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One Hundred and Eight Rosary Beads in Landscape and Architecture Design

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Abstract

A study about monuments containing 108 architectonic and decorative elements, is here proposed in the framework of their environments and cultural landscapes. The number is related to Lord Buddha and to the beads of the Japamala that here we call as “rosary”. Number 108 is highly relevant in Hinduism too. In the proposed discussion we will illustrate some examples regarding the presence of 108 elements (shrines, stupas, statues) in Buddhist and Hinduist architectures. Among the monumental sites here considered, the reader can find the well-known Angkor Thom, Angkor Wat and Candi Borobudur. For this last site, we will also refer to a publication regarding the temples of Pawon, Mendut and Ngawen, the archaeologists found linked to Borobudur. We will consider in detail the zenith passage of the sun at Angkor (Cambogia) and Java.

Keywords: Architecture, Landscape, Buddhism, Hinduism, Numerology, Archaeoastronomy

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In Kieschnick, 2003, we can find written that Lord Buddha told a king:

If you wish to eliminate the obstacles of affliction and bad karmic consequences, you should string together one hundred and eight seeds from the aristaka. Keep this with you always. Whether you walk, sit, or sleep, always concentrate your mind, not allowing it to stray as you chant the words “Buddha, Dharma, Sangha,” after which you may pass one of the aristaka beads. In this way, gradually work your way through the aristaka beads. Do this ten times, twenty times, a hundred times, a thousand times, and even up to one hundred million times. If you can [chant through the beads] two hundred thousand times then you will feel no confusion in body or mind, nor will you be swayed by flattery. When you give up this life, you will be born in the third heaven, realm of the yāma gods, where your clothing and food will be supplied naturally and you will constantly abide in tranquility, joyfully practicing [Buddhism]. If you can complete a full one million [rounds of the rosary], then you will cut off all hundred and eight forms of karma. Only then will you turn your back to the stream of life and death and head toward nirvana. Forever cutting off the roots of affliction, you will thereby achieve the highest reward.

Japamala or simply mala is the Sanskrit name of a loop of beads used to count the units of spiritual practices (here we call it "rosary", in Latin “rosarium” in the sense of "garland of roses", a string of beads used to count the Rosary component prayers). The main loop of the Japamala rosary is usually made of 108 beads, but versions with smaller number of beads, 54 and 27, also exist. Japamala “are commonly used in Indian religions such as Hinduism, Buddhism, Jainism, Sikhism, for counting recitations (japa) of mantras, prayers or other sacred phrases”. It is also worn to be protected from evil ([Wikipedia](#), mentioning Apte, 1965, Tanabe, 2012, Mross, 2017).

“The 108 beads of the rosary, symbolizing the 108 afflictions, did more than convey information; it was more than a reminder to the adepts of the precise number of their potential problems. Precise symbolic criteria were necessary for the ritual of recitation to work.” (Kieschnick, 2003).

Here we will show that we can find the number 108 in monuments positioned in specific landscapes, in architectonic and in decorative units. That is, we can find the “rosary beads” represented by architecture too, as we will see in some examples. Both Buddhist and Hinduist cultural landscapes will be considered (from Mongolia to Java). Before showing them, let us add some information.



Fig.1 : Beautiful Buddha Shakyamuni (Museo Arte Orientale, MAO, Torino). The Buddha sits in the lotus position, with his right hand in the bhūmisparśhamudrā. The neck is marked by the three folds of beauty. The long eyes, with their eyelids, suggest inner contemplation. This Buddha image was created in a Tibetan monastery, but it is influenced by the tradition of Nepalese sculpture (Photograph by the author).

Prayer beads and wheels

“Both are used by Buddhists. Prayer beads are called malas and are made up of 108 beads like the Hindu and Sikh counterparts. The number 108 is pre-Buddhist and goes back into ancient Indian astrology” (Cole & Morgan, 2000). “Buddhists can make their own prayer beads out of available material ... Prayer beads are a kind of ‘spiritual abacus’ on which a Buddhist can count a set number of prostrations or mantras as they are completed. ... Because 108 beads can be noisy, or get tangled during prostrations, Buddhists often use a quarter-sized one of 27 beads. There are often larger or colored beads at 1,7 and

21. This is a means of remembering the Buddha, Dharma and Sangha during practice.” (Cole & Morgan, 2000).

The prayer wheels are of two kinds. There are handheld prayer wheels used when people walk around Buddhist shrines or temples and there are prayer wheels placed in monasteries and temples. The number of these wheels is up to 108. People walk clockwise turning each of these wheels.

Japanese Bells Ring 108 Times

About number 108, in the book by Cole and Morgan we can find also mentioned the Japanese New Year Festival. “The last day of the year in Japan brings us the tradition known as *joya no kane*, the tolling of 108 bells on New Year's Eve. Rooted in both Buddhist philosophy and Shinto ritual, and entrenched in the cultural fabric of the Japanese people, this ancient custom serves as a bridge between the past and the future, resonating with profound symbolism and spiritual significance. ... Why is the bell tolled 108 times? There is debate as to how the number 108 was derived. Some offer calculated formulations. There are six senses: sight, sound, taste, smell, touch, and consciousness (unique to Buddhism). We experience everything through these senses, but each sense can be experienced in one of three ways: negative, positive, or neutral, which gives us a total of 18 feelings (6x3). These feelings may be either pure or contaminated, creating 36 passions (18x2). Because each passion can be formed in either the past, present, or future, we are left with 108 defilements of mind (36x3).” bells.org/blog/

“Late on the evening of December 31, after all these preparations were completed, everyone would eat a bowl of buckwheat noodles called *toshikoshisoba* ("year-crossing noodles") and listen for the sound of the Buddhist temple bells, which were rung 108 times at midnight. The sound of these bells is said to purify the listeners of the 108 sins or evil passions that plague every human being.” asiasociety.org

3-smooth numbers

It is interesting the previous discussion, because we can find further numbers, which are linked to 108. Number 108 is a member of the sequence known as “3-smooth number” in [OEIS](https://oeis.org/A003586), n.A003586. The numbers are of the form $2^i \cdot 3^j$ with $i, j \geq 0$. Then the 3-smooth number sequences is: 1, 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, **27**, 32, 36, 48, **54**, 64, **72**, 81, 96, **108**, 128, 144, 162, 192, 216, 243, 256, 288, 324, 384, **432**, 486, 512, 576, 648, 729, 768, 864, 972, 1024, 1152, 1296, 1458, 1536, 1728, 1944, 2048, 2187, 2304, 2592, 2916, 3072, 3456, 3888.

See also <https://mathworld.wolfram.com/SmoothNumber.html>

108 Brahmin scholars

In a note “Poison Damsels”, by Penzer (2016), it is told that “The number 108 is mystical among both Brāhmins and Buddhists. Thus at Gautama’s birth the number of Brāhmins summoned to foretell his destiny was 108; there are 108 shrines of special sanctity in India; there are 108 Upanishads; 108 rupees is the usual sum for a generous temple or other donation. In Tibet and China we also find 108 occurring as a sacred or mystical number *in connection with architecture*, rituals and literature”. It is suggested as reference the Yule’s Marco Polo. “The number of beads in both Tibetan and Burnese rosaries is usually 108. Colonel L. A. Waddell refers me to his articles “Burnese Buddhist Rosaries”, 1892, “Buddhism of Tibet”. It is also used in documents before the name of the “Maharaja” or high priests of the Bhattia caste. In any letter or statement containing a reference to one of these Gosains, the name of the individual invariably appears as “108 Devadinandan Laharaj” or “108 Gokulnathji Maharaj”. M. Pelliot refers ... M. Pelliot is inclined to see in the number 108 a multiplication of the twelve months by the nine planets, Another suggestions is that it is obtained by the following arrangement of the lucky 3: $((3+3)(3+3))3$.”

Siddhartha

“On the fifth day after the prince’s birth, the king invited 108 learned Brahmins to choose a suitable name for him. The name Siddhartha Gotama was agreed upon. “Siddhartha” means wishfulfilled, while “Gotama” was the family name. The King also summoned highly distinguished Brahmins, specially selected to predict the future of the prince. Out of the group, of eight, seven of them raised two fingers to indicate that the new born prince would either become a universal monarch or a Buddha. However the youngest of them, a Brahmin named Kondanna, raised only one finger, and said that the prince would definitely become a Buddha”. (Wickremeratne, 2016).

Marco Polo

In a note from Yule’s Marco Polo, about rosary. “No doubt the number in the text should have been 108, which is apparently a mystic number among both Brahmins and Buddhists. Thus at Gautama’s birth 108 Brahmins were summoned to foretell his destiny; round the great White Pagoda at Peking are 108 pillars for illumination; 108 is the number of the volumes constituting the Tibetan scripture called Kangyur; the merit of copying this work is enhanced by the quality of the ink used, thus a copy in red is 108 times more meritorious than one in black, one in silver 108^2 times, one in gold 108^3 times; according to the Malabar Chronicle Parasurama established in that country 108 Iswars [rulers], 108 places of worship, and 108 Durga images; there are said to be 108 shrines of especial sanctity in India; there are 108 Upanishads (a certain class of mystical Brahmanical sacred literature); 108 rupee is frequently a sum devoted to alms; the rules of the Chinese Triad Society assign 108 blows as the punishment for certain offences; 108, according to Athenaeus, were the suitors of Penelope!”

Past, present and future

“The Buddha explains to a big crowd of beings how virtuous men and women, who wish to obliterate all their sins, must ask to obtain this end. He gives them the names of the Buddhas of the past, present and future. ... If virtuous men and women wish to “extinguish” their sins, they must purify themselves ... join their palms and say: I adore Akshobhya Buddha of the Eastern quarter (followed by the invocation of eleven other Buddhas of the East); I take refuge in all these numberless Buddhas of the Eastern quarter”. Then follow the names of 12 Buddhas of the South, 12 of the West, 10 of the North, 10 of the South-East, 10 of the South-west, 12 of the North-west, 10 of the North-east, 12 of the nadir and 8 of the zenith, in all *108 names* ...” (De Wisser, 1928).

Temples and Buddha’s lifetime

“We drove from an 8-th century site to a 6th-century one: Jampa Lhakang. ... The monastery courtyard contains 108 prayer wheels, and we made the circuit to turn them all. (The *number 108 refers to the number of temples built during Buddha’s lifetime*, it is also the number of beads on a rosary)” (Untermeyer, 2016). “The Jampa Temple ... or Temple of Maitreya is located in Bumthang (Jakar) in Bhutan, and is said to be one of the 108 temples built by Tibetan King Songtsen Gampo in 659 CE on a single day, to pin down an ogress to earth forever” ([Wikipedia](#), mentioning Pommaret, 2006).

This is a very remarkable information, that 108 was also the number of temples, which have been built during Buddha’s lifetime (or by the Bhutan king in a day). Therefore, our search for architectonic and decorative units in landscape is well-posed.

Why the Number 108?

And now the above question, that we can find in Olsen's "Sacred places around the world: 108 destinations.", 2004. "Numbers, it can be argued, carry as much significance as letters. Numbers convey a different method of communication altogether, forming the basis for commerce and all the sciences. Numbers are deeply rooted in many cultural traditions, oftentimes contemporary with a civilization's original literary works. Such is the case with the number 108 in most East Asian religious cultures. 108 is the number of beads on sacred mala necklaces worn by millions of reverent Buddhists and Hindus. To them, the number 108 is associated with the precessionary cycles of earth and the cosmos above. If a Buddhist or Hindu pilgrim can endure a trip to the most sacred mountain in Asia, the inhospitable Mount Kailas on the Tibetan Plateau, one is on a true path to nirvana. If that same pilgrim can manage 108 circuits around the base of Kailas in a single lifetime, their entry into heaven is assured."

Let us start visiting a place in China.

