

Architecture

The Form and Structure of the Keel-shaped Arch from the Buddhist Prototype to its Development in Eastern Iran

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The keel-shaped arch first appears in a rock-cut cave environment in the Barābar and Nāgārjunī hills, Bihar. It adorns a trapezoidal door on the facade of the Lomāś Rṣi cave (Fig. 1). The entrance is formed by two inward-sloping beams and is surmounted by a projecting arch that ends in a point crowned with a pinnacle. Starting from the latter, every characteristic feature is a stone reproduction of a fictile element. For example, the tympanum frieze decorated with a motif of intersecting circles is a clear imitation of the grate that features in wooden models. The fact that the curves of the arch were barely accentuated at this early stage suggests that the form underwent a maturation process in around the middle of the third century BCE.¹

From an architectural point of view, the keel-shaped arch is polycentric, symmetrical and stilted, formed by four separate arcs of circles that are higher than the semi-circle created by the span of the arch, as the centre of the intrados is positioned above the impost line. The rise is greater than half of the span and the springers – the beginning of the curve of the arch on either side, its weakest points – are approximately at the level of the diameter of the circle protruding over the abutments, which do not support it. Consequently, the arch does not have any structural function either in terms of self-support or in relation to the more general structural system of the building. Instead, its defining characteristics lend it a chiefly decorative and ornamental role. Therefore, although the form can easily be transferred to a bamboo construction, it is much less adaptable to a stone or brick structure. Indeed, the curvature of the arch is so fragile that it cannot support any real weight and is liable to collapse.

There have been various hypotheses as to why the keel-shaped arch was employed in stone models. From an architectural point of view, it is believed that wooden prototypes formed the basis for its use in cave environments, which is confirmed by archaeological data.² However, the symbolic analysis of the profile of the arch is a more complex and problematic issue, as there are different analogies with certain motifs from the Buddhist tradition.³

Essentially, the reason for using stone – an unsuitable material for such purposes – can be found in the shape of the arch, which, according to Pope evokes the transverse section of a *stūpa* or the leaf of a pipal tree.⁴ In this way, the intrinsic meaning of the form of the arch might explain why it was created as a decorative element from such a hard construction material as stone. This aspect is much more apparent in early renderings than in later ones, where the dominant feature is a strong symbolic connotation, as they are entirely pictorial, sculpted or carved into the rock. Examples of these can be found in Bhājā (beginning of the first century BCE), Kondane (latter half of the first century BCE), Kārli (first century BCE) and Udayagiri (Rānī Cave, second century CE) among others.⁵

However, in order to fully understand the process of transferring highly complex Buddhist symbology – the main reason for this architectural choice – on to a flat material, we first need to analyse the symbolism

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of the *stūpa* itself. To this end, there is a wide body of literature that identifies the *stūpa* as a cosmogram, or replica of the cosmic order.⁶ Mus distinguishes the axial pillar and the dome as the two main supportive components of a *stūpa*. On the basis of these elements, he attributes a cosmogonic and religious meaning to the whole structure, which becomes an image of the world.⁷ The axial pillar represents the axis of the world, an instrument which both separates and unites heaven and earth, while the dome (*aṇḍa*) symbolises the primordial mound with its hemispheric shape. Nevertheless, Irwin believes that the function of the axial pillar, which is called *yūpa* in Sanskrit and *Inda-khīla* in Pāli, was to rise above the mound that surrounded it rather than marking the centre of the mound.⁸ In this way, the *stūpa* becomes a microcosm, an image of the creation of the universe.

