

# **The Sacred Geometry of Perfect Forms in East and West**

## **Understanding Religious Buildings: Different Perceptions - Identical forms**

### **A CONCEPTUAL and VISUAL COMPARISON OF RELIGIOUS ARCHITECTURE - EAST AND WEST**

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Identical Geometric Forms - The square, the circle, and the triangle

Differing Concepts: Importance of the circumference as opposed to the center

#### **General Overview**

##### **Architecture**

Western Classical architecture, such as that of Greece and Rome, as well as the Eastern architecture of Hinduism and Buddhism considered the circle, the square, and the triangle to be the most perfect of building forms. These geometric forms are directly expressed in architecture, but especially in religious structures.

However, a difference in perception - the western emphasis on the periphery or circumference of each form as opposed to the eastern focus on the center - led, in part, to the creation of building types in East and West that differ in how religious buildings look, in how they are experienced, and in how they are used.

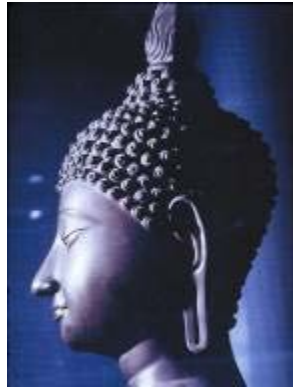
##### **Sculpture**

In Greece and Rome the same forms, the circle, square, and triangle, were used as the measure of the perfect physical body. This belief was revived during the Renaissance and was the subject of several drawings by Leonardo da Vinci. One of these is pictured below.



**Figure 1 Renaissance Man, Leonardo da Vinci**

In countries practicing Hinduism and Buddhism, a different system representing physical perfection and beauty was employed. A series of analogies were used as the measure of bodily perfection such as “a nose like a parrot’s beak” or “a chin like the seed of a mango”. These analogies are referred to as “The Magic Marks” or “the Marks of a Great Man.” Sculptors looked to them as a guide for the proper presentation of the divine anatomy in both Hindu and Buddhist sculpture.



**Figure 2 Buddha Subduing Mara head, Thailand, Sukhodaya style**

### **The Importance of the Architectural Center and Periphery – East and West**

**The importance in the West of the architectural perimeter, as opposed to the center, is a result of the practice of congregational worship in Western religions.**

Western religions, including the ancient Imperial cults of Greece and Rome as well as Christianity, Judaism, and Islam, ritually celebrate their beliefs as a congregation where prayer and religious addresses are a communal activity. This practice requires a space in which a congregation can assemble and readily hear the words spoken by their leader or clergyman. Therefore, the speaker had to be situated facing the congregation in order to be heard. If the speaker were located at the center point of a square, circular, or triangular space, all those behind him would have difficulty hearing (before modern amplification) and consequently could not fully participate in the religious service. Hence, a rectangular space with a podium located at one end evolved as the most useful space in which to hold western religious activities. (This is not to say that the circle was never employed for religious practices. Circular forms, such as the circle of stones at Stonehenge, were used but did not persist as the primary architectural form for religious buildings. Structures used to make astronomical observations are often, of necessity, circular in form.)

Also, the center point of Christian, Jewish, and Islamic religious structures is not of ritual or theological significance and, therefore, is rarely architecturally marked inside the building or on the exterior. In many Christian churches the steeple, the most salient external architectural feature, is not located over the center of the building or over the altar but instead, for structural reasons, is often placed over the foyer to the sanctuary – a point of no ritual or theological importance at all!

In Christianity and Judaism the sanctuary is most often a rectangular area that is usually walled and enclosed by a roof. In Islam, the sanctuary is often left open to the sky, although the space is always clearly demarcated, today most often by walls. This practice is an outgrowth of Islam having first appeared, and having been practiced for long periods, in arid, desert-like areas by nomadic peoples who worshiped in spaces enclosed by curtain-like hangings. Also, Islam was not founded until 622 AD, long after the demise of the Roman Empire and, consequently, having limited contact with these archaic traditions, the Muslims did not generally borrow the classical temple form for their religious house of worship as did the contemporary Jews and the Christians. For example, Emperor Constantine was converted to Christianity and the temples used in the Imperial cult were converted by decree to Christian worship. This is why so many Christian churches as well as many Jewish synagogues are, even today, modeled on Greco-Roman prototypes, which ironically are pagan in origin. The realization of this discordant relationship was a major factor that prompted the revival of the Gothic style, during the nineteenth century in America when it was seen in hindsight to be more purely Christian.

