



# Exploration into the Impact of Functionality on Architectural Form

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## Abstract

The function of a building has a certain impact on its form. Under the same function, even buildings from different regions and cultures may exhibit some similarities. This article takes two religious buildings as examples, combs and compares their historical development processes, and summarizes the consistency of their forms under the same religious function.

## Subject Areas

Architecture

## Keywords

Chaitya Cave, Basilica, Religious Architecture

## 1. Introduction

Chaitya originally meant pagoda in India, and was also translated as pagoda cave. There was a pagoda at the back of the cave, and people would circumambulate the pagoda to worship in the cave [1]. At the same time, a public building called “Basilica” appeared in the ancient Roman Empire, and then this basilica-style building gradually evolved into the Latin cross structure commonly seen in Christian churches. Both have similar colonnade structures, and both have the function of circling the hall around the statue as the center to end the worship [2].

As buildings of different religions, the similarity between the Chaitya Caves and the Basilica may not involve direct reference to architectural style, but the intersection of culture and thought is inevitable. This subtle influence based on

deep cultural aspects cannot be subjectively concluded through direct observation of the appearance. On this basis, this paper combines the historical evolution of Indian Buddhism and early Christianity and the evolution of religious beliefs, and studies the Chaitya Caves and the Basilica Church from the perspective of the impact of the functional needs of religious buildings on their worship space, so as to analyze the reasons for the similarities and differences between the two.

### Historical Origin

During the reign of King Ashoka, Indian Buddhism was vigorously promoted and widely promoted by political authorities as an ideology. King Ashoka was the third king of the Maurya Dynasty and ascended the throne in 271 BC. The earliest cave temples were built during the Maurya Dynasty. Their purpose was to meet the worship needs of believers even in bad weather [3]. In the early 2<sup>nd</sup> century, during the rule of the Kushan Empire (30 - 375 AD) in northwestern India, Buddhist caves were continuously excavated and expanded under the influence of Gandhara art, entering a period of prosperity. In the early 4<sup>th</sup> century AD, Indian Brahmanism rose again. This doctrine continued to strengthen the caste system and suppress Buddhism, resulting in a stagnation in the excavation of Buddhist caves. It was not until the middle of the 5<sup>th</sup> century that it gradually flourished again, ushering in the second prosperous period of Indian Buddhist caves. With the rise of Hinduism and Mahayana Tantra and the entry of Islamic countries, Buddhism disappeared in India during the Pala Empire (8<sup>th</sup>-12<sup>th</sup> century), that is, at the end of the 12<sup>th</sup> century [1].

The legitimacy of Christianity was established in the Edict of Milan issued in 313 AD. Believers were freed from restrictions on religious activities and urgently needed a gathering place that was different from the traditional temples dedicated to idols [2]. In this context, the basilica became the standard form of public church venues because it had fewer pagan elements. The side aisles were just right for distinguishing female believers and Protestants from official believers. The feudal territorial system in Western Europe was formed after the 6<sup>th</sup> century AD. With the fall of the Western Roman Empire (396 - 476 AD) and the continuous influx of backward nations, the development of religious architecture stagnated. It was not until the 10<sup>th</sup> century that further changes occurred due to economic development and technological progress, becoming today's Latin cross [3].

Through the above historical evolution, we can find that the development stages of the Chaitya Cave and the Basilica can be divided into four periods: the initial period (2<sup>nd</sup> to 1<sup>st</sup> century BC), the development period (1<sup>st</sup> to 3<sup>rd</sup> century AD), the stagnation period (4<sup>th</sup> to 5<sup>th</sup> century AD), and the heyday (6<sup>th</sup> to 9<sup>th</sup> century AD). The author cuts out the different development periods of the two from their respective ages for comparison and contrast, in order to analyze the architectural features presented in different periods.