ONE HUNDRED AND EIGHT STUPAS



Fig.2: The 108 stupas at Qingtongxia. Courtesy: BabelStone, Own work, CC BY-SA 3.0, https://en.wikipedia.org/wiki/One_Hundred_and_Eight_Stupas#/media/File:108_stupas_all_3.jpg

The site we can see in a [Wikipedia page](#) (Fig.2) can be easily assumed as an example of a rosary in its landscape. The beads are the 108 stupas at Qingtongxia. Coordinates of the site are 37°52'27"N 105°58'43"E . The first version of the Wikipedia page was created September 4, 2016, by Andrew Christopher West, an English Sinologist. His Wikipedia username is BabelStone. Almost all revisions of the Wikipedia item have been performed by West. References are Lei and Yu, 1991, Lei, 1996, Du, 2012, Han, Sun and Chen, 2001.

We can read in Wikipedia item that the One Hundred and Eight Stupas is a set of 108 Buddhist stupas (also names “dagobas”) positioned on a hillside on the west bank of the Yellow River at Qingtongxia in Ningxia, China. The original stupas are dating to the Western Xia time. The 108 units of the site have been rebuilt several times over the centuries. “The 108 stupas are arrayed in a triangular formation up the side of a hill, facing southeast, overlooking the Yellow River. There is one large stupa at the apex of the triangle, with a Buddhist Hall behind it, and below that are eleven rows of one hundred and seven smaller stupas on brick platforms of increasing width running down the hill. The number of stupas on each level is: 1, 3, 3, 5, 5, 7, 9, 11, 13, 15, 17, 19. The reason why there are 108 stupas is that the number 108 is a sacred number in Buddhism, for example Buddhist rosary beads number 108. Odd numbers are also considered auspicious in Buddhism (so pagodas always have an odd number of storeys), which is why the number of stupas on each row is an odd number” (A.C. West, already in the 2016 version).

“The 108 stupas are believed to have been originally constructed during the period of the Western Xia kingdom (1038–1227), as part of a Buddhist temple complex. ... During renovation in 1987 it was possible to reconstruct the architectural history of the stupas. The original stupas were made of sun-dried mud bricks surrounding a central wooden supporting pillar. The mud core was coated in white plaster, with lotus flower designs or Sanskrit text painted in red around the base. ... The stupas were replastered twice during the Yuan and Ming dynasties (West, and references here mentioned).

Gobi’s spiritual power

Buddhism arose in Ancient India. since then, it has reached the whole world.

Here from the Croft’s book about the Khamar Monastery (Mongolia). It is “at the foot of one of the sacred mountains in Mongolia, and in the old stomping grounds of the 13th-century ruler Genghis Khan and his Mongol nation”. It “is where you’ll discover Khamariin Khid, or Khamar Monastery, glowing from the golden sand of the Gobi’s spiritual power”. Coordinates 44°35’49.98” N, 110°16’24.53” E. “At the centre of the small complex is Shambala, a word ... [meaning] ‘place of tranquility’. Here 108 stupas surround 80 small shrine-like temples, the most prominent of which sports a large pair of blue eyes that stare at passers-by from the hot desert sands. ... The number 108 is sacred in Tibetan Buddhism for it correlates with the 108 volumes of sacred texts described in the Word of the Buddha as well as to 108 temptations each Buddhist must face on the road to nirvana.”

Let us pass then to Erdene Zuu Monastery.

This is a monastery of the Tibetan Buddhism, located near Kharkhorin, Övörkhongai Province, Mongolia. Geographic coordinates 47°12’06”N 102°50’36”E. The monastery was established in 1585. “The Erdene Zuu Monastery is probably the earliest surviving Buddhist monastery in Mongolia.

This monastery is close to Karakorum, the capital of the Mongol Empire. In Rogerson, 2014, it is told that the “Genghis Khan’s city of Karakoram, the tented capital of Asia, was encircled with a wall that was decorated with 108 stupa-shrines. This remains a highly propitious and symbolic number in Central Asia, India and the Far East”. Of 108 stupas decorating the walls of Karakorum, we are not sure, but we are sure about Erdene Zuu.

ERDENE ZUU



Fig.3a: Erdene Zuu in Google Earth Street View

“Stones from the nearby ruins of the ancient Mongol capital of Karakorum were used in its construction. Planners attempted to create a surrounding wall that resembled a Tibetan Buddhist rosary featuring 108 stupas (108 being a sacred number in Buddhism), but this objective was probably never achieved. The monastery's temple walls were painted, and the Chinese-style roof covered with green tiles” (Wikipedia, mentioning Snipe, 2007, Gutschow and Brandt, 2005). As previously told, the rosary is also worn for being protected from evil, in this case it is used to protect the monastery enclosure.



*Fig. 3b: Erdene Zuu in a photograph by Martin Vorel, LibreShot (under Creative Commons Deed CC0 license).
<https://libreshot.com/erdene-zuu-monastery/>*

DOCHULA PASS

And here we find another rosary in landscape. Coordinates: 27°29'24"N 89°45'01"E. The Dochu La is a mountain pass in Bhutan on the road from Thimphu to Punakha where 108 memorial chortens or stupas known as "Druk Wangyal Chortens". "The chortens are built in three layers, the first lowest level layer has forty five chortens, the second has thirty six and the top layer has twenty seven built around the main chorten" (Wikipedia mentioning Braun, 2014).



A web site, bhutan/druk-wangyal-lhakhang/ , illustrates that the monument was built to celebrate 100 years of monarchy in Bhutan. "The entire structure is set against the backdrop of dense forests, which are themselves overlooked by enormous mountains. It has been built at a high altitude, so as to emphasize its importance and for what it stands".

The 108 stupas in a satellite image courtesy Google Earth.

BOROBUDUR



Fig. 4a: Borobudur Temple in 2013. Courtesy Kartika Sari Henry, Own work, CC BY-SA 3.0. https://en.wikipedia.org/wiki/Borobudur#/media/File:Borobudur_Temple.jpg .

Let us pass therefore from Himalaya to Java

“Candi Borobudur (Borobudur Temple) is the world’s largest Mahayana Vajrayana Buddhist temple, which is located in Magelang, Central Java, Indonesia. It was built by the Sailendra dynasty between the 8th and 9th centuries A.D. The temple was built with 10-step pyramid terraces, which are decorated with 2,672 relief panels, 504 Buddha statues, and 1,537 stupas. . . . The stupas at Borobudur located from the second to ninth terraces are called the secondary stupas, whereas the one located on the tenth terrace is called the primary stupa. They are symbolic stupas, which consist of a base (Prasadha), a bell-shaped body (anda), a top support (harmika), and a top (yashti). The stupas are divided into four types, namely plain stupas, hollow space-square stupas, hollow space-diamond stupas containing the Dhyani Buddha Vairocana that represents the turning wheel of the dharma and the single main stupa that becomes the centre of Borobudur. Temple is reflecting Sailedra art-style.” (Revianur, 2017).

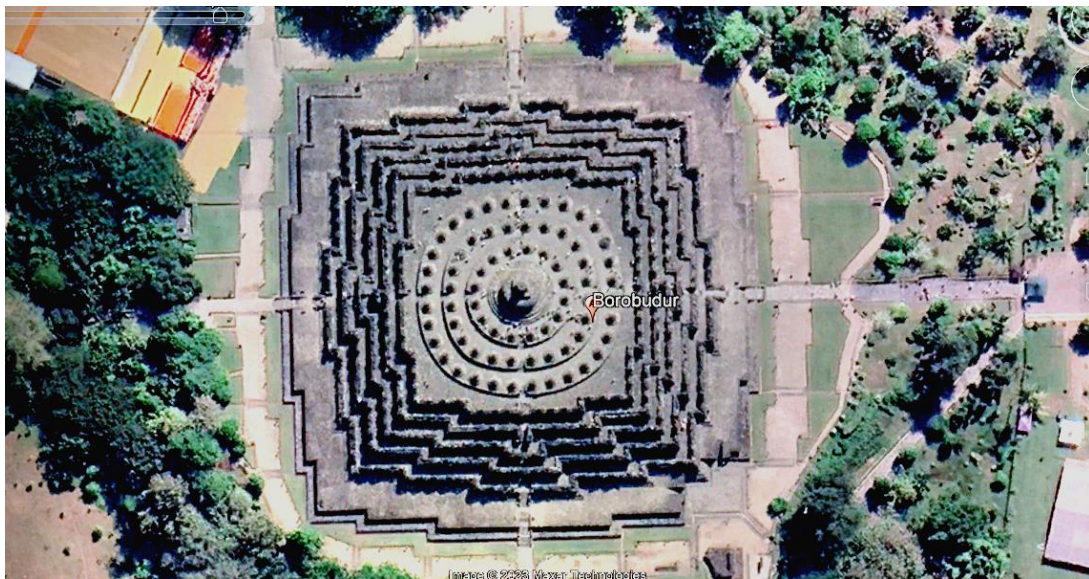


Fig. 4b: Borobudur seen from above. Satellite image. Courtesy Google Earth.

“The main component of a Buddhist temple, including Borobudur, is the stupa. The stupa, in the period before Buddha, would have served as a tomb and later became the symbol of Buddha’s life. It was originally built to bury the relics of Buddha shortly after his body was cremated. In its further development, a stupa was used to store not only the relics of Buddhist monks but also Buddhist objects. . . . A stupa, which describes the concept of Buddhism, has several sections, namely the basis of the stupa (Prasadha), the parts of the ball (dagob) or bell (genta) and the top or crown (yashti) (Revianur, 2017).

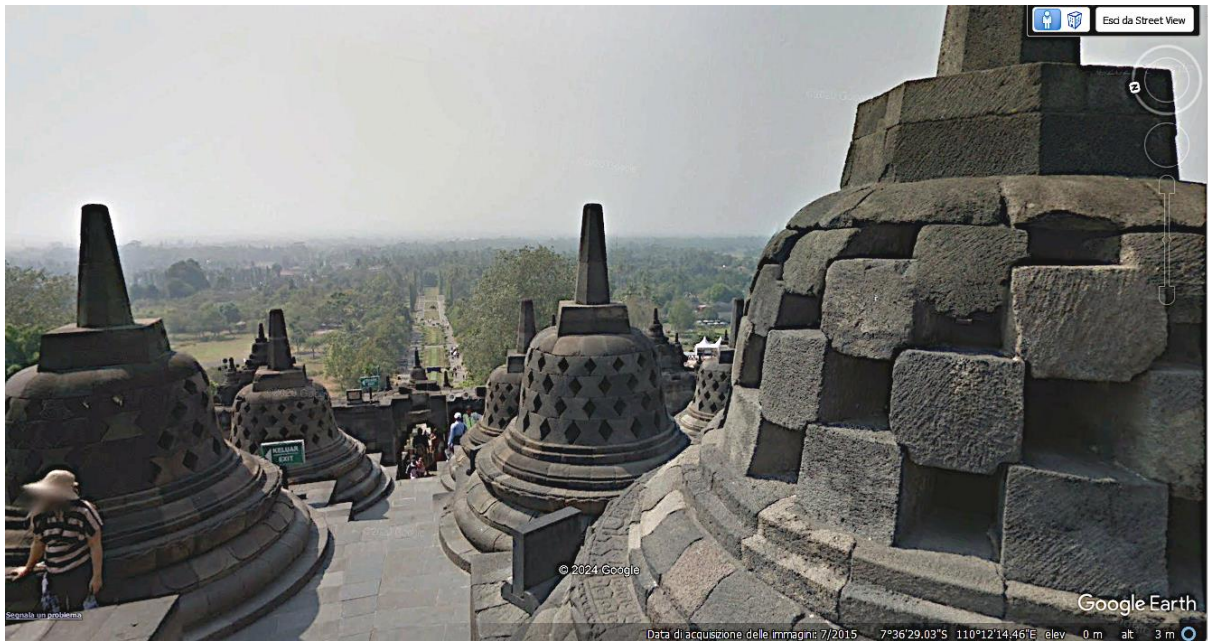


Fig. 4c. Stupas on the Borobudur platform. Image Courtesy Google Earth Street View.

