 4 was created. Considering the importance of pagodas and the development of Buddhism in the Northern Zhou Dynasty, the pagoda might be added in another unique form despite its seeming absence in Cave 4.

In the early transmission of Buddhism in China, the pagodas were mainly mchod-rten, the center pillar pagodas, and pavilion-style pagodas. Considering the imitation of the wooden structure in Cave 4, the hidden pagoda in Cave 4 might be a pseudo-timber structural pavilion-style pagoda.

3. The similarity between the niches of Cave 4 and the pseudo-timber structural pagodas before late Southern and Northern Dynasties

The similarity between Cave 4 and the existing wooden pavilion-style pagodas must be recognized if Cave 4 imitates the designs of these wooden pavilion-style pagodas.

The existing pavilion-style pagodas created from the Western Han Dynasty to the late Southern and Northern Dynasties includes: the stone-carved pseudo-timber structural Buddha pagoda sponsored by Cao Tiandu in Shuozhou, Shanxi, originally built in the first year of the Tian'an era of the Northern Wei Dynasty (466 AD), the Xiuding Temple Pagoda in Anyang, Henan, which was originally built in the 18th year of the Taihe era of the Northern Wei Dynasty (494 AD) and was rebuilt during the Tang Dynasty, the nine-story wooden pagoda of Yongning Temple in Luoyang, Henan, built in the first year of the Xiping era of the Northern Wei Dynasty (516 AD), the nine-story stone-carved pseudo-timber structural pagoda at the Yungang Grottoes in Datong, Shanxi, which dates from 386 to 534 AD, the three-story pseudo-timber structural pagoda on the west wall of the main chamber of Cave 14 at the Yungang Grottoes in Datong, Shanxi, from the Northern Wei Dynasty (386–494 AD), and the three-story Northern Wei pagoda in the Jataka of Vessantara mural at Cave 254 of the Mogao Grottoes in Dunhuang, Gansu, from the Northern Wei period. These preserved pagodas have several similarities with the architectural form of Cave 4. The comparison is shown in the table below.

Table 2. Comparison of characteristics of architectural forms between pavilion-style pagodas from the Han Dynasty to Southern and Northern Dynasties and Cave 4 at Maijishan Grottoes

Comparison of characteristics	Pavilion-style pagodas from the Han Dynasty to the Southern and Northern Dynasties	Cave 4, Maijishan Grottoes
Shape of body	Mostly with square body	square body niches
Number of story	Mainly with odd numbers of stories, such as single-story, three-story, five-story, seven-story, or nine-story pagodas	Single-story niches
Pseudo-timber structure	Mostly pseudo-timber structure pagodas	Pseudo-timber structure style
roof	Mostly pyramidal roof	Pyramidal roof

The comparison shows that there are four evident similarities between the architectural form of niches in

Cave 4 and the existing pseudo-timber structural pagoda: the square body, the odd number story, the imitation of the wooden structure, and the top of the pyramidal roof. The similarities lead to reconsidering the relationship between Grottoes and pagodas. The author believes that Cave 4 may imitate the single-story square wooden pavilion-style pagoda.

The Xi'an Museum has several collections of existing steles of niches created in the Northern Zhou Dynasty, most of them decorated with drapery. In the Kangxi Dictionary, one of the meanings of the character of niche is pagoda or the room under pagoda. In **Figure 1**, the museum also preserves a pavilion-style pagoda from the Northern Wei Dynasty, which has a square body, drapery decoration, imitation of octagonal wooden columns, and a top that looks like a hip roof or pyramidal roof. In **Figure 2**, the case is quite similar to the architectural form of Cave 4. It is highly possible for these steles of niches to be imitations of the pagodas with drapery created in the Northern Zhou Dynasty.



Figure 1. The statue tablet of Buddhist niche from the Northern Zhou Dynasty (Source: Xi'an Museum)



Figure 2. The pavilion-style statue pagoda from the Northern Wei Dynasty (Source: Xi'an Museum)

The steles of pagodas created in the Northern Wei Dynasty, excavated in Xi'an also support the hypothesis that Cave 4 imitates the single-story wooden pagoda with drapery.

4. Pagoda as Grottoes: a hypothesis to the origin of the architectural form of the niches

Although Cave 4 does not follow the common sense of Buddhist architectural design and has no evident central pillar or pagoda, its form is similar to that of the pavilion-style pagodas, created during and before the Southern and Northern Dynasties. Some characteristics of pagodas might be preserved in Grottoes.

Sicheng Liang points out that the common form of the Chinese wooden pagoda was formed in the Southern and Northern Dynasties after being transmitted to China. It is a pity that none of the cases are preserved in China, but the Kofukuji five-story pagoda, the center pillar in the caves of Yungang Grottoes, and pagodas in murals in Mogao Grottoes all can represent this kind of pagoda. Another important clue is that all pagodas created between the Wei Dynasty and Kaiyuan and Tianbao era in the Tang Dynasty—except Songyue Temple—have square bodies ^[10].