## 2. Characteristics and Comparison of Different Periods

### 2.1. Initial Period

During this period, the Chakri caves and basilicas had not yet formed their own unique architectural systems. The interior space of the early Chakri caves was circular in plan, with a dome roof and carved chakri arches or chakri windows on the facade. During this period, the pagoda, as an absolute object of worship, occupied the core position of the space and could meet the needs of Buddhists for the ritual of circumambulating the pagoda. However, the limited size of the space restricted the development of the number of monks and there was no space for them to gather. After going through the stages of thatched huts and bamboo forests, Buddhism began to gradually form an architectural form with its own style and characteristics. Christianity began to have its own places of worship and gathering buildings after the amnesty. Therefore, the Chakri caves evolved into their own systematic development context, while the basilica-style architecture was directly borrowed from the architecture of the ancient Roman Republic [4].

The initial period of the Chakri Cave and the Basilica Church are characterized by a semicircular apse, barrel vault, rectangular main hall, and single-row colonnade, forming a high-in-the-middle and low-on-the-side structure, which is also a common manifestation of the architectural functional needs of different religions in rituals. However, the rectangular main hall of the Chakri Cave is the same width as the apse, and the two form a U-shaped plane (Figure 1). Even though both divide the religious space into three areas, due to different religious doctrines and rituals, the Chakri Cave pays more attention to the integrity of the side aisle hall, while the Basilica is mainly centered on the central hall area (Figure 2).

### 2.2. Development Period

During the development period, due to the significant increase in the number of

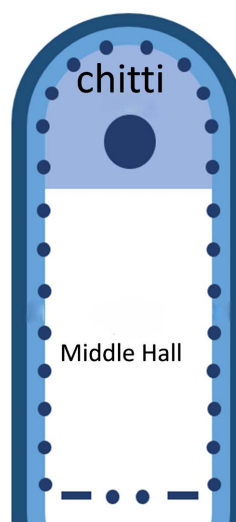
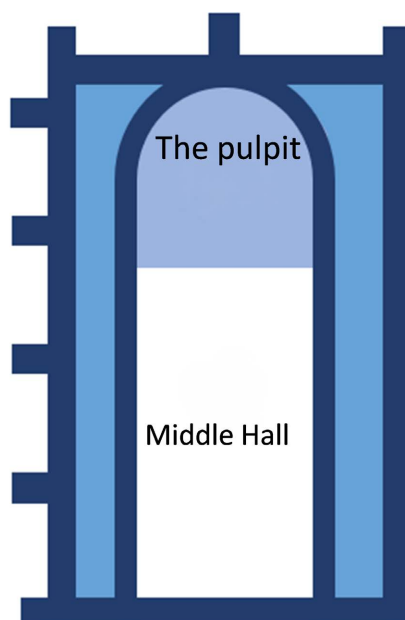


Figure 1. Bhajadi Cave 1-2, 1<sup>st</sup> century BC.



**Figure 2.** Palazzo Latino Basilica, 1992.

believers, standardized religious rituals and the improvement of the status of clergy, the Chaitya and Basilica architecture respectively strengthened the plane depth and functional auxiliary space, which was manifested in the front part of the colonnade and the outer chamber in the Chaitya, and in the Basilica by the addition of the forecourt and the transept.

During this period, the area of the Chaitya caves increased, and the religious space gradually became richer. Compared with the initial period, the biggest feature was that four large columns formed the front porch, columns were added to the entrance to form a circular colonnade, and small rooms with similar auxiliary functions appeared on the outside (**Figure 3**). The area of the basilica's central hall also gradually expanded, and the altar was set up in combination with the semicircular apse to increase the indoor ritual space. At the same time, the side halls were added to accommodate more clergy (**Figure 4**), forming the prototype of the Latin cross basilica.

### 2.3. Blockage Period

During this period, Indian Brahmanism was widely revived, which led to the suppression of Buddhism, which also caused the excavation of Indian Buddhist caves to slow down. It was also during this period that Western Europe entered the Middle Ages, with frequent wars. Due to the social and economic recession, the construction of churches was difficult for Christianity, and the creativity of architectural forms also stagnated.