Accompanied by a thorough analysis of Vedic and Buddhist texts, Irwin's study provides an interpretation of the *stūpa* closely connected to the creation myth. However, there are a number of caveats to consider. Firstly, there are different cosmogonic stories in the Indian tradition; secondly, Buddhist speculation and metaphysics evolved disparately in different places; and finally, the symbolism of the *stūpa* did not remain unchanged over time.⁹ Therefore, it is not easy to demonstrate that the *stūpa* expressed meaning through its form at a given moment in history.¹⁰

Fussman has suggested that the importance of the *stūpa* lies in the monument itself, which reminds believers of the Buddha (*anusmaranti*) and his teachings, thereby generating wholesome thought (*kuśala-citta*) and producing good *karma*.¹¹ This concept suggests that the construction and the cult of the *stūpa* increasingly aim to provide a substitute for the Buddha. In this way, after the Buddha has achieved *nirvāṇa*, only the *stūpa* will be able to accommodate the *pūjā* of the faithful, which will earn them good *karma*. In this respect, the *stūpa* will become the symbolic home of *parinirvāṇa*, whose power will increase if some of his bodily relics (*śarīra*, *śarīra-dhātu*, *dhātu*) are preserved inside.¹² This explains why Buddhists felt an increasingly pressing need to procure holy relics. The *stūpa* is the Buddha, or rather represents the Buddha's body – not his mortal human body, but his *dharma* body.¹³ In the broadest sense, we can therefore state that the *stūpa* is the embodiment of many symbolic concepts, although the notion associated with *cakravartin* seems to be predominant.

Stone models of the keel-shaped arch were inserted into a Buddhist framework and developed accordingly. Its unusual shape is more the expression and configuration of various religious meanings than a distinctive load-bearing feature. Essentially, it is as if the symbolic idea associated with the inflected arch preceded its general use in an organic balanced structure. It was thus not chosen by architects for its structural use or aesthetic appeal, but because of its basic religious meaning. This religious symbolism adapted well to

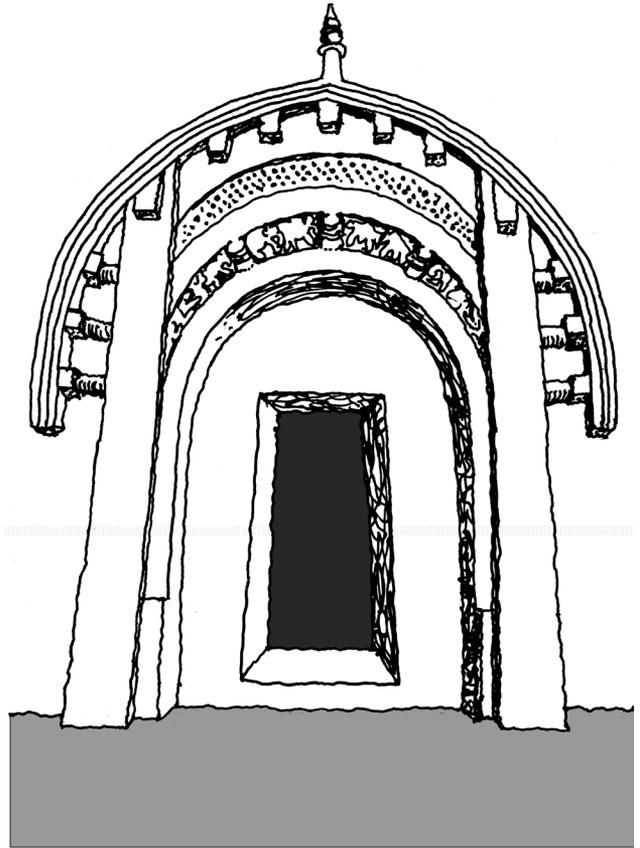


Figure 1: Entrance to the Lomās Rṣi cave. Drawing courtesy of Adam Hardy.

ancient construction forms. For example, in a Buddhist context the counter-curve of wooden structures can resemble the shape of a pipal leaf or the cross-section of a *stūpa*. The former represents the enlightenment of the Buddha, while the latter symbolises *parinirvāṇa*, or the Buddha himself.