Based on Liang's research and the existing pagodas created before the Northern Dynasty, the author hypothesizes that the wooden pavilion-style pagoda with the square body was once a major form of pagodas in the late Southern and Northern Dynasties. The Songyue Pagoda's body reliefs, the independent single-story pagoda behind the Songyue Pagoda from the Northern Wei Dynasty, the stone-carved single-layer pagoda in the Great Buddha Cave of Xiangtangshan from the Northern Qi Dynasty, as well as those found in the Subashi Great Buddha Temple in Xinjiang, Maolsari Temple Ruins, Rawak Buddha Temple in Lop County, and the single-story pagodas seen on the walls of Yungang Grottoes and Tianlongshan reliefs, all prove that the single-story pagoda has existed widely in and before the late Northern Zhou Dynasty. The funerary function of the single-story pagodas may have continued from the parinirvana of Shakyamuni until after the Tang Dynasty. Yunxin Li, in memory of his father, adopted the architectural form of a single-story pagoda in Cave 4, which aligns with this Buddhist tradition. Thus, the design of the niches in Cave 4 is likely to imitate a single-story wooden pagoda, decorated with curtains, rather than a dugong structure.

Why does Cave 4 not have an evident appearance of a pagoda? Considering that the earliest Western Wei Grottoes at Maijishan were influenced by the construction of Yungang and Longmen Grottoes. Before the relocation of the Northern Wei capital, Yungang Grottoes achieved the innovation of separating the main Buddha statue from the pagoda; the Binyang Central Cave at the Longmen Grottoes makes evident the disappearance of the main pagoda, shifting the focus from worshipping the pagoda to prostrating before the main Buddha statue. The designers of the cave temples attempted to represent the top of the pagoda with a lotus at the top, subtly implying that the cave is the pagoda to the believers. This idea may have not only influenced the Grottoes around Longmen Grottoes but also extended westward to influence the Mogao Grottoes and Maijishan Grottoes. Cave 4 likely achieved the effect of a pagoda as a grotto through the architectural elements and details of a single-story wooden pagoda.

5. Pagodas as the heart of Buddhist culture

During the eastward transmission of the pagoda from India, the initial form of the open-air stupa in India evolved into various forms in China's Western Regions, including the open-air stupa, the central pillar-style pagoda within Grottoes, and the sinicized multi-storied pagoda. From the early Northern Wei period and before, up to the Kaiyuan Tianbao era of the Tang Dynasty, pagodas, as symbols of Shakyamuni, consistently occupied the central position in Buddhist temples.

The author previously questioned the absence of an evident pagoda in Cave 4 of Maijishan. This problem was resolved under the premise that Cave 4 mimics a single-story wooden pagoda: the seven Buddha niches in Cave 4 have already served the function and significance of an embedded pagoda, thus eliminating the need for an additional one.

As previously stated, the importance and rank of Dou Zhang and the hip roof do not match, and the

temporary nature of the canopy tent is also incompatible with the permanence of the hip roof. However, the high status and permanent nature of the pagoda and hip roof are perfectly aligned. The Thousand Buddha Corridor and the hip roof in Cave 3 serve as a prelude, leading to the core of Cave 4's architectural complex—the most important building in Buddhism—the pagoda, whose significance justifies the placement of the hip roof at the forefront. The purpose of constructing the hip roof is to highlight the importance and high rank of the embedded pagoda. This arrangement of hierarchy and sequence is consistent with Buddhist and architectural logic and explains the grand approach of the architectural lead-in.

Therefore, the embedded pagoda within the niches of Cave 4, which mimics a single-story wooden pagoda, is likely the fundamental reason and purpose for the construction of the grand hip roof. Only a pagoda deserves such an exalted status. The embedded pagoda within the niches of Cave 4—serving as the pagoda within the cave—enjoys a central position within the architectural complex of Cave 4.

6. The effect of grottoes as pagodas in mind topography

The design of the embedded pagoda significantly enhances the devotees' inner veneration of the Buddha and their resonance with the topography of the mind, marking a significant innovation in Buddhist architecture. The embedded pagoda realizes the concept of pagodas as grottoes, further practicing the belief that the cave itself could represent a pagoda. During the Northern Wei Dynasty, Mahayana Buddhism began to worship colossal Buddha statues, leading to the innovation in the Binyang Middle Cave at Longmen Grottoes, where a large lotus at the top replaced the central pillar pagoda to represent the top; in the Mogao Grottoes, the domed ceiling replaced the central pillar pagoda to represent the top, and at Maijishan, the pyramidal roof with five lotus carvings also represented the top of the wooden pagoda.

This concept may have originated from the Yungang and Longmen Grottoes and influenced the surrounding Grottoes, as well as the Mogao Grottoes and Maijishan Grottoes. In this phase, the pagoda's disappearance facilitated the realization of the design philosophy that the cave is the pagoda, leading to a flourishing of diverse interpretations. The architectural language of different pagoda tops explained the embedded pagoda design concept of the pagoda as grottoes to the devotees, thereby achieving the concept that the cave is the pagoda.

Compared to the distant traditional circumambulation around the pagoda, the design of the pagoda as a grotto allows devotees to be within the pagoda, venerating the Buddhas such as Shakyamuni and the Seven Buddhas as close as possible. Through exquisite, thin, sculpted murals with life-like details, the iconographic layout of one Buddha, two disciples and six bodhisattvas, the symbolic design of the embedded pagoda, the exquisite craftsmanship of decorative curtains, the existing main Buddha and bodhisattva mudras within the cave, and the scenes of flying apsaras and deities attending gatherings in the murals inside and outside the cave, the designers and craftsmen of Cave 4 collectively depicted the domain of the Seven Buddhas' teachings or Shakyamuni's seven teachings. This promotes spiritual and mental communication between the devotees and the Buddha in the same space. The design has a psychological impact on the devotees that far exceeds the traditional form of circumambulation, bringing them closer to the divine, and achieving a powerful reconstruction of the mind topography.