During this period, the Chaitya Caves strengthened the connection between the layout axis and the whole, perfectly connecting the main body of the cave with the small room combination, and the style was similar to the traditional courtyard-style dwellings in northern China (**Figure 5**). The Basilica Church

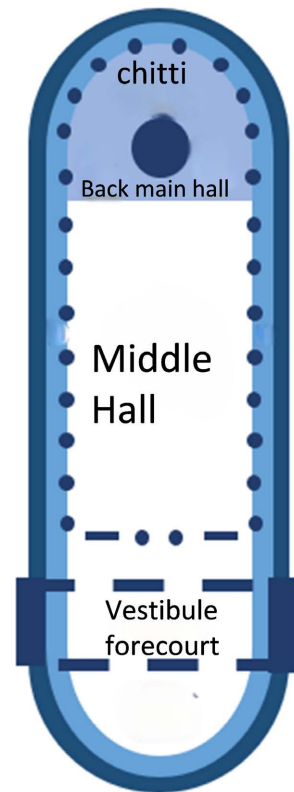


Figure 3. Kalradi Cave 8, 1<sup>st</sup> century.

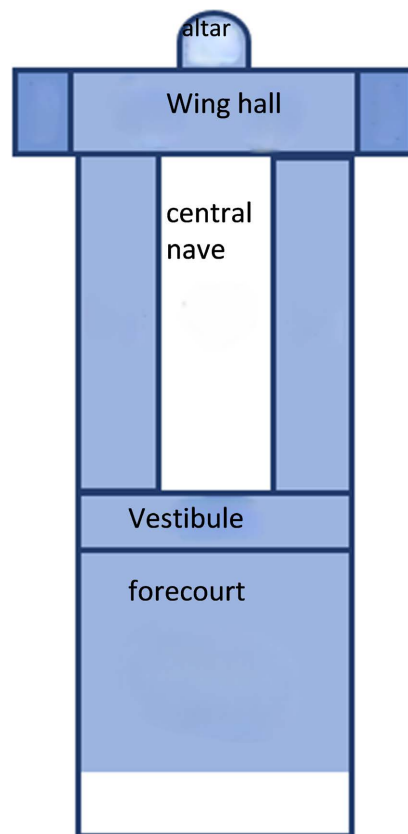
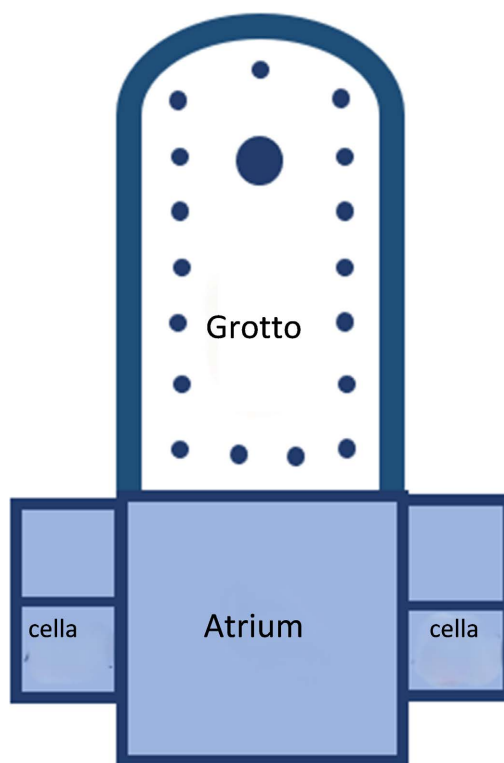


Figure 4. Old St. Peter's Basilica.



**Figure 5.** Achita Cave 19, 5<sup>th</sup> century.

made a breakthrough, with the integration of architectural functions, ingeniously integrating the religious symbolism of the cross plane into the plane layout, and making new breakthroughs in the overall expression by adjusting the proportion and scale relationship between the hall and the corridor, forming a monastery model with rich forms, diverse functions and self-sufficiency (**Figure 6**).

#### 2.4. Heyday

The Gupta Dynasty (320 - 540) was the heyday of Mahayana Buddhism in India, with idolatry becoming more prominent. The caves were surrounded by corridors, courtyards, and small rooms in an orderly manner, with rich layers and complete spaces (**Figure 7**) [5]. Western European churches recreated church space by incorporating the transept into the Latin cross-strengthened transept, setting up corridors and chapels around the altar, and re-adopting the long-lost vaulted arch structure of the ancient Roman era (**Figure 8**). On this basis, Romanesque and Gothic churches were developed, which even influenced the architectural style and layout after the Renaissance.