Outside India, Buddhist monasteries spread over a fairly wide area ranging from Afghanistan to South-Central Asia, Xinjiang and Northern China in the east and the Iranian province of Sistān in the west. As in traditional Indian monumental complexes, they included features such as the *vihāra*, the *caitya* and the *stūpa*, but were adapted to local materials and traditional construction techniques. Pointed arches can be found at the monastery of Kuh-i-Khwaja (Sistān) on the border between Iran, Pakistan and Afghanistan, a region extremely close to Buddhist influences; on the great portal at the sanctuary of Masjid-i-Gauhar Shād in Mashhad (Eastern Iran); and in the oldest parts of Masjid-i-Jāmi in Iṣfahān, which probably date back to the eleventh century.¹⁴ Havell was the first scholar to argue that the pointed arch found in these areas is an evolution of the inflected arch that originated in India.¹⁵ This hypothesis, however, was not favourably received because of the insufficient and unconvincing reasons put forward. Pope later revisited the idea and examined the question further. At first he identifies a plausible route, and on the basis of a series of archaeological findings connected with trade and historical events, he supports the idea of Indian origins. He then also considered the possibility that the pointed arch was introduced into the Western world independently from any Indian mediation.

Nevertheless, ongoing contact with Buddhism was maintained for centuries in these areas close to India with their Buddhist monuments and influences. The caravan routes connecting Iran and India were used regularly by merchants, soldiers and officials, who acquired a degree of familiarity with Buddhist monuments. The shape of the arch might have been passed on from the small portable plaster shrines or temple flags that believers carried with them. To this end, Pope stresses the religious affinity between Buddhism and Zoroastrianism. The form of the keel-shaped arch may have prompted Iranian travellers to draw a stylised parallel with the flame of the Zoroastrian cult of fire, thereby contributing to its introduction into the Iranian world. Conversely, the idea that it developed in Iran completely independently from India is implausible for three main reasons. Firstly, it is an ornamental arch rather than a functional one. Secondly, the relevant examples are not the result of subsequent developments of a different pre-existing model. Finally, there was a strong Buddhist influence in these areas, as shown by the fact that the form was common in Kashmir, in the caves of Bamiyan and in Gandhāra. The hypothesis that there was religious syncretism in Iranian areas with a strong Buddhist influence is corroborated by a series of pictorial depictions of the Buddha with tongues of fire emanating from his shoulders, which Taddei identifies as luminous manifestations of the Blessed One.¹⁶ One of these is especially noteworthy, both for its distinctive composite nature and the stylised aspect of its flame, which has some similarity to the inflected arch. This wall painting of a Buddha is found in the D Complex cave temple in the major Buddhist centre located on Kara-tepe hill in Old Termez, Uzbekistan. The site was extensively excavated and studied by researchers from the Russian Archaeological Mission of the Hermitage Museum, who dated it to between the second and third century CE. The painting, which portrays the Buddha sitting in a state of meditation (*dhyānamudrā*), is on the south wall of the temple near the passageway leading to the cells and the eastern exit to the cloister. The Buddha's head has been almost completely destroyed, but it is rendered unique by a significant detail deliberately placed in the background, consisting of two clearly discernible stylised lines identified as tongues of flame. The unknown artist's creativity in this depiction is truly remarkable, combining the image of the Buddha with the attributes of light or fire, which are characteristic of the god Ahura Mazda. Indeed, the Buddha's head is flanked by an inscription in Bactrian that reads BODDOMAZDO ("Buddha-Mazda"), which was probably left by a visitor at the end of the third/fourth century CE. It offers an unequivocal key to understanding the image, with the Buddha symbolising a fusion between Buddhism and the Eastern Iranian Mazdaist cults.¹⁷

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Other similar depictions are found on bas-reliefs from the region of Kapiśa and in the image of a Kuṣāṇa emperor with tongues of fire behind him.¹⁸ Stavisky notes a certain similarity between the haloes in the Kapiśa bas-reliefs and the nimbus in the Kara-tepe painting, suggesting that both were created at the height of the Kuṣāṇa Empire at monasteries associated with the Kuṣāṇa elite. These combined elements suggest that this iconography of light originated in the North-West, although it can also be found in certain reliefs from Amarāvātī studied by Coomaraswamy.¹⁹ The Buddha appears in these depictions as a flaming pillar or column – the cosmic axis – offering a guarantee of stability. In this guise, the Buddha is closely related to the Vedic god Agni, as shown by some verses from the *Rgveda* (*Rgveda*, I. 59. 1):²⁰

The other fires are just twigs of you, Agni. In you do all the immortals bring themselves to euphoria. Vaisvanara, you are the navel of the settlements. Like a pillar, as prop you hold the peoples fast.²¹

However, the outline of the flame, a symbol of Zoroastrianism, also recalls the Buddhist form of the keel-shaped arch. The tip of the flame is associated with strength, seen as movement but also the destruction of all boundaries, and with brightness or enlightenment. It also shares many similarities with the head of an inflected arch, whose counter-curves indicate both the convergence of two opposing lines and their upward thrust, reproducing the rising movement of fire.