Through its architectural language, unlike traditional outdoor stupas, cave central pillar pagodas, and ordinary multi-story pagodas, the embedded pagoda conveys the message that “the cave is the pagoda” and “the devotees are with the Buddha.” This started a new phase in Buddhist architecture. The design allows devotees

to communicate with the Buddha within the pagoda, which is of great significance.

At the end of the Northern Zhou Dynasty, Buddhist architectural designers and craftsmen in the Qin State ingeniously innovated the interpretation of pagodas as Grottoes in Cave 4 of Maijishan, leaving behind a valuable Buddhist and artistic legacy for future generations. The author will detail the architectural language of Cave 4 in the following text to further substantiate the hypothesis that the architectural form of the niches in Cave 4 imitates a single-story wooden pagoda.

7. The similarity between architectural elements in the interior of niches and the single-story wooden pagoda

The interior of the niches of Cave 4 has unique designs: octagonal columns, column bases with overturned lotus motifs, painted wooden joints, three layers of shallow relief on the walls, and the five overturned lotuses on the top. These architectural elements are not random decorations, but the necessary expression to construct an embedded pagoda in the cave.

7.1. Octagonal columns

The stone-core clay sculpture, imitating wooden octagonal columns, is one of the typical characteristics of Cave 4, which some researchers have taken to be the supporting evidence of the theory of the imitated Dou Zhang.

However, Dai pointed out in his paper that the diameter of the rods of Dou Zhang excavation is usually only 2–3 cm, while the dimension of octagonal columns in Cave 4 is much greater. This implies the distant relationship between the two designs. Moreover, the octagonal columns and their bases in the interior of niches (**Figure 3**) are consistent with the octagonal columns in the outside Buddha hall with a hip roof, which means the columns in the interior of niches are more likely to be imitation of wooden architectures that match the hip roof hall well rather than Dou Zhang^[4,22].

Sicheng Liang believes that the octagonal shape and the gradual shrinking dimension from the bottom to the top of the columns in grottoes created in the Northern Wei and Northern Qi Dynasties accurately imitate the shape of contemporary wooden columns^[10].

Both the Northern Zhou and Northern Qi Dynasties preserved the style and core techniques of architecture of the Northern Wei Dynasty. After the relocation of the capital of Northern Wei, Buddhists in Maijishan were also affected by Pingcheng, Luoyang, and Changan where Buddhism thrived the most. Stone octagonal columns in the Great Buddha Cave at Xiangtangshan Grottoes, which imitate wooden octagonal columns, were created at the same time as Cave 4's creation and have various similarities with octagonal columns in Cave 4. The octagonal columns in the Great Buddha Cave at Xiangtangshan Grottoes offered reference to stone-core clay sculpture imitating wooden octagonal columns in Cave 4; this implies that the octagonal columns in niches aim to imitate the octagonal columns in wooden Buddhist architecture. The preserved great octagonal columns in the central Buddha hall of Jokhang Temple created in the Tang Dynasty show how common it was that the octagonal columns were used in Buddhist architecture.

The stone-core clay sculpture imitating wooden octagonal columns of niches in Cave 4 is more symbolic while the octagonal columns in the Great Buddha Cave have a more realistic style. Considering the size, these columns are more reasonably an imitation of the wooden architecture rather than the removable Dou Zhang.

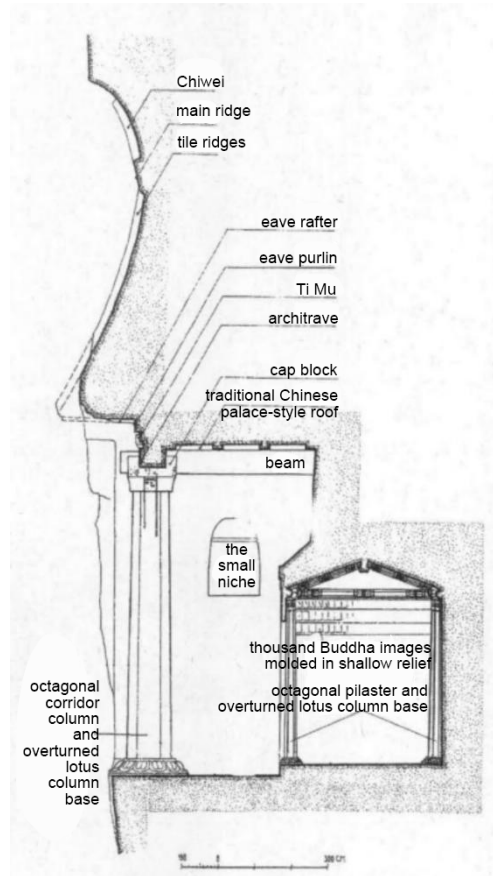

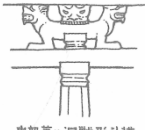




Figure 3. The long section of Cave 4 (Source: Dunhuang Research, 2013(2): 22)