Although Western religions as well as Eastern religions are concerned with providing their followers with a ritually demarcated, sacred space that is protected from the elements, a concern with the perimeter is more important in Western religious practice. This is because in Western religions the essential religious rituals are communal and, therefore, a ritual space must be provided that is large enough for all members of the congregation to assemble at once. Although external size is symbolically important in both East and West - the larger the building, the more powerful and prestigious the religious group is thought to be - the interior of Western religious buildings must enclose a large, unobstructed space to be useful for congregational purposes.

### **The importance in the East of the Center as opposed to the periphery is a result of processional worship.**

Worship in Hinduism and Buddhism is essentially a processional and singular practice, not congregational. Daily worship by Hindu and Buddhists consists of a pilgrimage from home to temple that terminates with individual prayer at the architectural, as well as ritual, center-point of the temple. Eastern worship, therefore, is essentially processional, as opposed to congregational, because it is an actual journey that is meant to trace the path or journey of the individual's soul to salvation – an event believed to occur at the very center of an individual's being. As an outgrowth of these beliefs, Eastern religious practice requires processional pathways or corridors to guide the worshiper along what is conceptualized as a “circular” route moving toward the center of the temple. Consequently, there is little need for a large interior space, since the center is approached, experienced, and used individually, not communally, for devotional purposes. Although a single small room is minimally adequate for most Eastern religious practices and often suffices for a wayside shrine, Eastern religious buildings are not necessarily small. Although often vast, they are not centered on the large sanctuary that is used for communal gatherings as in the West. Instead, large Eastern temples most often consist of concentric corridors leading circuitously to a small room, the inner sanctum, where the most important religious image is located and which has enough room for individuals to conduct their devotionals and pray, *ad serium*. In Hindu temples, the inner sanctum is a space sufficiently large to accommodate several priests while they perform required rituals (that do not require an

audience) and for devotees to receive blessings from the priests after they arrive for prayer at the center of the complex.

In Hinduism and Buddhism this centermost point is ritually and theologically important because it represents the point at which the soul experiences salvation or transcendence, known as *Nirvana* in Buddhism and as *Moksha* in Hinduism. At this point the soul escapes or transcends the endless repetition of birth and rebirth, and hence all suffering – and thus achieves a “heavenly” state. These concepts are both adequately and elegantly represented by concentric geometric forms. The number of concentric squares, circles, or triangles, can be enlarged and infinitely repeated while the center remains the same regardless of how large the final form. – One of geometry’s small marvels. This geometric truism and its variant forms was seized upon as an organizing principle by Hindus and Buddhists to represent religious beliefs concerning cosmology, geography, government, etc., but, most importantly, the salvation of the soul from suffering.

This center-most point has many meanings and uses: it is the world axis or *axis mundi*, an invisible column (of energy, some believe) that connects Heaven to earth. It is through this column that the gods above release prosperity to flow downward into the kingdom(s) below. This is why Buddhist and Hindu monarchs build a least one temple and, indeed, often their entire capital city, in the shape consisting of concentric squares that is known as a Mandala. The name of the 19<sup>th</sup> century capital of Burma, Mandalay, is derived from this word. The Mandala is a sacred, geometric diagram or map that usually consists of “concentric” squares but may include concentric circles and rarely “concentric” triangles (the “Sri Yantra” used in Tantric practices). In all instances, the concentric forms are centered on a single point. These mandala plans - from the largest outer square to the smallest inner square - are believed to represent and include the universe, the world, the kingdom, the capital, the temple, the individual, and even, the very soul. Thus, when a king constructs a capital in a mandala form, it is believed that he has created an “exemplary center” insuring that prosperity will flow down into the capital from above and then from the capital throughout his kingdom.

The Mandala can be presented in two or three dimensions. Any mandala can be infinitely expanded horizontally in two dimensions. Also, each square or unit may be pushed differentially upward to form a stair- step pyramid. This creates a visual emphasis on the point of transcendence when it is both the center-most and highest point in a structure. By incorporating this stair step pyramid as well as corridors and niches within a structure, the architect express a basic Hindu-Buddhist belief that mountains, mountain ranges and caves are the sacred abodes of the Gods. The differing ways in which this mountain- cave symbolism is expressed will be traced below in three Southeast Asian buildings: the Borobudur, a Buddhist Stupa in Indonesia; The Ananda, Buddhist Temple in Burma; and Angkor Wat, a Hindu temple in Cambodia.