### 3. Cause Analysis

#### 3.1. Direct Cause: Demand Orientation of Building Functions

Buddhists believe that a visit to the Chakri Cave is like a journey into an unknown world. “At first, by counting the pillars you pass, you can still calculate the depth of the unknown world you have entered. As the light in front becomes

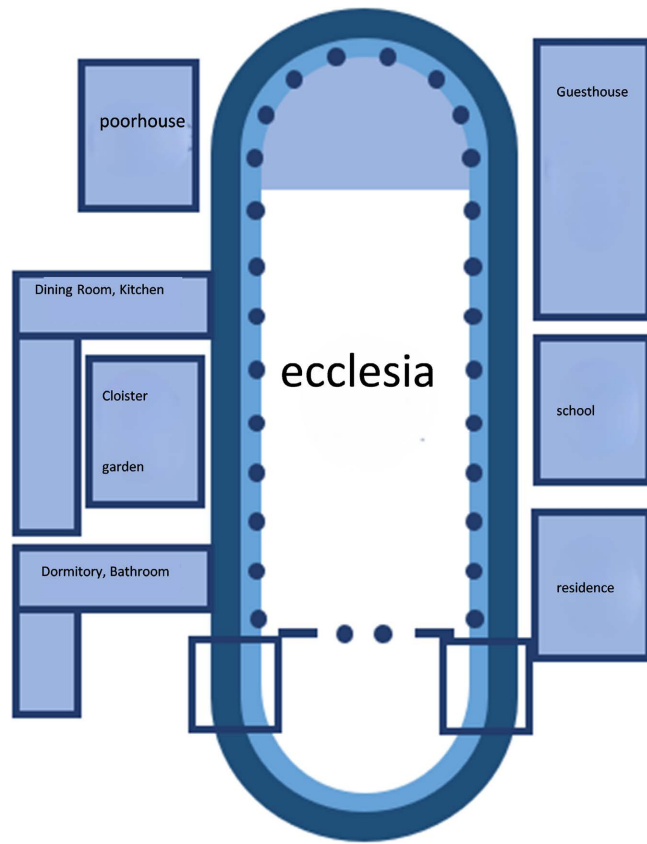


Figure 6. St. Gall's Monastery.

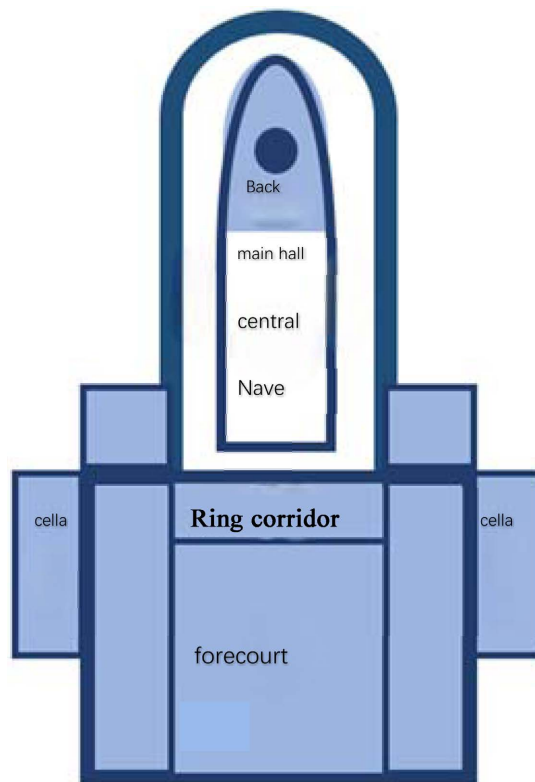
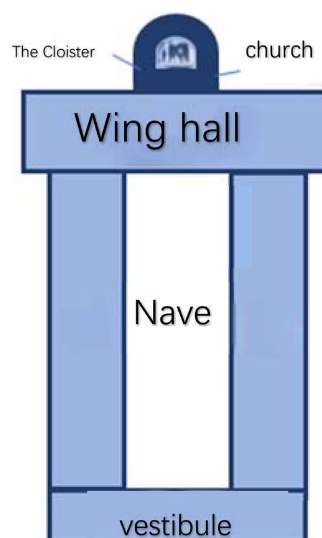


Figure 7. Ellora Cave 10, 9<sup>th</sup> century.