Table 3. Octagonal columns in grottoes from the late Northern Dynasty

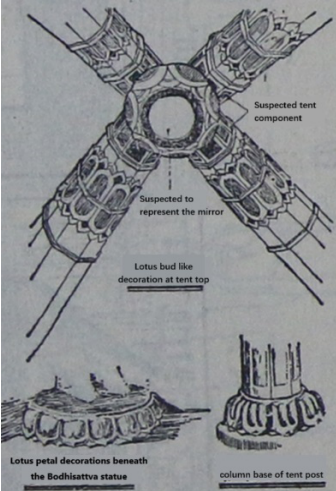
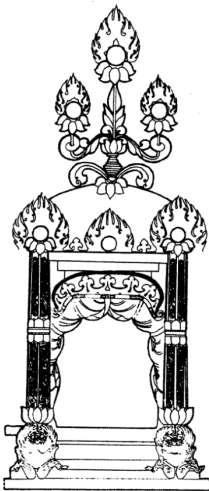
Name of the Cave	Cave 4, Maijishan Grottoes, by the author	Cave 8, Yungang Grottoes, by Sicheng Liang ^[10]	Shaka Cave, Xiangtangshan Grottoes ^[11]
Imitated wooden octagonal columns		 <p>中部第八洞 斗拱形斗拱 DOUBLE-LION 'TOU-KUNG' PERSIAN INFLUENCE</p>  <p>中部第八洞 伊昂式柱 'IONIC' CAPITAL GREEK INFLUENCE</p>	

Considering both the columns of the hip roof and in the niches, and the purpose of the overall architectural style, the author believes that the octagonal columns in the niches of Cave 4 are imitations of columns of wooden Buddhist architecture in the Northern Zhou Dynasty rather than rods of Dou Zhang.

7.2. Lotus-shaped bands

The octagonal pillars within the niche of Cave 4 at Maijishan Grottoes are adorned with lotus-shaped band decorations, which, despite weathering, remain distinctly visible and recognizable in their patterns and forms. Such lotus-shaped bands are not only found in Cave 4 but are also commonly seen in the construction of other pagodas and Buddhist temples. For instance, similar lotus-shaped bands are carved on the pillars of the Great Buddha Cave Pagoda at Xiangtangshan, as well as in Caves 1 and 2 of Southern Xiangtangshan, and Caves 2 and 3 on the Eastern Peak of Tianlongshan.

Table 4. Lotus-shaped bands in late Northern Dynasty

Name of the cave	Cave 4, Maijishan Grottoes ^[9]	Great Buddha Cave, Xiangtangshan Grottoes ^[12]
Lotus-shaped Band		

It is also recorded in the architectural history of the Northern Dynasty that the wooden joints are very similar to lotus-shaped bands in Cave 4 (Figure 4) ^[7].

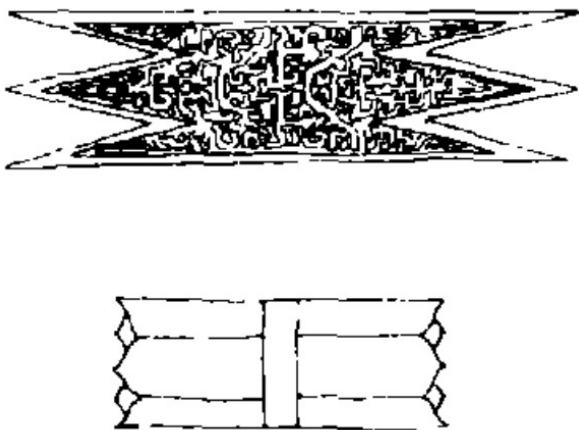


Figure 4. The golden normal bands and lotus-shaped bands

Although it cannot be completely concluded that the lotus-shaped bands are an imitation of wooden joints based on their application, the similarity between them still supports the hypothesis that the niches of Cave 4

imitate wooden Buddhist architecture.

7.3. Stone column bases in an overturned lotus pattern

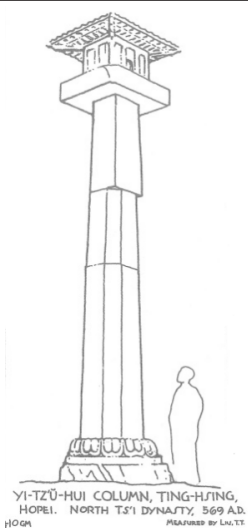

The stone lotus column base beneath the octagonal pillar within the niche of Cave 4 at Maijishan is equally noteworthy. To prevent the bottom of wooden pillars from moisture damage and decay, high-grade ancient Chinese architecture often employed stone column bases beneath wooden pillars for long-term preservation, a practice also observed in Buddhist architecture.

Portable and lightweight, the Dou Zhang does not necessitate the presence of stone column bases. The stone column base in Cave 4, however, is more likely to be a load-bearing and moisture-proof accessory characteristic of traditional Chinese wooden architecture. Stone lotus bases from the Northern Dynasties still exist, such as the Yici Hui stone pillar base in Dingxing, Hebei, which features a top in the form of a Buddhist temple, an octagonal pillar body, and a stone lotus column base carved at the bottom. Cave 1 on the eastern peak of Tianlongshan, which was excavated during the Northern Qi period, also has stone lotus column bases carved beneath its octagonal pillars outside the niches.