Southeast Asian architects took architectural forms that had originated in India and creatively adapted them to the needs of Southeast Asians. This has resulted in the following irony: the largest buildings following Indian models of construction were constructed in Southeast Asia, not in India – the Borobudur in Indonesia is the largest Buddhist Stupa and Angkor Wat in Cambodia is the largest temple in the world. One important way in which Southeast Asian architects adapted Indian models was by expanding the buildings horizontally and also raising

them vertically on stair step pyramids that symbolized the World Mountain, Mount Meru. Because the replication of the Mandala plan by a ruler (i.e. the exemplary center) was believed to assure the prosperity of the kingdom by channeling prosperity down into the kingdom, the representation of the mandala as physically expressed in the temple became a vital statement of his right to rule. Therefore, the more impressive the temple (and by expansion, the capital city built to resemble a mandala), the more confident the populace would be that peace and prosperity were assured. This complex of beliefs offers an explanation for why mandala plan monuments were extended in Southeast Asia both horizontally and vertically. The clever use of this process of expansion (by replication, not by new, conceptual additions) is clearly seen in the Borobudur and in Angkor Wat. By contrast, the Ananda Temple at Pagan, Burma suffers visually from not having been raised on a high plinth although it is one of the largest temples at Pagan. This failing is abundantly documented by the realization that no photographs taken at ground level capture the enormous mass or complexity of the building. Only aerial photographs or those taken from the top of the tallest temple at Pagan, the Thatbyinnu, capture the basic cruciform structure of the temple and its numerous out accouterments.

Summary: In Western religions, a primary requirement for religious ritual is to provide a space suitable for a congregation to gather, to pray, and to listen while a member of the clergy delivers a sermon. In the East, the felt religious need is to enact a pilgrimage that symbolically concludes with salvation at the very center of the temple structure. In daily practice, it concludes with individual prayer or, perhaps, with meditation at the center of the building.

**The difference in the way perfect geometric forms are perceived and are used in Eastern and Western Architecture can be demonstrated in a comparison of the following religious buildings:**

**Western Architectural Examples:**

**The Parthenon, Athens, Greece**

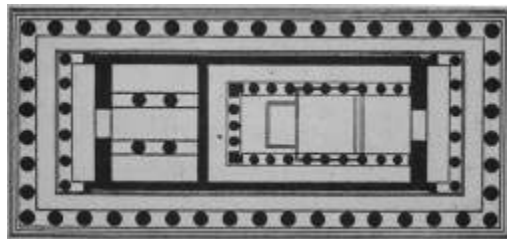
**Greek Gods, later used as Greek Orthodox Church, then as a mosque  
447-438 BCE**



**Figure 3 Parthenon, View of the Façade**

The square and triangle are the primary forms used in the design of the Parthenon.

The Classic principles of symmetry and balance are readily apparent in the rectangular façade (composed of two adjoined square forms) that is crowned by a triangular pediment or gable. The monumental frieze consists of alternating metopes and triglyphs that are basically a repetition of the square that serves as the major decorative element encircling the exterior of the building. The enormous gold and ivory image of Athena was is thought to have been located in the center of the building, although interior partitioning walls made the image appear to be located at the end of a long rectangular space, the usual arrangement in pagan temples.



**Figure 4 Parthenon floorplan**

The Parthenon was extensively remodeled for use as a Christian church sometime after the imperial Roman decree of 435 AD stated that all buildings used for pagan worship must be converted and rededicated for Christian worship, or demolished. Although the Parthenon was used as a mosque during the Turkish occupation of Greece, few changes were made, and Islam did not adopt the classical form for mosques elsewhere.

**The Pantheon, Rome, Italy**  
**125-28 CE**  
**Roman Gods, later Catholic Church**



**Figure 5 Pantheon, aerial view**

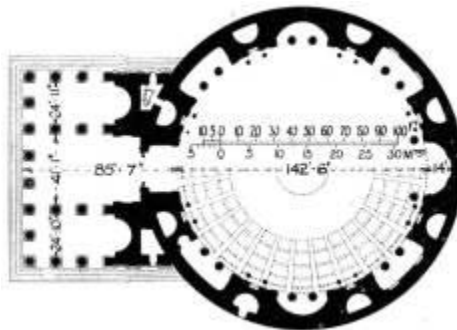
Although the design of the façade of this Roman temple, the Pantheon, very much resembles the façade of the Greek Parthenon in its extensive use of the square and triangle, the sanctuary is a perfect circle enclosed by a dome. This domed circular space was created to accommodate a

number of pagan gods and to give them equal pride of place – hence the building’s name meaning “across or including all the gods”. A single circular window at the center of the dome, the oculus, lights the interior. It is ritually important for connecting individual gods with specific astral bodies seen through the window, although it does not mark a ritually important point. Also, the window appears at this point in the structure of the building because this was the most efficacious place to locate a window without weakening the dome.