The imagery of light present in this form of the arch might also include the emblematic content of the *stūpa*, combined with symbolic motifs from images of enlightened Buddhas with clear references to royal power. Indeed, this iconography of light is perfectly integrated into the dynastic realm of the Kuṣāṇas, as shown by the fact that they are sometimes depicted with flames emanating from their shoulders both in the North-West and in Bactria.²²

Furthermore, Buddhism played an important role for Eastern Iranian peoples, mainly as a channel for spreading knowledge westwards from India. It developed specific characteristics according to the places in which it was established, giving rise to numerous cases of religious syncretism through interaction with Zoroastrianism and Manichaeism. This explains the Zoroastrian and Sasanian influences on Buddhist iconography and vice versa.²³ One case in point is at Kuh-i-Khwaja, where it is highly likely that a Buddhist monastery stood in the sacred enclosure of a Zoroastrian fire temple.²⁴ Instead, in the case of Kara-Tepe near Termez, it seems that a Buddhist monastery was transformed into a fire altar at the time of the Sasanian conquest (late third or fourth century CE).²⁵

In conclusion, it is plausible that interaction between different cultural areas generated artistic motifs that synthesised shared influences on the basis of the perception of light as divine energy (Mazdaism) and an attribute of the Buddha's enlightenment, both of which took shape in the form of the halo or nimbus. In the same way, on the basis of these assumptions it is likely that the motif of the keel-shaped arch resulted from the stylisation of metaphors of fire (flames and light) found in both the Buddhist and Zoroastrian cultures, above all in areas where there was significant syncretism in the Kuṣāṇa era and following the Sasanian conquest.

NOTES

1. Percy Brown, *Indian Architecture: Buddhist and Hindu Period* (Bombay: British India Press, 1942), p. 27.
2. Bruno Dagens, *Traité des Temples et Images du Monde Indien: Etudes d' Histoire et d' Archéologie* (Paris: Presses Sorbonne Nouvelle, 2005), p. 15.
3. Brown, p. 43.
4. Arthur Upham Pope, 'Some Interrelations between Persian and Indian Architecture', *Indian Art and Letters*, 9.2 (New York: American Institute for Persian Art and Archaeology, Reprint Series No. 6, 1935), p. 8.