The lotus is an important motif in Buddhism. The tradition originated from both India and Greece, as recorded, “The lotus is a sacred motif of Buddhism. Though it originated from India, the design of its petals is evidently from the egg-and-dart pattern in Greece” [10].

The lotus-adorned column base beneath the octagonal columns within the niche of Cave 4 at Maijishan Grottoes exhibits a striking similarity to the octagonal stone columns from the Northern Qi Dynasty, specifically the Dingxing Yici Hui’s octagonal stone column, as well as the lotus-covered column bases, carved on the Buddha Hall pillars of the Great Wild Goose Pagoda from the Tang Dynasty. This consistency suggests a continuous architectural tradition of employing lotus motifs as column bases in Buddhist structures from the late Northern Dynasties through to the Tang Dynasty. The presence of the stone lotus column base within the niche of Cave 4 further substantiates the argument that the niche is designed in the style of Buddhist architecture rather than Dou Zhang.


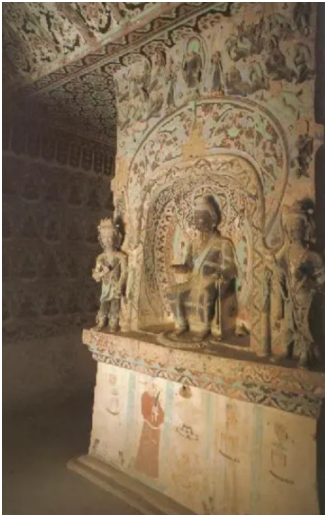
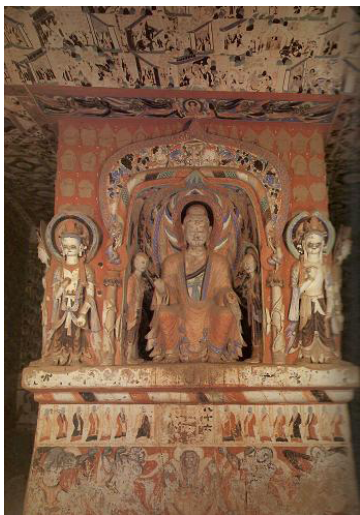
Table 5. Late Northern Dynasties Buddhist architecture: lotus-base pillar foundations

Name of the Cave	Yici Hui Stone Pillar, Northern Qi Dynasty, by Sicheng Liang ^[10]	Cave 1, Tianlongshan Grottoes, Northern Qi Dynasty ^[13]
Pattern of the column base		

7.4. Three-story shallow relief on the upper section of walls in the interior of niches

The three-story of shallow relief in the niches are also worth noticing. Shallow relief has long been used as a decoration on pagodas. Early pagodas in India are decorated with narrative paintings of Sakyamuni's previous lives. The excavation of the Yongning Temple from the Northern Wei Dynasty led to the finding of more than three hundred small statues, most of them shallow reliefs originally attached to the walls ^[14]. The shallow relief has already been a feasible decoration on pagodas during the Northern Wei Dynasty.

Table 6. Shallow relief in grottoes from the Northern Dynasty

Name of the cave	Cave 4, Maijishan Grottoes, Northern Zhou Dynasty shallow relief in the interior of niches	Cave 437, Mogao Grottoes, Northern Wei Dynasty Shallow relief on the niche on the front of the center pillar ^[15]	Cave 290, Mogao Grottoes, Northern Zhou Dynasty shallow relief on the front of the center pillar ^[15]
Shallow relief			

The three-story shallow relief is similar to the shallow relief decorated on the central pillars in Cave 437 created in the Northern Wei and Cave 290, created in Northern Zhou in the Mogao Grottoes. The only difference is the shallow relief is placed on the interior of the niches in Cave 4, while it appears on the exterior of central pillars in the caves in the Mogao Grottoes.

Both Dunhuang and Qin State were affected by Buddhism in Luoyang, Changan and Northern Liang Dynasty, so the style of decorations of Grottoes in the two places have some similarities. It is then reasonable to conclude that the three-story shallow relief might also be an imitation of the pagoda in Cave 4.

7.5. Overturned lotus on the top of the interior of niches

The unique way the five overturned lotus are presented at the top of the interior of niches in Cave 4 is also worth noticing. The major Buddha statue is usually integrated with the body of the pagoda and is placed on the front of the pagoda. This practice continued from the Eastern Han Dynasty to the early Northern Wei Dynasty. Another practice that continued throughout the Eastward transmission of the pagoda in China is the circumambulation of the pagoda.

The design of Yungang Grottoes created before the relocation of the capital of the Northern Wei Dynasty separated the major Buddha statue and the pagoda: the designer put the pagoda in the front hall, while the statue is in the back hall. To emphasize the connection between the major Buddha statue and the pagoda, designers

from the middle of the Northern Wei Dynasty usually used the roof of mchod-rten above the head of the major Buddha statue, and massive carvings of pagodas and niches on walls, so that the audience would be reminded that the statue was still in the pagoda. In Yungang Grottoes, the top of the caisson of the pagodas in the Buddha hall outside is mostly decorated with lotus and flying apsaras ^[10].

In grottoes like the Binyang Middle Cave and Lotus Flower Cave at Longmen Grottoes, and the Cave of the Engraved Scriptures at Northern Xiangtangshan Grottoes, the center pillar disappears from the center of the plan, and the place is replaced by the giant lotus on the roof. Twenty years after the creation of Xiangtangshan Grottoes, Cave 4 at Maijishan Grottoes also adopted five overturned lotus on the roof for decoration of niches.