**Figure 6 Pantheon, interior view (drawing)**

When converted to a Catholic Church the altar opposite the front door became the primary altar, which was visually indicated by a sculpture of the crucifix. The remaining altars were dedicated to various saints. The interior space is awesome. If the arc of the dome is continued downward, it circumscribes a sphere, a circular form that would rest on the floor.



**Figure 7 Pantheon floorplan**

## Eastern Architectural Examples:

### The Borobudur, near city of Jogjakarta, Island of Java, Indonesia Buddhist Stupa c. 800 AD



Figure 8 Borobudur, aerial view

The Borobudur, the largest Buddhist building in the world was constructed in what has become in recent years the country of Indonesia, the world's most populous Muslim country. It is a solid building that cannot be entered because its ritual use was confined to external circumambulation – the journey tracing the path of the soul to Nirvana. Therefore, in its design, the Borobudur is an excellent example of the articulation of external rather than internal space.



Figure 9 Borobudur, side view

The building is symbolic of a mountain range with numerous caves, in which are situated images of the Buddha. The mountain and the cave are primary architectural symbols in both Buddhism and Hinduism, but not in Western religious buildings. Generally, an extensive articulation of exterior space is more characteristic of Eastern rather than Western architecture and the Borobudur is an excellent example of a building that consists exclusively of the articulation of exterior space. The Borobudur is the largest Buddhist Stupa in existence and is an excellent example of this Buddhist building type, since it, like all Buddhist stupas, consists of a “relic mound” erected over a deposit box that contains a major “relic”(ashes, etc.) of the Buddha. Buddhist stupas, therefore, are usually a good example of the Eastern building type that is primarily an articulation of exterior space.





**Figure 10 Borobudur Buddha image**

The plan of the Borobudur is essentially that of a mandala comprised of seven tiers of graduated size. The lower four terraces are square with redented angles at the corners. The upper three levels consist of circular terraces of decreasing size. Both the square and circular forms are centered on the same point, the central and tallest spire that also marks the point below ground level where the deposit box is located. This deposit box contains ashes or some other evidence of the Buddha's physical body such as hair, teeth or bones. These relics are considered by Buddhists to be *prima facie* evidence that the Buddha lived a human existence, gained spiritual enlightenment, and successfully escaped from human suffering at his death. Therefore, these human relics are also seen as irrefutable evidence that the way to salvation or Nirvana is open to all humans since the Buddha was born and died a human and gained Nirvana during his time on earth. He was not a figment of someone's imagination nor was he a supernatural being - states that a human could not hope to willfully assume.



**Figure 11 Borobudur floorplan**

On pilgrimage through the Borobudur, the devotee circumambulates each level by walking in a clockwise direction while viewing the bas-reliefs on the walls that depict how other humans have individually followed the path to salvation. After each complete circuit around the temple, the

devotee climbs up one level and then makes another circumambulation. Since the path around each tier has walls covered with bas-reliefs on either side while being open to the sky, it is very much like walking through a valley in a mountain range. The ultimate goal of the devotee's pilgrimage is the base of the center pinnacle or *stupika* – as close as the individual may approach Nirvana without turning inward to himself. This is symbolic that Nirvana is to be found within the individual not by traveling to any particular point outside one's self.

### **The Ananda Temple, Pagan, Burma**

**11<sup>th</sup> century**

**Buddhist Temple-known in Burmese as a *gu* or cave temple – entry halls, corridors, and inner shrines can be entered and circumambulated by devotees.**



**Figure 12 Ananda Temple, Pagan**

This temple was constructed at Pagan during the Pagan Period (11<sup>th</sup> to 13<sup>th</sup> c. AD) when over two thousand religious structures were erected on the arid plain of central Burma that is found within the bend of the Irrawaddy River. The temple has four entrances, one facing each of the four directions. Each doorway opens into an entry hall that is connected to a shrine consisting of an enormous niche in the central masonry block that occupies the center of the building. A short hallway connects the entry hall with the shrine by crossing the two circumambulatory corridors that encircle the central block.



**Figure 13 Ananda interior hallway**

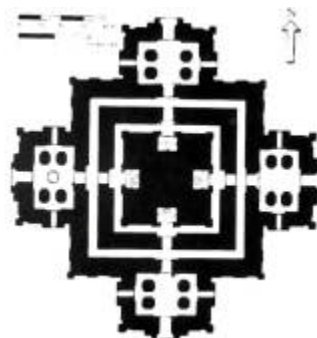
Although the center point of the building is clearly marked on the exterior by the towering spire, once inside the building the visitor cannot reach the center-most point because a solid block of masonry fills it. Each of the four sides of the central block is pierced by an enormous niche that holds one of the four tallest Buddha images in Burma. Each measures over thirty-three feet tall.