Of this temple and of the sun zenith passage above it, we discussed in February and May 2017. On the uppermost platform of Candi Borobudur, we can see 72 stupas (see Fig.4c), dedicated to the Zenith direction. In February 2017, I observed that 72 is also the number of days passing from the zenith passage of October 12 to the December solstice, and from December solstice to the zenith passage on the end of February (or first of March). The same number, 72, is observed for the Sewu and Prambanan temples. These temples and the Candi (temple) Borobudur are in Java. However, in May 2017, I stressed that a pure religious interpretation of the seventy-two temples of the Sewu central structure existed, as for those of Borobudur. “Within the Buddhist Abhidharma philosophical schools”, there are “three unconditioned Dharmas whose nature is free from the laws of causation (asamskrta) as well as 72 conditioned Dharmas, which are subject to the laws of causation (samskrta). So one might conjecture that these 72 auxiliary shrines [at Sewu] had pertained to what Vilāsavajra had called the second circle of Mahāvairocana containing the divinities belonging to the perfectly pure Dharmadhātu of Vairocana” (Long, 2015). Being number 72 relevant in Buddhism and being this number also dedicated to the Zenith direction, we can argue that the 72 days passing from the sun zenith passage and December solstice, and from solstice to the zenith passage at the end of February, could have been important for local people. In this manner, solstices and zenith passages could have been used to mark periods of the year.

Further information and number 108 at Borobudur

But here we are investigating number 108, so let us consider in detail stupas and statues of Borobudur to test if we can find in it also 108 units. Before illustrating the further numbers displayed by the temple, let us add some information. The temple is a site of pilgrimage. In it, the pilgrim can find the “biography of the Lord Buddha, ... , [which] is depicted on the main wall of the first gallery. ... In striking contrast

to the square terraces of the rupadhatu, the circular platforms representing the Sphere of Formlessness are plain: no carvings, no ornaments, no embellishments. The only break in the monotonous plainness is offered by the row of stupas that encircle the big central dome. Supported by lotus cushions, the stupas are arranged in three concentric circles, corresponding to the three circular platforms. In all there are 72 stupas: 32 on the lowest or first platform, 24 on the second and 16 on the third. Each of the 72 stupas has a kind of lattice-work surface, composed of stones and diamond-shaped empty spaces which partly disclose the seated Buddha statue inside” (Soekmono, 1976). And “the Borobudur statues show five kinds of mudra, corresponding to the five cardinal points of the compass (East, West, North, South, Zenith), and also to the Mahayana conception of the five Dhyani Buddhas. One point of the compass is ascribed to each Dhyani Buddha, and the distinction between the Dhyani Buddhas is indicated by the different mudras” (Soekmono, 1976).

We can find many illustrations of the Buddha’s life depicted on Borobudur walls in a book by Isaac Groneman, 1912. Groneman had a profound interest for the religious context of Candi Borobudur. He considered Borobudur as a Buddhist sanctuary, obtaining support by King Chulalongkorn, that we can find mentioned in Groneman's book entitled "Ruins of Buddhist temples in Prägä valley: Tyandis Barabudur, Mendut and Pawon". In the title we find the word "tyandi", that is "candi", "temple". The book is a remarkable discussion of the three temples (Borobudur, Mendut, Pawon), which are linked by a ritual relationship and by an alignment of the sites. The temples of Mendut and Pawon are thought to have been early purification temples for pilgrims going to Borobudur (Brockman, 2011).

On the Vesak Day, a procession along the alignment of the temples goes from Mendut to Borobudur (Brockman, 2011). In his book, Groneman is following the same approach, and the first temple he discusses is Candi Mendut. That is, the Borobudur Temple Compound seems being made of three monuments: namely the Borobudur Temple and two smaller (ancillary) temples situated to the east on a straight axis to Borobudur (see Appendix about Four Temples). Let us stress that the first historically attested celebration of Vesak at Borobudur dates 1953 (Chia, 2020).

From [The Borobudur Temple: A Cosmic Stupa, by Indosphere Culture, 2019, Medium](#). “The temple [Borobudur] is oriented to the four directions and is expanded vertically in accordance with Buddhist cosmology to construct the Universe in a small scale. There are all total four entrances and four complete steps for ascending the highest point from the lowest point from the four directions of East, South, West and North respectively to enter the monument.... Mendut Temple, whose depiction of Buddha is represented by a formidable monolith accompanied by two Bodhisattvas. Pawon Temple, a smaller temple whose inner space does not reveal which deity might have been the object of worship. Those three monuments represent phases in the attainment of Nirvana. During the full moon in May or June, Buddhists in Indonesia observe the Vesak annual ritual by walking from Mendut temple, past Pawon and then to Borobudur.”

Is number 108 present in Candi Borobudur? “Looking at all sides of Borobudur there are *108 Buddha statues in niches on each side facing each cardinal direction*.” (Kandahjaya, 2022). In Snellgrove, 1996, we can find that “the one and only Buddha manifests himself under a variety of names in all the directions of space. This idea is expressed admirably by the pattern of a mandala. ... as it is well known, this notion is eventually formalized as the basic set of Five Buddhas, representing the centre and four points of the compass, although it is assumed that their power of emanation is infinite. It is this stage of Mahayana development which we find represented on the great Borobudur stupa. The Buddhas of the four directions, Aksobhya (E), Ratnasambhava (S), Amitabha (W) and Amoghasiddhi (N) are represented on the four sides of the stupa, the auspicious number of 108 to each side. Vairocana (with his conventionalized hand-gesture of preaching) presides over the three upper circular terraces, manifest as eight such Buddha images on the upper terrace [actually it is four times four], 16 on the next lower one [six times four] and 32 on the lowest of the three [from Fig.4b, eight times four]. John Lundquist observes that this total number of 72 represents just twice the number of the 36 divinities (less the central divinity) of the Vajradhatu mandala” (Snellgrove, 1996). Stupas (see Fig.3b) are $4 \times 8 + 4 \times 6 + 4 \times 4 = 72$.



Fig. 4d: Buddha statues and stupas at Borobudur. Image Courtesy reggaelooper, <https://pixabay.com/it/users/reggaelooper-3002941/>, under License <https://pixabay.com/it/service/license-summary/>

However, mentioning Lundquist's work, 1995, Snellgrove remarks that 72 are the manifestations "of the central Buddha Vairocana, whose popularity as Primary Buddha is well attested by many other images in commanding positions during the Sailendra period. It is certainly significant that he appears enthroned centrally in Candi Mendut, the important shrine visited by pilgrims on their way to Borobudur. There would seem to be nothing very special about the number 72, if these manifestations are simply regarded as the most obvious symmetrical lines of emanation from a fixed centre. The fact that they are all of Vairocana is certainly significant. We may then conceive of him as yet further dispersed to the four major directions as the 108 manifestations of each of the four well known Directional Buddhas. There is thus no need for any other specific supreme Buddha manifestation at the very centre of this stupa, and archaeological research has identified none with any certainty" (Snellgrove, 1996).

Let us stress that, being Java in the Tropical Zone, we have there the sun zenith passage. This can be a good reason to stress, also in the monuments, the fundamental role of Vairocana.

The five Buddhas are therefore linked to what is "the spatial form of a circle with a center, a form that would imply the four cardinal directions with a center (zenith/nadir)" (Rhie, 2019). In Snodgrass, 2018, in a discussion about the symbolism of the stupa, we can find a table reporting the correlations of the five Buddhas, the directions, the types of consciousness and the aspect of Knowledge.

	Direction	Consciousness	Knowledge
Vairocana	Centre or Zenith	Undeified Consciousness	Knowledge of the Essential Nature of the Dharma World
Akṣobhya	East	Storehouse Consciousness	Mirror Knowledge
Ratnasambhava	South	Mind Consciousness	Knowledge of the Identity of Essences
Amitābha	West	Thought Consciousness	Knowledge of Wondrous Perception
Amoghasiddhi	North	Sense Consciousness: Sight Taste Hearing Touch Smell	Knowledge of the Perfection of Action

(Table adapted from Snodgrass, 2018).

MANDALA

In the book by Giuseppe D'Acunto, entitled "Il disegno del Cosmo, L'architettura mandalica di Angkor Vat", we can find a remarkable discussion of Borobudur.

"Il tempio che forse esprime in maniera più eloquente e diretta le richieste, spirituali e simboliche è il Borobudur, costruito nel 860 d.C. a Java su matrice buddista. È questo un perfetto esempio di stupamontagna, a forma piramidale, poiché incarna pienamente il simbolismo cosmico estremo-orientale". In the layout of Borobudur, we can find the Mandala Law. "Non esiste monumento al mondo, buddista o altro, che possa fungere da campione di riferimento: con il Borobudur nacque un'arte, e una concezione dell'arte, che prima non esisteva, frutto di influenze indiane, persiane, greche e persino babilonesi. A commissionarlo furono i principi della dinastia Sailendra, a concepirlo furono i saggi del buddismo tantrico, che guidarono la mano dell'architetto *Gunadharmā*, a progettarlo fu una delle più formidabili equipe di scienziati (ingegneri, astronomi, matematici, fisici) della storia dell'umanità, a costruirlo furono diecimila operai, artigiani, scultori e schiavi nell'arco di quasi cento anni. *La posizione geografica non è casuale: nella piana si incontrano due fiumi che ricordano la sacra confluenza del Gange e dello Yumna in India, e sullo sfondo si ergono montagne che ricordano il profilo dell'Himalaya*" (D'Acunto, 2004).

Architect Gunadharmā is also mentioned by Mark Long, in his "Architectural Survey of Borobudur's Summit".

"L'edificio è composto da dieci terrazze, una per ogni fase del cammino spirituale verso la perfezione, divise in tre livelli, corrispondenti alle tre sfere buddiste: la base rappresenta la vita nelle spirali del desiderio (*kamadhatu*), le cinque terrazze quadrate rappresentano la progressiva emancipazione dai sensi (*rupadhatu*), mentre le tre terrazze circolari diventano l'ideale metafora della progressione dell'anima verso il nirvana (*arupadhatu*). In cima la densità massiccia dei livelli precedenti si distende improvvisamente in spazi aperti, la complessità delle terrazze si evolve con naturalezza in una semplice tranquillità ... Nelle gallerie di ciascuna terrazza si accede da sinistra per porgere tributo agli dei, da destra per i demoni; le gallerie compongono un labirinto di cinque chilometri e lungo le cui pareti sono disseminati 8.000 metri quadrati di bassorilievi, ... Sono 1500 i pannelli della storia di Buddha, a cui vanno aggiunti 1200 pannelli di puro decoro. Nell'insieme essi costituiscono una gigantesca enciclopedia del sapere buddista, in quanto abbracciano non soltanto religione, ma anche storia, arte, filosofia, arti marziali, agricoltura, commercio, danza, persino abbigliamento. Ma anche all'occhio più

profano risalta subito la giungla di immagini mitologiche, la folla di divinità che si accalcano in questo universo in cui Buddha e Shiva sono la stessa divinità” (D’Acunto, 2004)

PHNON BAKHENG

After Borobudur, let us consider the Angkor temples.

Coordinates: 13.42418°N 103.85601°E, [Wikipedia](#), Location: Angkor, Siem Reap Province, Cambodia.

Wikipedia item tells that Phnom Bakheng is a Hindu temple. Let us stress that it was a Khmer “state temple” (see the discussion in the section “NUMEROLOGY”). The temple was completed 889–910 AD. “Constructed more than two centuries before Angkor Wat, Phnom Bakheng was in its day the principal temple of the Angkor region, historians believe”, according to Wikipedia. “Phnom Bakheng is a symbolic representation of Mount Meru, home of the Hindu gods, a status emphasized by the temple’s location atop a steep hill 65 m above the surrounding plain. The temple is built in a pyramid form of seven levels, representing the seven heavens [Higham, 2014]. At the top level, five sandstone sanctuaries, in various states of repair, stand in a quincunx pattern—one in the center and one at each corner of the level’s square. *Originally, 108 small towers were arrayed around the temple at ground level and on various of its tiers*; most of them have collapsed [Rooney, 2002]” (Wikipedia and mentioned references).