5. Brown, p. 27.
6. J. Irwin, 'The Stūpa and its Cosmic Axis: The Archaeological Evidence', in *South Asian Archaeology 1977*, ed. by M. Taddei (Naples: Istituto Universitario Orientale, 1977), pp. 799-846.
7. P. Barabudur Mus, *Esquisse d'un Histoire du Bouddhisme Fondée sur la Critique Archéologique des Textes* (Hanoi: Imprimerie d'Extrême-Orient, 1935).
8. Irwin, *The Stūpa and its Cosmic Axis*; J. Irwin, 'The Axial Symbolism of the Early Stūpa: An Exegesis', in *The Stūpa – Its Religious, Historical and Archaeological Significance*, ed. by Anna Dallapiccola (Wiesbaden, Franz Steiner Verlag, 1980), pp. 12-38.
9. G. Fussman, 'Symbolisms of the Buddhist Stūpa', *The Journal of the International Association of Buddhist Studies* (1986), pp. 37-53.
10. Moreover, Hiuan-tsang claims that a stupa consisted of a square base, which recalls the Buddha's Śīvara, a dome, a direct reference to the Buddha's begging bowl, and a post that represents the figure of the Buddha. See Samuel Beal, *Buddhist Records of the Western World* (London: Trübner & Co, 1906), pp. 47-48.
11. A. Bareau, "Sur l'origine des piliers dits d'Asoka, des stupa et des arbres sacrés du bouddhisme primitif," *Indologica Taurinensia*, 2 (1974), pp. 9-36 (p. 21); A. Hirakawa, 'The Rise of Mahayana Buddhism and its Relationship to the Worship of Stupas', *Memoirs of the Toyo Bunko*, 22 (1963), pp. 57-106 (p. 88, f.n. 170); E. Lamotte, 'Histoire du Bouddhisme Indien, I: Des Origines à l'ère Śāka', *Louvain*, 43 (1958), pp. 701-705.
12. Fussman, p. 45.
13. To this end, Roth attributes a doctrinal symbol to every part of the stūpa. See Gustav Roth, 'Symbolism of the Buddhist', in *The Stūpa: Its Religious, Historical and Architectural Significance*, ed. by A. Dallapiccola and S. Zingel-Avé Lallemand (Wiesbaden: Franz Steiner Verlag, 1980), pp. 183-209.
14. Giorgio Gullini, *Architettura Iranica, dagli Achemenidi ai Sasanidi* (Torino: Einaudi Editore, 1964); Pope, Fig. 1.
15. Ernest Binfield Havell, *Indian Architecture: Its Psychology, Structure, and History from the First Muhammadan Invasion to the Present Day* (London: John Murray, 1913), pp. 4-13.
16. Maurizio Taddei, 'Appunti sull'iconografia di alcune manifestazioni luminose dei Buddha', in *Gururājamañjarikā: Studi in Onore di Giuseppe Tucci, Vol. II* (Napoli: Istituto Universitario Orientale, 1974), pp. 435-449 (p. 435).
17. In the Avesta, *xʷarənah* is a force of light or fire that can emanate from the heads of divinities or heroes and take on the appearance of a halo or irradiance.
18. Taddei underlined the relationship between images of the Buddha with flames emanating from his shoulders and from Kapiśa and the nimbus or halo (Iranian *xʷarənah*) and the dynastic religiosity of the Kuṣāṇas (Taddei, p. 436 in note 6 Maurizio Taddei, 1974).
19. The Amarāvātī reliefs belong to the third period of the site (around 150 CE), a time in which the presence of the Kuṣāṇas in the Vengi region is well documented from Amarāvātī to Nāgārjunikoṇḍa (G. Verardi, 'Tematiche Indiane di Alcune Iconografie Gandhariche. Il Buddha, Agni, i Lakṣaṇa, il Miracolo di Śrāvastī e Altri Temi Connessi', in *Orientalia Josephi Tucci Memoriae Dictata*, Vol. 3, ed. by G. Gnoli and L. Lanciotti (Roma: IsMEO, 1988), pp. 1533-49 (p. 1546)); Ananda K. Coomaraswamy, *Elements of Buddhist Iconography* (Cambridge MA: Harvard University Press, 1935); Maurizio Tucci, *On Swāt Historical and Archaeological Notes* (Roma: IsIAO, 1997), pp. 263-266.
20. The Kuṣāṇa rulers are also sometimes depicted with flames emanating from their shoulders, as shown by coins and a relief found in Surkh-Kotal.
21. *Vayā id agne agnāyas te anyē tvē viṣve amṛitā mādayante | vaiśvānara nābhir asi kshitīnām sthūīneva jānāñ upamid yayantha || 1 ||*. See Stephanie W. Jamison and Joel P. Brereton (eds.), *The Rigveda. The Earliest Religious Poetry of India* (Oxford: Oxford University Press, 2014), p. 176.
22. Verardi, p. 1543.
23. Benjamin Rowland, 'Iranian Elements in the Art of Afghanistan and Central Asia: The Formation of a Central Asian Style', in *The Memorial Volume of the VIth International Congress of Iranian Art and Archaeology II* (Tehran: 1972), pp. 379-82.
24. Jeannette Mirsky, *Aurel Stein, Archaeological Explorer* (Chicago: University of Chicago Press, 1977), pp. 390-391.
25. Patricia Crone, 'Buddhism as Ancient Iranian Paganism', in *Late Antiquity: Eastern Perspectives*, ed. by Teresa Bernheimer and Adam Silverstein (Oxford: Gibb Memorial Trust, 2012), pp. 25-41 (p. 36).