**Figure 8.** Saint-Senin's Cathedral, 12<sup>th</sup> century.

dimmer and dimmer, the light reflected from each pillar gradually disappears in the darkness. Suddenly, a semicircular bright spot can be identified between the pillars—the stupa's stupa is shining in the light from the bright window." The layout of the Chakri Cave uses reflection and darkness, combined with the division of columns, to make people feel like they are in a magical world.

Christians believe that the architectural form of the basilica has been integrated into their doctrines over a long period of development. The high and bright walls of the central hall and the back room provide ample space for frescoes and mosaics to depict the lives of saints in the Bible. Therefore, when a believer with a heart full of guilt and repentance walks devoutly into this "heaven on earth" that connects God and the human world, his spirit is baptized, his soul ascends, and his body is thoroughly purified, reflecting the medieval divine architectural aesthetics with a transcendent and sacred emotion [6].

In summary, although the objects and methods of worship in the Chakri Cave and the Basilica are different, the shaping of their architectural space is to set off the divine atmosphere. The Chakri Cave pays more attention to the side corridor space, and completes a spiritual practice by circumnavigating; while the Basilica pays more attention to the central hall space, and purifies people's souls with the help of the changes in light during walking. It is this reverence and yearning for God that makes believers have unique needs for places of worship, and also makes the two have completely different architectural styles on this similar plane layout.

### 3.2. Indirect Causes: The Exchange and Inheritance of Regional Culture

Since the 20<sup>th</sup> century BC, ancient Egypt has generally used columns to create different forms of pillar hall buildings in monumental buildings. This pillar hall architectural culture spread eastward through the Persian Empire (Achaemenid,

558 - 330 BC) across the three continents of Europe, Asia and Africa, and was widely spread in Central Asia and northwest India. Influenced by ancient Egyptian culture, the layout of this pillar hall temple was adopted in the ground building of Indian Buddhism, the Chaitya. The Chaitya Cave was excavated in imitation of the Chaitya, so its origin can also be traced back to the Achaemenid Dynasty. To the north, the Aegean culture influenced the ancient Greek culture, and then influenced the architectural history of Europe, including the Roman Empire, for more than 2000 years. The retro trend of thought shown in many aspects by the Western Roman Empire undoubtedly made the Greek architectural culture passed down from generation to generation in Western Europe stand out again. It changed the previous creation of the vault achievements and adopted the truss system, which influenced the architectural style of the entire Western Europe afterwards. At this time, the original form of Christian churches also adopted Greek-style architecture with trussed roofs, which can be seen as a direct inheritance of Greek and Egyptian architectural culture, rather than a re-creation of Roman architectural culture.

Therefore, the Chaitya Cave and the Basilica adopt similar pillar-hall structures in their plane layout, which is different from the traditional wooden frame buildings in ancient China and is more like the temple buildings in ancient Egypt. This tendency reflects the regional connection and inheritance relationship between the three to a certain extent, that is, the Chaitya Cave in India and the Basilica in Rome are actually the differentiated products of the pillar-hall structure of ancient Egypt under different historical environments. This common origin theory is both the premise for the development of their respective plane forms and the basis for their layout evolution. It also provides a reasonable explanation for the similar layout of the three buildings in different periods to a certain extent.

#### 4. Conclusion

The form of architectural space changes with people's demand for the function of the internal space. It is restricted by many conditions such as the region, climate and environment, and combined with local culture and aesthetics, people have created architectural art with regional characteristics [7]. In the development and changes of more than a dozen centuries, Buddhism and Christianity have formed valuable and rich religious culture and spiritual heritage. Although there is no clear evidence that there was direct communication between the two, combined with the influence of historical events, the needs of religious development and the inheritance of architectural culture, it is still possible to find from an architectural perspective that the Buddhist stupa caves and Christian basilicas have the same requirements for the plane function of religious buildings during their development, as well as the close relationship in the structural style of the pillar hall. This is also the reason and deep logic for the coincidence of commonality and similarity between the two [8].

## Conflicts of Interest

The author declares no conflicts of interest.

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