“Jean Filliozat of the Ecole Francaise, a leading western authority on Indian cosmology and astronomy, interpreted the symbolism of the temple. ... Phnom Bakheng's total number of towers is also significant. The center one represents the axis of the world and the 108 smaller ones represent the four lunar phases, each with 27 days. The seven levels of the monument represent the seven heavens and each terrace contains 12 towers which represent the 12-year cycle of Jupiter. According to University of Chicago scholar Paul Wheatley, it is ‘an astronomical calendar in stone.’ ” (Wikipedia).

The web site <https://www.templemountains.org> is offering further information.

“Yasovarman I built a new capital at Yasodharapura a few miles from the future sites of Angkor Wat and Angkor Thom, centered around his own state temple mountain located on the crest of an actual mountain, or at least a hill, rising 78m above the Angkorian plain named Phnom Bakheng (phnom is Khmer for hill.) ... Like the [Bakong](#), Yashovarman I’s pyramid had five-levels or terraces with a plinth on the uppermost one supporting a panchayatana or quincunx of shrines, surrounded on its terraces by sixty small shrines and forty-four medium-sized ones around its base. Phnom Bakheng thus turns an actual mountain into the cella or base of a five-tier man-made “temple mountain” which acts as its shikhara, with **108** shrines, each itself an aedicule of a temple mountain, strung around these five levels like the talas or haras of a Dravida vimana. Of all the temple mountains the Khmer built, Phnom *Bakheng seems most cognizant of its possible Javanese precedent, Borobudur*, in the multiple small, identical shrines lining its five terraces which are, however, too narrow to allow circumambulation, thus precluding the need for mural bas reliefs and the didactic purpose of its putative original. The forty-four large shrines surrounding the pyramid’s base also recall the phalanx of 224 pevara or guardian candi or small shrines standing watch at Candi Siwa at Roro Jonggrang (Prambanan,) Java. Nonetheless, the Bakheng’s 108 shrines would be an impressive number of aedicules on the shikhara of all but the most ambitious Indonesian and Indian temples.” (templemountains.org).

The number 108 is also mentioned in Ching et al., 2017, p. 301.

“On the top of this hill, Yasovarman built his primary royal temple, Yasodharesvara, known today as Phnom Bakheng. Phnom Bakheng sits on a platform, created through cut and fill, at the summit of the hill. Its five terraces, a man-made mountain on top of the natural mountain, culminate in a plateau with four shrines around a central Shiva shrine. Another 103 shrines are distributed geometrically on the

terraces, bringing the total to 108, an auspicious number by Hindu astrology. A sophisticated system of numerology – number of towers, steps, and ascending hierarchy of sculptural groups – reinforced the temple’s association with Shiva. As to Bakong, Phnom Bakheng was surrounded by a moat, and the terracing creates a spherical profile. From the summit, the temple affords expansive views, in particular towards the mountains in the north. Some of them seem to have the outline of Naga to protect and define the vast flood plain.”

“The number 108 is highly important in Hinduism. All Hindu eras, or yugas, are comprised of large numbers divisible by 108, while mantras are often repeated 108 times. The number is considered as a ‘building block’ of the universe. ... At Angkor, the early mountain temple of Phnom Bakheng had its central sanctuary surrounded by 108 smaller ones” (<https://sailingstonetravel.com/decoding-the-symbolism-of-angkor/>).

“In Hindu/Buddhist beliefs, there are 108 feelings, 108 earthly desires, 108 human delusions or forms of ignorance, 108 earthly temptations, humans tell 108 lies, 108 dance poses (karanas) in the Natya Shastra, 108 music talas and ragas, 108 Hindu deities, 108 gopis in Gaudiya Vaishnavism, 108 Upanishads, 108 qualities of praiseworthy souls, 108 Jain virtues, 108 paths to Gods.” (Agarwal, 2013). We can find also told that there are 19 constellations and 9 planets, so $12 \times 9 = 108$. Rama has been called by 108 different names.



Fig. 5 : Statues along the South Gate bridge, Angkor Thom. Photograph Courtesy Colin W. Licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license.

https://en.wikipedia.org/wiki/Angkor_Thom#/media/File:Angkor_Thom_South_Gate,_Angkor_-_panoramio.jpg

ANGKOR THOM

The causeway to the South Gate, which is leading to Angkor Thom, has 108 statues, 54 gods and 54 demons. These 108 statues are guarding the entrance. We can easily follow this causeway on the bridge flanked by statues by means of Google Earth Street View. The iconography is inspired by the epic on the Churning of the Ocean of Milk. The statues are positioned on opposite sides according to good and evil.

CHURNING OF THE OCEAN

‘The Churning of the Ocean of Milk’ was a favorite story of many Khmer artists and kings. It begins with the devas, or gods, being cursed by a powerful sage, leaving them as easy targets for their arch-rivals, the asuras ... They soon learned, however, that amrita, or the elixir of immortality, lie at the bottom of a milky ocean. As the ocean needed to be churned to obtain it, the devas and asuras had no choice but to cooperate with each other to get it out. The ocean was so big that the peak of Mt. Mandara was used as the churning rod. For stabilization, Vishnu transformed himself into a turtle named Kurma, on top of whom the peak was placed. And to spin the mountain peak, the devas and asuras used the naga king Vasuki as a churning rope. He wrapped himself around the peak as the two teams each took one side of his long body and began to pull. As they started to churn, ...” sailingstonetravel.com “The story also contains significant numerological symbolism. The two teams consisted of 54 devas and 54 asuras. The number 108 is highly important in Hinduism. All Hindu eras, or yugas, are comprised of large numbers divisible by 108, while mantras are often repeated 108 times. The number is considered as a ‘building block’ of the universe. ... At Angkor, the early mountain temple of Phnom Bakheng had its central sanctuary surrounded by 108 smaller ones.”

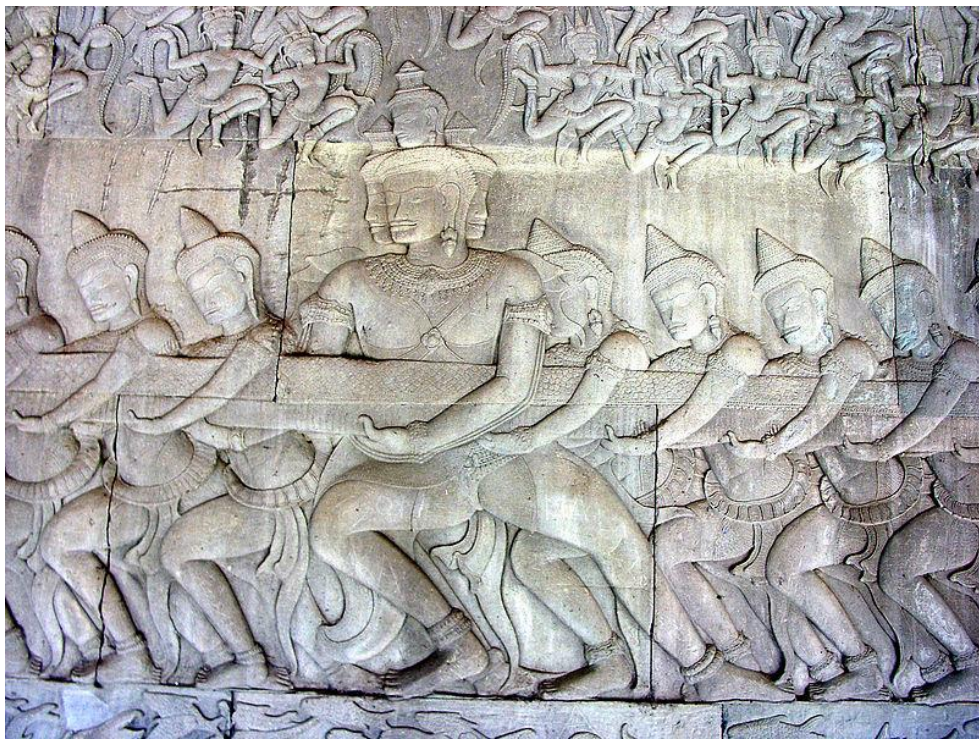


Fig.6: Large Deva Churning the Sea of Milk, Angkor Wat . “This is the middle of three large devas that participate in the churning. Its identification is unknown; Brahma, Shiva, and Vishnu have all been proposed.” Photograph and description by Michael Gunther. Creative Commons Attribution-Share Alike 4.0 International license. [Large Deva Churning the Sea of Milk Angkor Wat](https://www.flickr.com/photos/mgunther/10000000000/)

The zenith passage of the sun at Angkor and Borobudur

In fact, when I wrote about the zenith passage of the sun at [Borobudur, Prambanan and Sewu temples](#), I considered $n.72$ as the number of days passing from the zenith passage of October 12 to December solstice, and from December solstice to the zenith passage on the end of February (or first of March). In total, $2 \times 72 - 1 = 143$. But we could count the days from February/March to October, “with June solstice right in between”, obtaining 222 days. This different manner of counting the days has been proposed too, and before my discussion in 2017. Therefore, it is fundamental for me to carefully report this proposal that we can find in the Barnhart and Powell discussion of zenith passage of the sun. We will find the number of 224 days between the two zenith passages over the Prambanan temple in Java. However, the focus of Barnhart and Powell is Angkor, Cambodia.

“One other interesting element to notice about Angkor Wat’s churning the ocean of milk scene is the fact that the large figures on either end are not Bali and Indra, the leaders of the demons and gods, but rather Ravana and Hanuman, the antagonists from another famous Hindu story called the Ramayana. Later in this paper [Barnhart and Powell paper] [the authors] will discuss the Ramayana and its connection to solar astronomy. Why would the artists transpose these two figures into the lines of pullers? We believe it’s yet a further validation that the numerology of the scene is counts between solstices, equinoxes, and zenith passages. This would not be the only example of zenith passage numerology in Angkor. Mark Long of Borobudur TV and Caesar Voute have suggested another possible numerological reference to zenith passage at the gates of Angkor Thom. Quoting the account of Chinese trader Zhou Daguan, Long states *that a fifth, golden head once stood atop the four faced head above each of Angkor Thom’s five gates*. Each gate was reached by a bridge over the moat surrounding the city. Each bridge was lined with 108 supernaturals pulling the body of the snake, 54 devas on one side and 54 asuras on the other. Long suggested that $54 + 5 + 54 = 113$, the number of days between Angkor’s two zenith passages. Further, they hypothesize that the five heads all on the gate tower represent how the Sun hangs at a single horizon position at summer solstice, the mid-way point between zenith passages” (Barnhart and Powell).

“Perhaps due to the violent events on Southeast Asia’s mainland over the last few decades, a literature search turned up virtually no studies of ancient Khmer astronomy. However, Mark Long and Ceasar Voute have discovered some compelling evidence in ancient Java (Long 2002). First, Long has presented convincing evidence of zenith passage numerology encoded in the Loro Jonggrang temple complex at Prambanan, located in central Java just east of the modern city of Yogyakarta ($7^{\circ}45'21''S$, $110^{\circ}29'21''E$). The complex is clearly Hindu inspired, with three tall shrines at its center dedicated to Brahma (south), Shiva (center), and Vishnu (north). Around that central yard is Yard II, containing 224 perwara temples [ancillary temples]. As the two zenith passages for this latitude ($7^{\circ}45'S$) occur on February 26th and October 9th, the distance between these two events, with June solstice right in between, is 224 days. Long suggests that these 224 temples denote a recognition of zenith passage *and the authors of this paper agree*. What Long did not recognize (at least in print) was another element of the Loro Jonggrang complex that strengthens his hypothesis. The outermost walls of the complex, enclosing Yard I, are at an odd angle as compared to the inner yards which follow the standard Hindu inspired pattern of cardinal direction alignment. Measuring the angle of that outer compound, we find an angle of 8° south of east, the very same azimuth as zenith passage sunrise at Prambanan” (Barnhart and Powell).