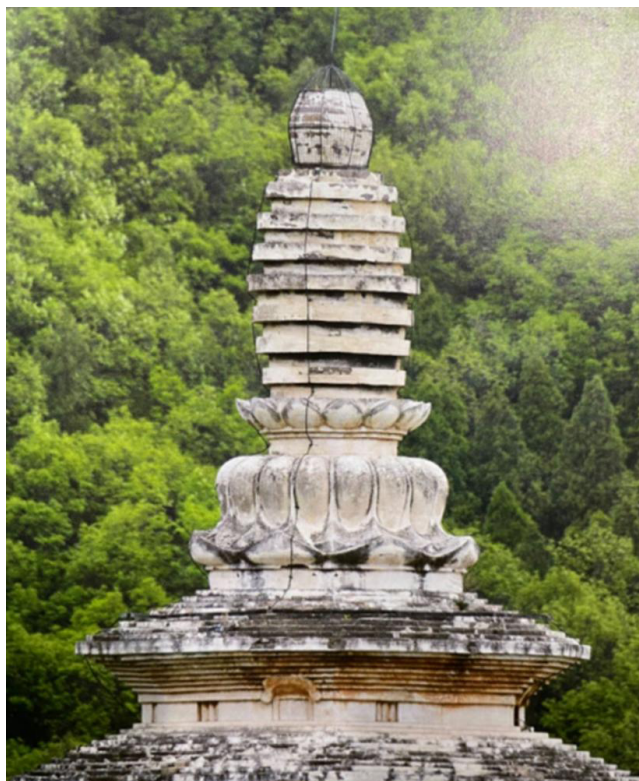


Figure 5. The finial of the pagoda in Songyue Temple (Songyue Pagoda: 443 ^[16])





Having a finial is a typical characteristic of a pagoda, and the bases of the finial are usually squares ^[12]. However, instead of direct or alone use of the finial or a center pillar, what appears in cases like the top of the Buddha Hall of Yungang Grottoes, the top of Binyang Middle Cave and Lotus Flower Cave at Longmen Grottoes, the top of the Cave of the Engraved Scriptures at Northern Xiangtangshan Grottoes, the finial of the pagoda at Songyue Temple (**Figure 5**) are motifs and carvings of overturned lotuses. The five overturned lotuses might have a connection with the cases, the purpose of which might be explained.

The author believes that the overturned lotus in the Yungang Grottoes, Longmen Grottoes, Xiangtangshan Grottoes, and Cave 4 at Maijishan Grottoes, though different in size, all imitate the overturned lotus on the finial of the pagoda, especially considering the close connection of innovative replacement of central pillar in the Yungang and Longmen Grottoes. The top of a cave in grottoes represents the pagoda finial, while the pagoda finial implies the existence of the top of a pagoda. Considering the hardship the craftsmen might face if carving a complicated structure of finial, it is also reasonable for the designer to consider the overturned lotus

as a typical symbol of the pagoda.

The implication of the overturned lotus on the top of the pagoda might be a new practice of the Buddhist architects in the Qin State after the central pillar was replaced by the overturned lotus in Binyang Middle Cave, Longmen Grottoes, in which they used the overturned lotus as a symbol of the pagoda. The five overturned lotuses are not only decorations but also the symbol of the pagoda and its finial, expressing the pagoda as grottoes to the audience.

Table 7. Overturned lotus on the roof of caves from late Southern and Northern Dynasties

Name of the cave	Binyang Middle Cave, Longmen Grottoes, Northern Wei Dynasty ^[17]	Lotus Flower Cave, Longmen Grottoes, Northern Wei Dynasty ^[18]
Pattern of the roof		
Name of the cave	The Cave of the Engraved Scriptures, Northern Xiangtangshan Grottoes, Northern Qi Dynasty ^[19]	Cave 4, Maijishan Grottoes, Northern Zhou Dynasty
Pattern of the roof		

8. The similarities between architectural elements on the exterior of niches and the single-story wooden pagoda

Past researchers barely focus on the characteristics of the top of the exterior of the niches in Cave 4. This section discusses the characteristics of elements, including the shallow relief on the top of the exterior of the niches, the small platform at the top, and the five banana leaf motifs for each of the niches. It will also analyze the close relationship between the elements and the design of single-story wooden pagoda.

8.1. Shallow relief on the exterior of niches

The preserved pavilion-style pagodas, created from the Eastern Han Dynasty to Northern Zhou Dynasty are mainly with a pyramidal roof. From the pictures taken by the drone, we can observe the similarity between

the niches of Cave 4 and the top of the single-story pagoda with a pyramidal roof. It is worth noticing that the techniques used to create the shallow relief of the top of the exterior of the niches are similar to the techniques used in shallow relief of mchod-rten in the Great Buddha Cave at Xiangtangshan Grottoes (**Figure 6**), especially considering that the time the two caves were created is quite close. The shape and techniques used in shallow relief of the top of the niches in Cave 4 provide important clues for the origin of its architectural form^[20].

The pyramidal roof, depicted on the exterior of the niches in Cave 4 is the major form, applied among existing pavilion-style pagodas, created during and before the Northern Zhou Dynasty. The shallow relief on the exterior is possibly a depiction of the pyramidal roof of the pavilion-style pagodas.