**Figure 14 Ananda Temple Buddha**

The four circumambulatory pathways that on the Borobudur were open to the sky are represented in the Ananda by two corridors that have carved sculptures set in niches on either side of each hallway. These sculptures depict eighty events in the Buddha's life that are seen as the steps or stages to salvation (more events than anywhere else in the Buddhist world). These events are frequently included in the corridors of Buddhist buildings because they are viewed as a model that others may follow to gain Nirvana.

The Ananda Temple consists of a single story (although the external fenestration gives the impression that there are two stories) that rests flat on the ground without employing a plinth of any kind. The entry halls, circumambulatory hallways, as well as the four shrines are all at ground level. Therefore the stair step, tiered pyramid that was so important in representing the stages of the soul's progress to salvation at the Borobudur is here indicated only by the tiered roofs of the Ananda. Therefore, the representation of the vertical ascent of the soul to Nirvana plays a subordinate visual role in the symbolic program of this building.



**Figure 15 Ananda Temple floorplan**

The tiered roofs, however, are decorated with 1,500 glazed plaques depicting the previous lives of the Buddha that are known as the Jataka Tales. An inscription on each plaque identifies each previous life or episode. However, no provision was made to allow visitors access to these roofs, although there are staircases within the Ananda and staircases in other temples constructed by the same ruler open onto the roofs - that ironically have no jataka plaques nor didactic decorations! Therefore, the intended use of these plaques was to sanctify the building and not for instruction.

**Angkor Wat, Angkor, Cambodia**  
**12<sup>th</sup> century**  
**Hindu Temple**



**Figure 16 Angkor Wat aerial view**

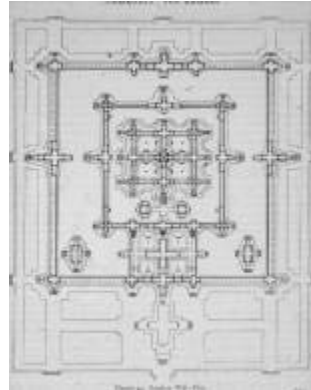
King Suryavarman II constructed the temple of Angkor Wat in the 12th century as the very epicenter of an empire that included areas in what are today Thailand, Laos and Vietnam. Angkor Wat is reputed to be the largest temple in the world and is only one of over 400 religious structures built at the site of Angkor.



**Figure 17 Angkor Wat façade**

Angkor is the Cambodian pronunciation of the Indian word *nakorn* that means “Capitol City” usually built in the form of a mandala. *Wat* is the Thai, not Cambodian, word for temple and has continued in use to refer to this temple ever since the sack of Angkor by the Thais in 1431 AD. Today, this building complex is used as a Buddhist temple and there is a Buddhist monastery within the grounds.

An excellent example of the continuing importance of kings building mandala-shaped temples up until the twentieth century is the large model of Angkor Wat that the Thai King Chulalongkorn built in 1867. It is located adjacent to the Royal Buddhist Chapel (Wat Pra Keow) that is located within the royal palace compound in Bangkok.



**Figure 18 Angkor Wat floorplan**

The temple of Angkor Wat was built according to a square mandala plan with a man-made, stair-step world mountain at its center. (The preference seen here in the floor plan for slightly more rectangular than square forms has resulted in the speculation that the world mountain and hence the center was placed farther away from the main entry, the western gate, to make the temple appear more solid and massive.) Much of the building consists of covered galleries that encircle each level of the pyramid and allow the devotee to continue on his pilgrimage from chapel to chapel while protected from the hot sun or rains. Conceptually, Angkor Wat, although Hindu, is like the Borobudur but with the open pathways roofed over. In Angkor Wat the symbolic center of the monument is marked externally by the tallest pinnacle of the world mountain and internally by a relatively small room or inner sanctum that originally is thought to have held an image of the Hindu god, Vishnu.



**Figure 19 Angkor Wat, interior corridor**

The center would have originally been clearly marked both externally and internally and fully accessible to the devout. Today, this centermost room has been closed off. In relatively recent time, images of the Buddha were placed in the four access chambers to the original inner sanctum, thus converting the building for Buddhist use. Being thus transformed, the present

spatial arrangement at the center of Angkor Wat is quite similar to that of the Ananda temple except for being raised on a terraced pyramid.

Thus we have seen the similarities in the religious buildings used by Hindus and Buddhists is so great that the same building can be used by both religions with little more than a change in the most significant images. This is possible because both religions subscribe to the same cosmological beliefs that assign the same meaning to the center of the sacred geometric forms – the square, the circle and triangle.