1 (unit) 0 (null) 8 (infinity)

Here some passages (in Italian) from “[Cambogia, dove i numeri sono angeli](#)”, Odifreddi, 2014. “Nel tempio di Angkor i bassorilievi raccontano la nascita della vita. Gli spiriti e i demoni sono 108: 1 (unità), 0 (nulla), 8 (infinito)”. “... Ma ciò che rimane in loco costituisce comunque una delle meraviglie del

mondo, e i suoi gioielli della corona sono il sacro tempio di Angkor Wat, il profano tumulo del Bayon e il memoriale naturale del TaProhm. Il primo è sicuramente l'attrazione simbolo del paese, Fu costruito verso il 1100 come un enorme mandala a rettangoli concentrici, ciascun perimetro dei quali corrisponde a un'ascesa di livello fisico e spirituale. E il passaggio da un livello all' altro rappresenta simbolicamente la salita al mitico monte Meru dalle cinque vette, che gli indù e i buddisti considerano il centro del mondo. Le gallerie che circondano i vari livelli e il tempio centrale a cinque torri, sono punteggiate di cappelle votive delle due religioni e ricoperte di bassorilievi, rappresentanti scene tratte dal Mahabharata e dal Ramayana. Il più famoso è quello spettacolare, lungo cinquanta metri, della frullatura del mare di latte, in cui 108 angeli (deva) e demoni (asura) tirano da parti opposte, per 1000 anni, un serpente gigante (naga) avvolto attorno a un monte usato come frusta, e producono infine il nettare dell' immortalità. ... 108 è il numero magico degli indù e dei buddisti, perché attraverso le sue cifre rappresenta l' unione dell' unità (1), del nulla (0) e del tutto infinito (8). Oltre che nella rappresentazione della frullatura lo si ritrova anche nei grani dei rosari, e nei 54 angeli e 54 demoni che costeggiano i ponti di accesso alla seconda meraviglia di Angkor: il Bayon, centro simbolico e planimetrico della vecchia capitale Angkor Thom. L'edificio è un ottimo esempio di architettura frattale, in cui la struttura dell'intero si riflette nella struttura delle parti, suggerendo un regresso all' infinito. Ciascuna delle 54 torri del complesso presenta, sui quattro lati, un'immagine del re Jayavarman VII, che lo costruì verso il 1200. E le 216 immagini osservano i pellegrini e i turisti da tutti i lati, senza concedere tregua né agli uni, né agli altri. Questo non impedisce al matematico di osservare, in alcune cappelle, il fallo lingam di Shiva in versione a tre stadi: a sezione quadrata in basso, ottagonale al centro e circolare in alto. Simbolicamente, le tre parti rappresentano la trinità(trimurti) di Brahma, Vishnu e Shiva. Matematicamente, ricordano invece l' approssimazione indiana di 3,11 al valore di pi greco, ottenuta notando che se si tagliano gli angoli di un quadrato si ottiene un ottagono non regolare quasi equivalente al cerchio inscritto, appunto.” (Odifreddi, 2014).



*Fig. 7 Bayon temple. Photograph by Sasha India, CC BY 2.0,
[https://en.wikipedia.org/wiki/Bayon#/media/File:Bayon_0759_\(27773814040\).jpg](https://en.wikipedia.org/wiki/Bayon#/media/File:Bayon_0759_(27773814040).jpg)*

DIVYA DESAM

(Adapted from Wikipedia)

In Sanskrit, divya means "divine" and desam indicates "realm" (temple)

A Divya Desam or Vaishnava Divya Desam is one of the 108 Vishnu and Lakshmi temples that is mentioned in the works of the Alvars, the poet-saints of the Sri Vaishnava tradition. Of the 108 temples, 105 are in India, one is in Nepal, and the last two are believed to be outside the earth, in Tirupparkatal and Vaikuntham. In India, they are spread over the states of Tamil Nadu (84), Kerala (11), Andhra Pradesh (2), Gujarat (1), Uttar Pradesh (4), and Uttarakhand (3). Muktinath, Saligramam is the only Divya Desam in Nepal. List of Divya Desams is available https://en.wikipedia.org/wiki/Divya_Desam



Fig. 8 - Gopuras of temple in Kumbakonam, India, one of the 108 temples. Photo by Adam Jones adamjones.freeservers.com, CC BY-SA 3.0 <https://commons.wikimedia.org/wiki/User:Adam63>

In Rogerson, 2014, we can find eight of the 108 names of Krishna.

Ajanma ('Limitless and Endless') * Bihari ('He Who Plays')
* Govinda ('He Who Pleases the Herds') * Krishna
('The Irresistibly Beautiful') * Murali ('Lord of Flute-
playing') * Navaneetha Chora ('Master of Butter-makers')
* Padmanabha ('Lord Who Has a Lotus for a Navel') *
Vardhamana ('The Formless Lord') * and 100 more

“Space permits listing eight rather than all 108 of Krishna’s names. But 8 is also the key number for the god. Krishna is believed to be the eighth great incarnation of Vishnu: the beloved god-child, the playful flute-playing cow-herder who proves himself irresistibly attractive with his dark skin and dreadlocks. He is a model lover, muse of musicians and actors, a great warrior hero, and rescuer of women. In Western imagery we can see him as made up of identities we associate with Apollo, Pan, Dionysus, Orpheus and Christ. But behind this charming earthly identity lies the form of all-powerful Vishnu, so that many of Krishna’s 108 title will be shared by other avatars of the Supreme Being.” (Rogerson, 2014).

108 SHIVA TEMPLE, KALNA

108 Shiv Mandir, Thakur Para, Kalna 713409 India





Fig.9 : Previous page: the 108 Shiva Temple in Google Earth. This page: the temple in a photograph by Satadeep Moitra, CC BY-SA 3.0 DEED, Attribution-ShareAlike 3.0 Unported, https://commons.wikimedia.org/wiki/File:108_Shiva_Temple_2.JPG

“Built by Maharaja Teja Chandra Bahadur in 1809 ad these atchala brick Temples are made out of auspicious numerical combination in two concentric circles and dedicated to Shiva. The outer circumference contains 74 temples and inner circumference has 34 temples. The temples represent beads in a rosary symbolically” (Satadeep Moitra).

108 SHIVA TEMPLE BARDHAMAN





Fig. 10: The Bardhaman 108 Shiva Temple in Google Earth, and some shrines in a photograph by Rangan Datta, Kolkata, India. Licensing: Creative Commons Attribution-Share Alike 4.0 International license.
https://commons.wikimedia.org/wiki/File:Bardhaman_108_Shiva_Temple.jpg

The Bardhaman 108 Shiva Temple is 235 years old. The temple had been established by Rajas of Bardhaman.

VEERA NARAYANA TEMPLE, BELAVADI

https://en.wikipedia.org/wiki/Veera_Narayana_Temple,_Belavadi tells that the temple, also referred to as the Viranarayana temple of Belavadi, is a Hindu temple “with a complex Hoysala architecture completed around 1200 CE”. “This ornate trikuta (three shrined) temple was built in 1200 C.E. by Hoysala Empire King Veera Ballala II. The material used is Soapstone”. “Each of the three shrines has a complete superstructure (tower on top of shrine) and is one of the largest temples built by the Hoysala kings. While the famous temples at Belur and Halebidu are known for their intricate sculptures, this temple is known for its architecture.” (See please references in Wikipedia).





Fig. 11: The Veera Narayana Temple and the turned pillars “in the ranga-mantapa between the Venugopala and Yoga Narasimha shrines”, as explained by Bikashrd who kindly provided the photograph under CC BY-SA 4.0 License ([link to the phptograph](#)). Pillars are 108 ([Video](#))

108 PILLAR TEMPLE, CHATURMUKHA BASADI



Fig. 11. Chaturmukha Basadi is built in a form of a square mandapa or hall and has 4 identical doorways with a lofty doorway and pillared entrance on each of its four sides. There are a total of 108 pillars inside and outside the temple. Photograph courtesy Anooprata maker, CC BY-SA 3.0 ([link to the photograph](#))

https://en.wikipedia.org/wiki/Chaturmukha_Basadi,_Karkala is providing information about this temple. The Chaturmukha Basadi is a symmetrical Jain temple situated in Karkala, Karnataka, India. It was built in the late 16th century by Immadi Bhairarasa Vodeya of the Santara dynasty. It is characterized by four symmetrical faces, so that it is called chaturmukha (four faces) basadi (a term used to refer to Jain temples in South India).

NUMEROLOGY

“Numerology, in the sense of constructing meaningful relationships between numerical patterns and concepts as a way of understanding the world, may not be to Magli and Belmonte's ‘scientific’ taste, but it is regularly observed amongst non-Western societies when building calendars and giving order to the cosmos.” (Darvill, 2023). Darvill’s words come from a response to observations, published by Magli and Belmonte in [arXiv](#), 2023, where it is told that “Numerology is the pseudo-scientific way of reasoning that tends to attribute a meaningful, but hidden, relationship between numbers and concepts. These numbers are generated in various ways, from attributing numerical values to the letters of a text to extracting the measures of a building”. Magli and Belmonte add that this pseudo-scientific “way of reasoning spans a range of significance, from acceptable to nonsensical.”

As previously told, in February and May 2017, I published about the zenith passage of the sun at the Sewu, Prambanan and Borobudur temples in Java, and at other places in the world. For instance, in 2013, I stressed orientation of the Lion Rock Complex in Sri Lanka, according to the sunset of the zenith passage of the sun. In December 2017, G. Magli published a discussion about Borobudur. After Darvill’s words about numerology, in his response to Magli and Belmonte [observations](#) on his proposal of a Stonehenge calendar, I cannot avoid stressing some points we can find in Magli’s Borobudur.

In the abstract of Magli’s Borobudur, it is claimed a Mendut, Pawon and Borobudur alignment, “probably connected by a processional path running along this line”, “points, at the horizon, where the sun sets in the days of the zenith passages. This orientation is likely intentional and related to a ritual procession which connected the three temples, mimicking the path of the sun in the sky.” That, according to Magli, a ritual processional path mimicking the path of the sun existed. We will discuss this alignment in the Appendix, about the four temples (Ngawen, Mendut, Pawon, and Borobudur) and rituals.

Let me stress once more that I published about Borobudur before Magli’s article, and this is a further reason I cannot avoid making some observations now, because here I consider numerology in Angkor and Borobudur architecture.

STUPAS AND NUMBERS

Magli (December, 2017) tells that “The walls and balustrades [of Borobudur] are decorated with fine low reliefs, and around the circular platforms are 72 small chapels in stupa form, each containing a Buddha statue”. No mention is given about the connection of these 72 stupas to the Zenith direction. Magli continues as follow. “A number of pages have been written about the symbolism embodied in the details of the construction and in the numbers devised in the Borobudur architectural features, allegedly connected with astronomical cycles. In many cases, this kind of “numerology” arises by chance and has little or nothing to do with the true intentions of the builders of monuments of this kind, which were rather (or mostly) meant as explicit, easily readable symbols of the religion on which the temporal power relied its rights”. No references have been given by Magli about the “number of pages” on Buddhist symbolism, relevant for Borobudur case. No references have been given about the “allegedly” connection with astronomical cycles. The same for the “numerology”: no references provided by Magli, 2017. Consequently, I cannot avoid saying that his observations are useless to

comprehend the role of numbers in Borobudur architecture, such as in its cosmology. Biased by Magli's words, some could consider my discussion here proposed as a "numerological" discussion. No problems, indeed. However, Magli too considers that in some cases, numerology can be relevant ("In many cases, this kind of "numerology" arises by chance". It means not in all cases).

ANGKOR TEMPLES (CAMBOGIA) AND BOROBUDUR (JAVA)

Magli (2017) mentions the "paradigmatic case" of the Angkor state temples, claiming that these temples are "Very close both temporally and ideologically to Borobudur". As before, no references are given. Magli continues: "however - at Angkor exactly as at Borobudur [no given reference] - the fact that esoteric astronomical "numerology" is typically a modern invention [again, no reference] does not mean that the builders were not interested in the celestial cycles and in connecting their monuments with the sky". About celestial cycles, I agree with Magli, because in Java, number 72 is also the number of the days from zenith passage to solstice and from solstice to zenith passage. Of course, we have an uncertainty regarding the observation of zenith passage. It is evident, according to references I provided before, and even because of Magli's observation about temples alignment, that the zenith passage was relevant in Java. About alignment, I must stress to see the Appendix about the Four Temples (Borobudur, Pawon, Mendut and Ngawen), to judge if it is relevant or not. In any case, counting the number of the days between the zenith passages of the sun is not "esoteric astronomical numerology" for sure.