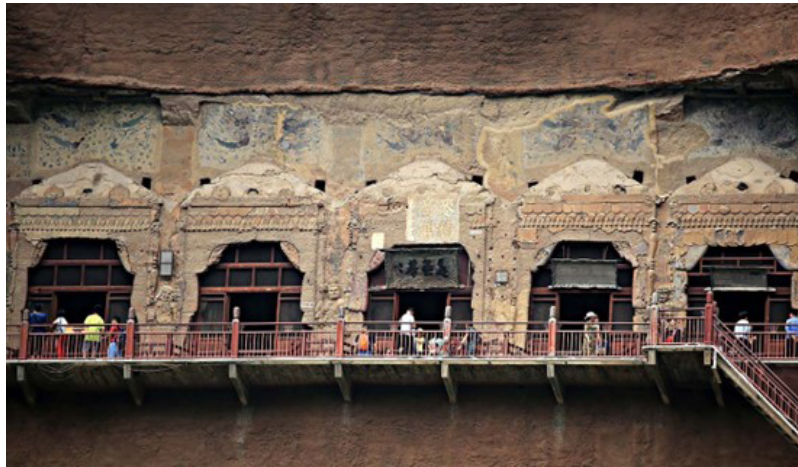


Figure 6. The plan view of Cave 4

8.2. Small platforms on the top of the exterior of niches

Although the top of the exterior of the niches looks like the top of Dou Zhang; the latter does not have the small platform at the top, nor does the canopy tent. Considering the great difference between the exterior of Cave 4 and Dou Zhang, it is unlikely that the former imitates the latter. It is more likely that the small platforms imply the existence of a finial base of pagodas. Past researchers have ignored the design of the small platforms, including the sketching of the exterior of Cave 4 and Cave 5 at Maijishan Grottoes created by Xinian Fu^[9].

A similar design also appears in the carvings of the finial of the pagoda in Cave 2 at Yungang Grottoes (**Figure 7**) in which the finial base of the pagoda is represented by the relief of a platform^[21].

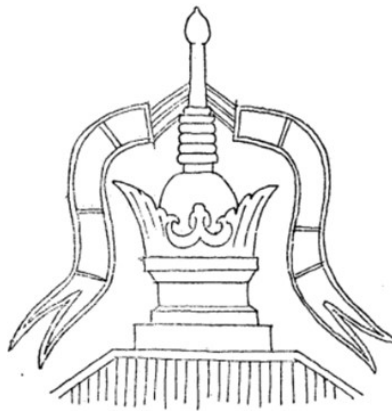
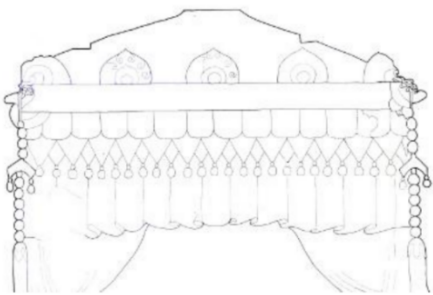

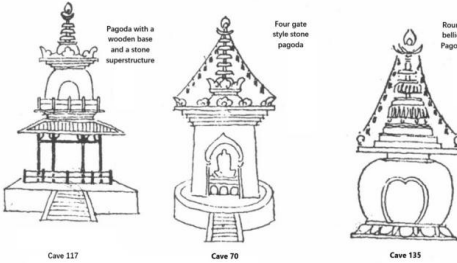
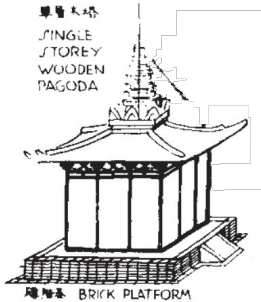


Figure 7. The relief stupa finial on the east side of the second cave at the Yungang Grottoes (Source: *The Origin of Ancient Chinese Pagoda Spires*: 56)

8.3. Five banana leaf motifs on the top of the exterior

The banana leaf motif on the exterior of the niches in Cave 4 is quite similar to the decoration on the top of the single-story, mchod-rten in Great Buddha Cave at Xiangtangshan Grottoes. Similar decorations are also found in Cave 70 at Yungang Grottoes and single-story pagodas in the murals from the Tang Dynasty in Mogao Grottoes. As a typical decoration on the top of a pagoda, the existence of the banana leaf motifs on the exterior of niches also supports the imitation of Cave 4's niches to the single-story pagodas.

Table 8. Comparison of the banana leaf motif in Cave 4 and the decoration of the roof of existing pagodas

Location	Banana Leaf Motif on the top of exterior of niches in Cave 4, Maijishan Grottoes, illustrated by Ming Zhang ^[8]	Decoration on the top of the Great Buddha Cave, Xiangtangshan Grottoes, Northern Qi Dynasty ^[12]
		
Single Layer Pagoda	<p>Decoration on the top of single layer pagoda in Cave 70, Yungang Grottoes, Northern Wei Dynasty ^[22]</p> 	<p>Banana Leaf Motif on single-layer wooden pagoda in a mural from Dunhuang, Tang Dynasty ^[10]</p> 

The shallow relief, depicting the pyramidal roof, the small platform similar to the finial base, and the banana motif, all imply that Cave 4 might imitate the form of single-story wooden pagodas.