Magli asserts Angkor state temples very close (temporally and ideologically) to Borobudur. Since Magli did not provide references, let us add information about, because here we have a remarkable subject, that of the connections between Cambodia and Java. For the "Angkor state temples", let us help us with the following link: <http://www.angkor-travels.com/html/templehistory.php> and also with https://en.wikipedia.org/wiki/Khmer_Empire . Let us consider that the first of Khmer rulers, Jayavarman II, had grown up at the Javan courts. Here in short about the state temples.

A ceremony on Phnom Kulen in 802, led by Jayavarman II, is considered as the founding act of Angkorian Khmer empire. The first extensive Angkorian inscriptions and monuments are those in Roluos. In the end of the 9th century Indravarman I erected Preah Ko. His state temple was Bakong, the oldest Khmer temple pyramid or "temple mountain" that remains. His son Yashovarman I. shifted the capital to Angkor. "The first Angkor" was the Bakheng pyramid (that we have seen before) on top of the only hill in this area. Then Koh Ker was the capital under Jayavarman IV; Rajendrarvarman II returned to Angkor and erected Pre Rup as his state temple. The state temple of his son and successor Jayavarman V was Ta Keo. During the first half of the 11th century, the ruler was Suryavarman I. He restored older temples such as Phimeanakas of the Royal Palace. His successor Udayadityavarman I built Baphuon. Suryavarman II built the Angkor Wat, the first Khmer state temple not dedicated to Shiva, but to Vishnu. Most probably the Angkor Wat was Suryavarman's II funerary temple too. In the 1170th the Cham attacked Angkor conquering it. The Khmer commander who repulsed them declared himself king in 1181. His name is Jayavarman VII. He became the first Buddhist monarch and the most prolific temple builder in Cambodia's history. "Jungle temple" Ta Prohm and other important tourist attractions of present-day Angkor, such as Preah Khan, Banteay Kdei and Ta Som, are from this period. Jayavarman VII's major project was the new capital Angkor Thom with the face-tower temple Bayon in its centre. After Jayavarman VII died, there were no further huge monuments built in Angkor. In the second half of the 13th century, Jayavarman VIII restored Hinduism as state cult and ordered the destruction of many Buddhist sculptures.

In Wikipedia, we can find the chronology, and some further details (see a screenshot of the initial part of it in the next page). We find told that Jayavarman II proclaimed the independence of Kambuja from Java, claimed himself as Chakravartin through sacred Hindu ritual on Phnom Kulen and initiating Devaraja cult in Cambodia. "A chakravarti ... is an ideal (or idealized) universal ruler, in the history, religion, and mythologies of India. The concept is present in Indian subcontinent cultural traditions,

narrative myths and lore” ([https://en.wikipedia.org/wiki/Chakravarti_\(Sanskrit_term\)](https://en.wikipedia.org/wiki/Chakravarti_(Sanskrit_term))). “Devaraja ... was a religious order of the "god-king," or deified monarch in medieval Southeast Asia. The devarāja order grew out of both Hinduism and separate local traditions depending on the area. It taught that the king was a divine universal ruler, a manifestation of Bhagavan (often attributed to Shiva or Vishnu). The concept viewed the monarch to possess transcendental quality, the king as the living god on earth. The concept is closely related to the Indian concept of Chakravarti (universal monarch). In politics, it is viewed as the divine justification of a king's rule. The concept was institutionalized and gained its elaborate manifestations in ancient Java and Cambodia, where monuments such as *Prambanan* and *Angkor Wat* were erected to celebrate the king's divine rule on earth.” (Wikipedia <https://en.wikipedia.org/wiki/Devaraja> mentioning Sengupta, Arputha Rani (Ed.), 2005, and Britannica).

Reign ♦	King ♦	Capital ♦	Information and events ♦
802–835	Jayavarman II	Mahendraparvata, Hariharalaya	Proclaimed the independence of Kambuja from Java. Claimed as <i>Chakravartin</i> through sacred Hindu ritual on <i>Phnom Kulen</i> and initiating <i>Devaraja</i> cult in Cambodia.
835–877	Jayavarman III	Hariharalaya	Son of Jayavarman II
877–889	Indravarman I	Hariharalaya	Nephew of Jayavarman II. Built Preah Ko dedicated to <i>Jayavarman II</i> , also for his father and his grand father. Constructed temple mountain <i>Bakong</i> .
889–910	Yasovarman I	Hariharalaya, Yaśodharapura	Son of Indravarman I. Built Indratataka Baray and <i>Lolei</i> . Moved the capital to Yaśodharapura centred around <i>Phnom Bakheng</i> , and also built <i>Yashodharatataka</i> .

Let us return to Java. From Munandar, 2016. “Borobudur Temple can be perceived as the climatic point of the Syailendra’s religious thinking and concepts and their people in Java. The temple is a representative case of the zenith of Buddhist civilization that was developed by Syailendrawangsa in Asia and outside Buddha’s place of birth in India.” Munandar’s “article seeks to examine possibilities of influence from Borobudur Temple which is a sacred building of Syailendra, as well as a monument of reference for many sacred temples in ancient Khmer.” (Munandar, 2016).

“With the glory of its period, the Syailendrawangsa influence is felt outside Java to Sumatra, the Malay Peninsula, to the highlands of Southeast Asia. There is evidence that in the era of Syailendrawangsa in Central Java Javanese soldiers attacked Khmer and Champa several times, damaging villages and set fire to the temples of the Champa and Khmer people. The attack on mainland Southeast Asia occurred approximately 752-760 years (Dumarcay 1983: 67, Groslier 2002: 122-23, Coedes 2010: 136 [see please references in Munandar, 2016]). In the attacks, presumably the Javanese army brought some Khmer people as prisoners or those who are invited to learn the civilization in Java. One of the Khmer students, who later became King Jayavarman II of the Khmer, is considered a forerunner of the Angkor dynasty who built an impressive variety of sacred buildings until now.” (Munandar, 2016)

“At about 8th century AD, a relationship was established between the Ancient Khmer dynasty and Wangsa Syailendra dynasty who ruled Central Java. At that time, young Jayavarman II, who was probably sent by the Khmer royalty to learn and settle temporarily in Central Java. Records show that Jayavarman II did indeed live with the Syailendra dynasty royal family for some time. He returned to Cambodia around the year 790 AD and brought with him knowledge of the ancient Javanese culture and also the desire to spread the Javanese culture in his native country. Besides Syailendra art, he also brought his knowledge of the concept Dewaraja that is associated with the worship of lingga. The reason of Jayavarman II’s return to Khmer is likely to be caused by the decline of the power of the dynasty in

Java, due to the rise of other competing powers (Le May 1964: 127; Rawson 1967: 41 - 42; Rooney 1994: 25; Groslier 2002: 124)” (Munandar, 2016, see please references there given).

“The palace building in "Mount Indra" by Jayavarman II can be viewed as a political act as well as religious. This political act is stated in the inscription stating that the land Kambuja is no longer under the power of Java, and there is also chakravartin in Kambuja which is no other his own Jayavarman II. The inclusion of Java in the inscription raises the interpretation that, at about that time, there was profound relationship between Java and Kambuja / Cambodian (Khmer). Javanese influence in many respects very likely contributed to the capital for further development of Khmer civilization”.(Munandar, 2016). “In Sdok Kak Thom’s inscription, it was stated clearly that Jayavarman II as the king of the time came from the land of Java, "... man wrah on Parameswara mok amwi Java pikirung nagara Indrapura nau ni ..." (the king came from Java to reign in the city Indrapura). In connection with the statement, Soewadji Syafei, an Indonesian archaeologist, once stated about the identity of Jayavarman II, which is associated with historical events occurred in Java itself (Syafei 1977).” (Munandar, 2016, see please references there given).

“Based on the information gathered from the Ancient Khmer inscriptions, and scholarly interpretations, it can be concluded that there was a close relationship between the land of Java and ancient Khmer society. Quite possibly the Sailendra dynasty was once a powerful family in Khmer. ...The influence of ancient Javanese art to ancient Khmer not only occurs due to the construction of Borobudur temple. Ancient Javanese art developed by Syailendrawangsa was known in Khmer before Borobudur was built and was developed by Jayavarman II (802-850 AD). It is highly possible that after the completion of Borobudur, many pilgrims from various countries came to visit, and they were among others from Khmer)” (Munandar, 2016).

THE 108 STUPAS IN CHINA

In his discussion, Magli, 2017, is mentioning the One Hundred and Eight Stupas in China. “Finding comparison belonging to the same cultural context ... as far as the present author [Magli] is aware the unique, vaguely reasonable comparison is the so-called 108 stupas monument, located on a hillside directly on the western bank of the Yellow River at Qingtongxia, Ningxia, China. ... A front view of this monument is actually quite reminiscent of one side of Borobudur”. No references are given about One Hundred and Eight Stupas. I provided them here in the discussion of the site. Everybody can observe the front view of Borobudur and of the One Hundred and Eight Stupas, and judge whether reminiscence exists or not. Google Street View is allowing a detailed visit of the Borobudur monument. In any case, as we have shown in the discussion about Borobudur, number 108 is present in both monuments. Magli mentioned only the 72 stupas for Borobudur.

VOÛTE AND LONG ARCHAEOASTRONOMY

Magli (2017) is mentioning Voûte and Long, telling the following: “An astronomical interpretation of the axis has already been attempted (Long 2009, Long and Voûte 2008). These authors propose an orientation to the rising of the star Altair, The same authors also suggest a solar interpretation ... They mention the zenith passage sunset as a possibility, but get involved in a *rather complicated* discussion ...” (Magli, 2007). *As we have seen before, in the section “The zenith passage at Angkor and Borobudur”, when reporting the discussion by Barnhart and Powell, the proposal by Long and Voûte is clear and simple, because it is related to counting the days between the zenith passages of the sun.*

Let us note that it exists a very interesting review about Voûte and Long work, entitled “Alternative approaches to eighth-century Central Javanese Buddhist architecture” by Andrea Acri, 2011. Acri writes that “the [Voûte and Long] book's most significant novelty is its emphasis on *archaeoastronomy*, the

study of ancient cultures' astronomical knowledge. Voute and Long demonstrate that the monument embeds an encoded (mainly, but not exclusively, numerical) symbolism based on the movement of celestial bodies such as Sun, Moon and asterisms of the zodiac. The builders of Borobudur 'embraced a "sacred science" that did not perceive any separation between the spiritual practice of Buddhism and Hinduism and the scientific disciplines of astronomy, *chronology*, cosmology, geometry and the higher mathematics' (p. 2). ... As John Miksic (1990:45) has acknowledged, the Borobudur expresses 'a complex message in a code that has yet to be cracked'. Voute and Long have produced a fascinating attempt to crack the code of Borobudur - a monument that, according to them, can be understood only if we assume that its builders had an advanced scientific and geographical knowledge" (Acri, 2011).

"The authors convincingly argue ... [that] important cultural and religious values were attributed to the regular celestial phenomena observed in the sky, among which is the cycle of the Sun through the day, months (in the form of equinoxes and solstices) and years (in the form of its almost imperceptible westwards shift through the zodiacal houses known as precession of the equinoxes). In this respect, the authors' approach appears to owe much to the erudite yet controversial study on ancient mythology by Giorgio de Santillana and Hertha von Dechend, *Hamlet's mill* (1969), as well as to Eleanor Mannikka's *Angkor Wat: Space; time and kingship* (1996)" (Acri, 2011).