9. Conclusion

This paper raises doubts about the theory of the imitation of Dou Zhang. Through a comparison of architectural elements in Cave 4 of the Maijishan Grottoes and wooden pavilion-style pagodas from before the late Northern Dynasty, it examines their similarities. From the perspective of Buddhist culture, the religious significance of pagodas aligns more appropriately with elements such as the hip roof.

The architectural form of Cave 4 is more likely the imitation of a single-story pavilion-style wooden pagoda with a pyramidal roof decorated with drapery, rather than Dou Zhang or nomadic tents. This paper has provided evidence, including the consistency of architectural styles among elements, the progressing design

in religious space, the similarity among elements like octagonal columns and their bases, lotus-shaped bands, the three layers of shallow relief, the five overturned lotus on roof symbolizing the top of the pagoda, the joints imitating wooden architecture on columns, the shallow relief depicting finial of pagoda on the exterior of the top of niches, the banana leaf motifs on exterior of niches, and the popularity of single story pagodas from the Eastern Han Dynasty to the Northern Zhou Dynasty. The designs of Cave 4 might have embedded the pagoda in the cave and realized the innovative expression of a similarity between pagodas and grottoes in Buddhist architecture.

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Disclosure statement

The author declares no conflict of interest.

References

- [1] Li Y, 2003, Research on the Late Northern Dynasties Grotto Temples. Cultural Relics Press, Beijing, 2003: 77.
- [2] Xiao M, 2002, Dunhuang Architecture Research. China Machine Press, Beijing, 2002: 311.
- [3] Fu XN, 1998, The Evolution of Layout in Early Chinese Buddhist Architecture and the Placement of Statues Inside the Hall. Fu Xi Nian's Collection of Architectural History Papers, Cultural Relics Press, Beijing, 1998: 137.
- [4] Dai C, 2013, Archaeological Observations on the Dome-shaped Ceilings of the Mogao Caves (Part I): The Dome-shaped Ceilings Did Not Imitate the Canopy. Dunhuang Research, 2013(4): 20.
- [5] Huang Y, 2016, “*应*” in Jin Inscriptions and Western Zhou Political Domination. Archaeology, 2016(09): 92.
- [6] Tang Y, 2015, Buddhist History of the Han, Wei, and Jin Dynasties. Shanghai People's Publishing House, Shanghai, 2015: 361.
- [7] Dong G. 2003. A Brief Discussion on the Canopy-shaped Caves of the Northern Dynasties at Maijishan. Dunhuang Research, 2003(6): 46.
- [8] Zhang M, 2017, Research on Cave 4 of Maijishan Grottoes, thesis, Lanzhou University, 2017: 184.
- [9] Fu XN, 1983, Northern Dynasty Architecture Reflected in Maijishan Grottoes. Cultural Relics Materials Series (4), Cultural Relics Press, Beijing, 1983: 170.
- [10] Liang S, 2001, Liang Sicheng Complete Works Volume 4: Chinese Architectural History. China Architecture & Building Press, Beijing, 2001: 55.
- [11] Uncle John Sees the World, 2024, Xiangtang Mountain Shijia Cave. Baidu. Published April 5, 2024. <https://haokan.baidu.com/v?pd=wisenatural&vid=17591599377166521722>.
- [12] Chang Q, 1998, The Artistic Journey of Chinese Ancient Pagodas. Shaanxi People's Fine Arts Publishing House, Xi'an, 1998: 57.
- [13] Yanyuke, 2024, Tianlong Mountain East Peak Cave 1. Sina Weibo. Published July 15, 2024. <https://weibo.com/ttarticle/p/show?id=2309405056418800861299>.

- [14] Du YS, 1981, Brief Report on the Excavation of the Yongning Temple Pagoda Base of the Northern Wei Dynasty. *Archaeology*, 1981(03): 223–224.
- [15] Yang H, 2024, The Yungang Grottoes at Dunhuang: The Northern Wei Cave 437 Central Pillar Main Niche Side Shadow Sculpture. NetEase. Published December 4, 2023. <https://www.163.com/dy/article/IL3NALHB0514R9P4.html>.
- [16] Yang ZW, Zhang GL, 2020, Songyang Pagoda. Science Press, Beijing, 2020: 443.
- [17] Suiyuan, 2024, Longmen Grottoes Binyang Central Cave. Sohu. Published May 31, 2021. https://www.sohu.com/a/469491474_121107223.
- [18] Baike, 2024, Northern Wei Longmen Grottoes Lianhua Cave. Baidu Baike. Published December 4, 2023. <https://baike.baidu.com/item/莲花洞/8584519>.
- [19] Pengpai News, 2024, Northern Qi Xiangtang Mountain Grottoes. Tencent News. Published February 1, 2021. <https://new.qq.com/rain/a/20210201A0E5R200>.
- [20] Luopu X, 2024, Cave 4 Long View. Sohu. Published August 13, 2019. https://www.sohu.com/a/257715229_537447.
- [21] Liu DZ, 2018, The Origins of Ancient Chinese Pagoda Spires. China Literature & History Press, Beijing, 2018: 56.
- [22] Liu DZ, 2007, Liu Dunzhen Complete Works Volume 7, China Architecture & Building Press, Beijing, 2007: 161.

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