"Applying the principles of archaeoastronomy to central Javanese architecture, the authors argue that Borobudur functioned as a calendrical monument, fixing in stone certain regular astronomical phenomena and thereby becoming a 'mirror' of the heavens. It was also a device for calculating time, namely a gigantic gnomon that calculated the hours in a day (vitally important for the daily life of Buddhist monks), the months, equinoxes and solstices in a solar year (useful for ceremonial and ritual purposes), and the much longer cosmic cyclical eras known in Sanskrit culture as yugas. The authors argue that, in order to properly understand the meaning and function of the monument, it must be studied against the background of its geographical position and setting, dominated by the imposing silhouettes of two volcanoes and ranges of hills. The surroundings of Borobudur, they conclude, are as important and significant as the monument itself for they provide the scope for certain astronomical alignment" (Acri, 2011).

And then, in Acri 2011, we can find mentioned "numerology": "Voute and Long draw attention to recurring, and thus 'meaningful' (that is, non-coincidental) numbers embedded in many architectural elements of the monument itself. Consider, for instance, the **72** stupas on the summit, the **504** jina images (**432 [4 x 108]** on top of the four gallery balustrades + 72 on the summit), the 1460 (365 x 4) narrative panels, and so on. Previous scholars have tried to connect these significant numbers with elements of Buddhist doctrine traceable to Sanskrit texts, whereas our authors understand them as an attempt by the ancient builders to harmoniously link the microcosmos to the macrocosmos by means of numerical correspondences between architectural elements and solar and lunar months, years and longer cosmic eras. I [Acri] have found most of their reasoning in this regard to be plausible and well argued" (Acri, 2011).

FINGERPRINTS

As we are here discussing number 108 in architecture and landscape, I cannot avoid mentioning the *Fingerprints of the Gods*, by Graham Hancock. In this manner, we can appreciate at a glance what we have previously reported from Acri, 2011. Here in the following some passages.

"According to Professor de Santillana, this type of uniformity suggests a guiding hand at work. In *Hamlet's Mill*, a seminal and original thesis on ancient myth written in collaboration with Hertha von Dechend (professor of the History of Science at Frankfurt University) he argues that:

universality is in itself a test when coupled with a firm design. When something found, say, in China, turns up also in Babylonian astrological texts, then it must be assumed to be relevant if it reveals a complex of uncommon images which nobody could claim had risen independently by spontaneous generation. Take the origin of music. Orpheus and his harrowing death may be a poetic creation

born in more than one instance in diverse places. But when characters who do not play the lyre but blow pipes get themselves flayed alive for various absurd reasons, and their identical end is rehearsed on several continents, ... it can hardly be a coincidence ... Likewise, when one finds numbers like 108, or 9×13 reappearing under several multiples in the Vedas, in the temples of Angkor, in Babylon, in Heraclitus' dark utterances, and also in the Norse Valhalla, it is not accident ...

Connecting the great universal myths of cataclysm, is it possible that such coincidences that cannot be coincidences, and accidents that cannot be accidents, could denote the global influence of an ancient, though as yet unidentified, guiding hand? ... According to Santillana and von Dechend, all such images refer to celestial events and do so, furthermore, in the refined technical language of an archaic but 'immensely sophisticated' astronomical and mathematical science: 'This language ignores local beliefs and cults. It concentrates on numbers, motions, measures, overall frames, schemas—on the structure of numbers, on geometry.'" (Hancock, 1995).

And also, about precession: "These, Sellers believes, constitute the basic ingredients of a precessional code which appears again and again, with eerie persistence, in ancient myths and sacred architecture. In common with much esoteric numerology, it is a code in which it is permissible ... The pre-eminent number in the code is 72. To this is frequently added 36, making 108, and it is permissible to multiply 108 by 100 to get 10,800 or to divide it by 2 to get 54, which may then ..." (Hancock, 1995). "Archaeo-astronomer Jane B. Sellers, who studied Egyptology at the University of Chicago's Oriental Institute, spends her winters in Portland, Maine, and summers at Ripley Neck, a nineteenth-century enclave 'downcast' on Maine's rocky coast" (Hancock, 1995).

About Angkor, we can find it investigated by archaeoastronomer J. B. Seller: "Nor does it seem that Sellers's 'code' is confined to mythology. In the jungles of Kampuchea the temple complex of Angkor looks as though it could have been purpose-built as a precessional metaphor. It has, for example, five gates to each of which leads a road bridging the crocodile-infested moat that surrounds the whole site. Each of these roads is bordered by a row of gigantic stone figures, 108 per avenue, 54 on each side (540 statues in all) and each row carries a huge Naga serpent. Furthermore, as Santillana and von Dechend point out in Hamlet's Mill, the figures do not 'carry' the serpent but are shown to 'pull' it, which indicates that these 540 statues are 'churning the Milky Ocean'. The whole of Angkor 'thus turns out to be a colossal model set up with true Hindu fantasy and incongruousness' to express the idea of precession." (Hancock, 1995).

I am here reporting about Seller, Santillana and von Dechend. Let me stress that I DO NOT consider number 108 linked to precession. This must be clear to everybody (J. Belmonte and G. Magli included): I do not consider 108 linked to precession. It is clear for all the discussion here proposed.

In Hancock, 1995, we can find also that "In the Hebrew Cabala there are 72 angels through whom the Sephiroth (divine powers) may be approached, or invoked, by those who know their names and numbers. Rosicrucian tradition speaks of cycles of 108 years (72 plus 36) ... Similarly the number 72 and its permutations and subdivisions are of great significance to the Chinese secret societies known as Triads. ..." (Hancock, 1995).

Appendix – FOUR TEMPLES AND THE RITUAL PROCESSION AT BOROBUDUR

As previously told, the abstract of Magli's arXiv paper, December 2017, claims that the Mendut, Pawon and Borobudur alignment, "probably connected by a processional path running along this line", "points, at the horizon, where the sun sets in the days of the zenith passages. This orientation is likely intentional and related to a ritual procession which connected the three temples, mimicking the path of the sun in the sky." That is, Magli's abstract is telling that a ritual processional path mimicking the path of the sun existed.

In Soekmono, 1976, we can read that “According to oral tradition the triad [Mendut, Pawon and Borobudur] was once linked by a paved processional path, flanked by richly decorated balustrades. Unfortunately, land and aerial surveys so far carried out have produced no convincing evidence of this. Some hewn stones found in the fields east of the village of Borobudur many decades ago are supposed to be remains of the pavement. Further evidence is still lacking.” (Soekmono, 1976). And also: “The exceptional composition of the triad has led to much speculation about the relation between Chandi Borobudur, Chandi Pawon and Chandi Mendut. The most plausible link is religious, if the denomination ‘compound’ is interpreted in a particular way; the three monuments can be taken as a whole to represent one religious conception” (Soekmono, 1976). Please note that, in the following discussion, we will further mention the rituals and that a study exists which is considering the alignment of four temple, and not of three temples.

According to Soekmono, 1976, “The assumption that the pilgrim had to pass Chandi Pawon as he made his way from Chandi Mendut to Chandi Borobudur along the paved processional path might suggest that Chandi Pawon was a kind of station on the long journey; after being purified through the required ceremonies of worship at Chandi Mendut, Chandi Pawon allowed him to pause and reflect before proceeding on the pilgrimage to Chandi Borobudur where a tiresome series of circumambulations awaited”. No information in Soekmono about the time (one day or more days) the pilgrim spent in pilgrimage. It means that we have an uncertainty at least of a day about the zenith passage of the sun, in the case that we assume the processional road intentionally oriented to the sunset on the days of the zenith passage of the sun. Let us stress that no link exists to Vesak (see Chia, 2020). But the temples of the worship complex could have been four, and a direction according to the sunset on the day of the zenith passage is questionable, as we will show in the following. Moreover, Magli is mentioning a study by Moens, translated by Long in 2007. If we consider in depth the Moens’ descriptions of rituals which are regarding the local kings, we can see clearly that the rituals have nothing to do with pilgrimages.

Magli told in 2017: “The three temples at Borobudur belong to the Mahayana Buddhism. The details of the cults practised are unsure [no reference], but a relationship certainly existed between the temples and the proclaimed divine nature of the kings who ordered their construction” (Magli, 2017). No reference given by Magli. Then why “certainly” did exist a relationship? Answer: We have seen before what told in Wikipedia and by Munandar, 2016, regarding the history of Cambodia and Java, and about the figure of “chakravartin”.

Magli continues “In this connection, a possible, symbolic relationship between the three monuments was investigated in details by Moens (1951)”. The Moens’ text is available at the following link <https://asisbiz.com/Indonesia/Barabudur-Mendut-Pawon.pdf>. Magli adds: “In this controversial but anyhow scholarly work, the idea is that the temples were connected by a “magical birth” ritual, in which the monarch’s consecration occurred both as the Buddha and as King. Moens proposed a ritual based on an analogy with the sun path in the sky in one day, and thus endowed with three main “stations”: east, zenith, and west. To these steps corresponded for the west, the beginning of the western staircase at Borobudur; for the east, Mendut; and for the zenith, Pawon.” (Magli, 2007). Why is Moens’ theory controversial? Here the answer: the translator, M. Long, in a note explain that “now readers without any Dutch-language capabilities can finally explore the depths of Moens’ original if controversial theories concerning some of Southeast Asia’s more stunning architectural achievements”. The popularity of Moens’ theories is very low, such as the relate controversy.

Magli continues: “Although this interpretation is well known, it has never been referred explicitly to the specific days of the zenith passages, a connection which instead looks natural: if the “solar path” ritual had to be referenced into in the architecture of the temples, and if the zenith culmination of the sun was, as it seems, a fundamental ingredient of the ritual, then we would expect the procession to go in the direction from sunrise to sunset, and the processional path to be oriented in such a way as to indicate the zenith sunset, as it actually occurs.” (Magli, 2007). In fact, “solar path” is the title of a subsection in Moens’ paper. Is Moens’ theory “well-known”? Not so largely popular indeed, as shown

by Google Scholar (cited 16 times the original book of 1951 and three times the translation). Let us repeat: “Although this interpretation is well known”, but this is not true, “it has never been referred explicitly”, (let us add, according to Magli’s best knowledge), “to the specific days of the zenith passages, a connection which instead looks natural”. The connection is “natural” for people living in the Tropical Zone.

Let me strongly suggest the reader to appreciate the complexity of Moens’ rituals, directly in his text translated into English, and compare to the short description given by Magli. Rituals are regarding the funeral of the king (west), and the enthronement of his son (east-zenith). Therefore, we have at least two rituals that were made in different periods of time for sure, being one linked to the death of the king, and the second in the resurrection of the king in his son.

Here some passages from an article mentioning Moens.

“The first study on Borobudur was conducted during the Dutch East Indies era by Van Erp and N. J. Kroom, which coincided with the temple’s restoration project (Ramelan et al., 2013, p. 27). The study indicated an association between Borobudur Temple and two other temples located nearby, namely Pawon Temple and Mendut Temple. This was based on the similarities with regard to the architectural style and ornamentation of the three temples, indicating that they were built in the same period, that is, the Sailendra dynasty era (Moens, 2007, p. 2). The next study was conducted by J. L. Moens in the 1950s (2007, pp. 93–99), which connected the three temples with Banon Temple, a Hindu temple located near Pawon Temple. Furthermore, it shows that Borobudur, Pawon, and Mendut Temples were all ritual centers of Mahayana Buddhism, whereas Banon Temple was a place for the followers of Siwa-Siddhanta. Another study conducted by IGN Anom imaginarily connected Borobudur, Pawon, and Mendut Temples, showing that the three temples were built along a straight line (Anom, 2005: 28). Totok Roesmanto also conducted a study on the location of Borobudur and the other temples surrounding it (2011: 99–120), which shows that the three temples are positioned along a single straight line, which was organized during the construction of Mendut Temple. It is also shown that the imaginary line connecting the three temples is linked to Mount Merapi.” (Izza and Munandar, 2017, see please references given by them in their article).

In Magli, 2017, “To study the orientation of the Borobudur axis we can use satellite imagery as the area is very well covered by Google Earth. In what follows we consider as azimuth of the axis that of the line connecting the summit of Pawon with the summit of Borobudur, as it is natural to do since the main temple was with all probability the final destination” (Magli, 2007). That is, in all probability, Borobudur was the destination of the pilgrimage. However, what was the starting temple? Pawon, Mendut or another temple?. In any case, please read Moens rituals www.borobudur.tv. <https://asisbiz.com/Indonesia/Barabudur-Mendut-Pawon.pdf>. As asserted by Long, who translated the book, Moens’ theory about ritual is controversial.

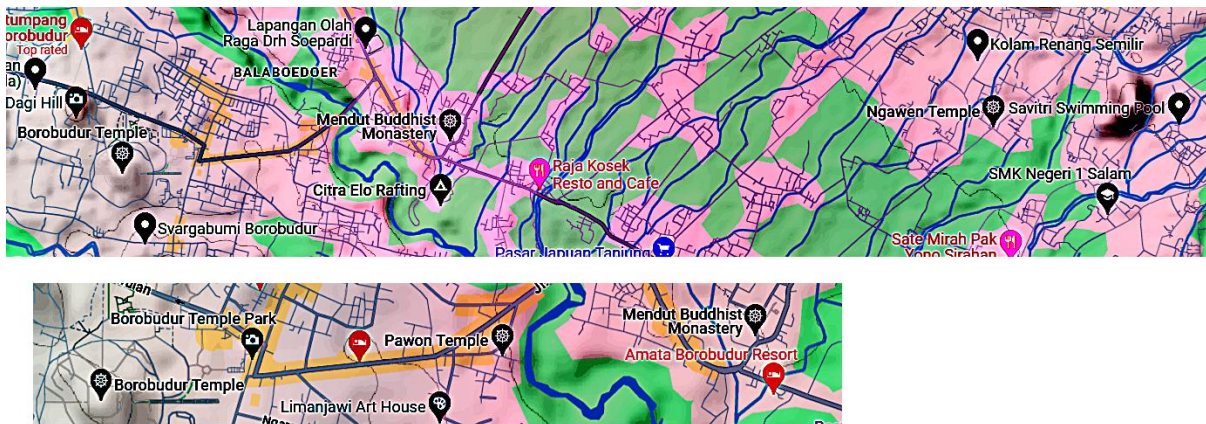
Magli reported: “The value of the azimuth is 263° , thus with a deviation of 7° from the east-west line; ... while the opposite azimuth (83°) has horizon height $2^\circ 10'$ yielding a declination $6^\circ 41'$ (declinations are calculated using the program Getdec by Clive Ruggles)” (Magli, 2017).

Magli established the setting of the sun on the days of the zenith passages at 11 October and 28 February. He also adds that “The error committed is less than a solar diameter ($30'$) and it must be taken into account that the trajectory of the sun at these latitudes is very steep so that very precise measurements have not to be expected”. Instead of “error”, it would better to mention “uncertainty”¹. Assuming the worst-case uncertainty, it means that the angular solar diameter mentioned above ($30'$) must be the uncertainty of measurement. That is, the uncertainty is at least of $30'$, and not less than $30'$. In the

¹ In physics, error is estimated by the uncertainty. Error and uncertainty refer to different quantities. Error is the difference between the actual value and the measured value; uncertainty is an estimate of the range of possible values that the actual value could be within. Like the actual value, the error is an unknown physical quantity. It is estimated by means of the uncertainty. In physics, it is usually given the worst case uncertainty.

discussion by Magli, it is not considered that this uncertainty corresponds to an uncertainty regarding the date of the zenith passage.

Before showing the results that we can obtain from Google Earth, let us talk of the article by Izza and Munandar, 2017, about the alignment of **four** temples, given in the following maps (Borobudur, Pawon, Mendut, Ngawen).



Borobudur, Pawon, Mendut and Ngawen alignment. Maps Courtesy Google Maps. In [Wikipedia](#), about Ngawen, we can find mentioned this alignment.

Izza and Munandar, in 2017, displayed the association of Borobudur Temple with the surrounding Buddhist temples. “Several studies have been conducted by scholars and experts, and according to one of them, Borobudur Temple is associated with other temples, such as Pawon and Mendut Temples”. However, they add, according to their specific and accurate archaeological research, the Ngawen temple.

Izza and Munandar “offer a new interpretation on Borobudur and its surrounding temples as a cohesive unit for sacred procession. Factors such as location, religious background, ornaments, and statues are common in Borobudur and Ngawen Temples. ... The collected data were then applied in the context of the Mataram Kuno (Ancient Mataram) period using a religious framework. The last step encompasses interpretation of the data”. Authors believe that their study “will provide a new interpretation on the roles of Borobudur and the surrounding Buddhist temples as monuments for sacred procession in the ancient times” (Izza and Munandar, 2017).

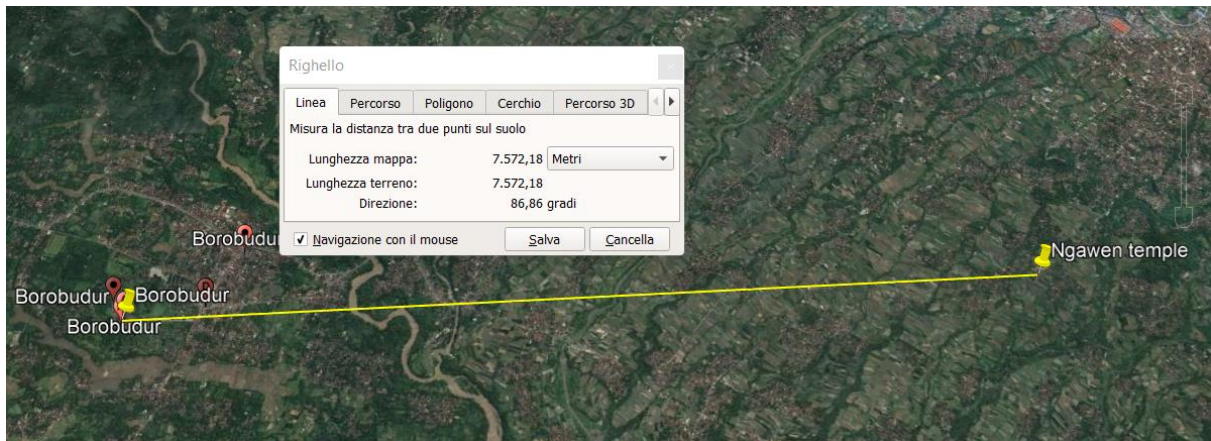
The Borobudur Temple “possesses several meanings related to the belief of Mahayana Buddhism. Moreover, in the past, Borobudur had served as the center of other sacred buildings surrounding it (Huntington, 1994, p.136). Within a distance of 5 km around the temple, there are three other temples affiliated with Mahayana Buddhism, among which are Pawon Temple (1,150 m from Borobudur) and Mendut (2,900 m) (Kaelan, 1959: 122). Borobudur, Pawon, and Mendut Temples are located in the west of Elo River, and Ngawen is, in fact, located in the east side of the river, which is, in turn, 4 km away from Borobudur” (Izza and Munandar, 2017) [see please the Google map given above].

“According to previous studies, Borobudur, Pawon, and Mendut Temples are positioned on a straight line and they form a triadic (a group of three) of sacred buildings affiliated to Mahayana Buddhism. However, according to Totok Roesmanto (2011, pp. 99–120), the imaginary axis connecting the three temples is not a straight line, and it is interpreted that they were the centers of religious rituals and processions in the past. Furthermore, it is suggested that the three temples were closely associated with Mount Merapi. Nevertheless, further examination of the map shows an addition temple called Ngawen Temple, from which a parallel imaginary axis can also be drawn, connecting it to the other three temples. Thus, on the basis of this fact, it

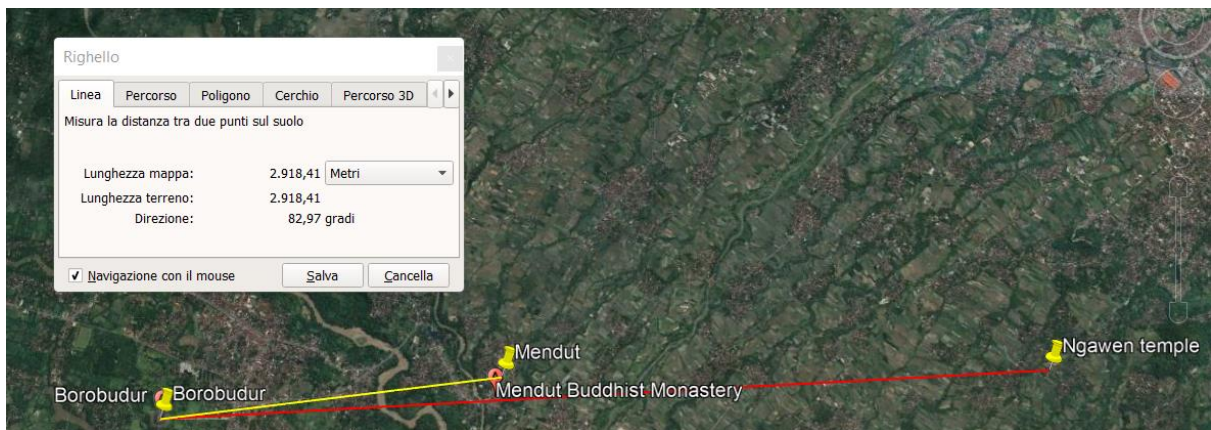
can be interpreted that, in the past, the procession of the religious rituals might begin in Ngawen Temple and end in Borobudur” ” (Izza and Munandar, 2017).

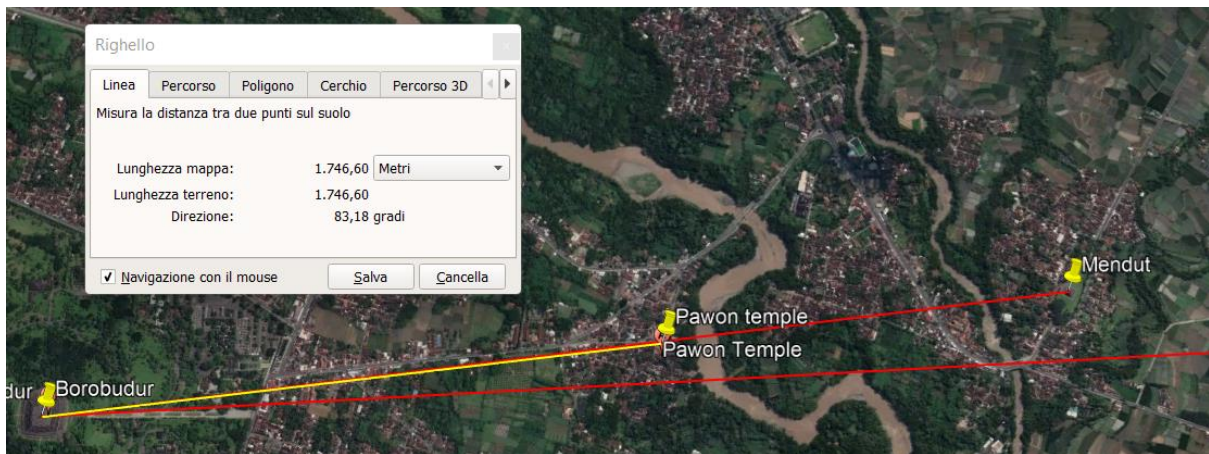
“To conclude, Borobudur, Pawon, Mendut, and Ngawen Temples are located adjacent to each other and connected by an imaginary axis. Ornamentation style in Ngawen Temple shows a similarity among the four temples. The shapes of statues in Borobudur and Ngawen are also similar. Therefore, we may conclude that Borobudur is not only associated with Pawon and Mendut, but also correlates with Ngawen Temple in terms of religious affiliation, positioning, ornamentation style, and iconography as well as the structures that were used as locations for sacred Buddhist rituals during the Ancient Mataram era. In addition to the association of Borobudur and the other temples, the association between Borobudur and Mount Merapi and the hills surrounding the temple is observed. More studies need to be conducted on Bubrah, Lumbung, and Sewu Temples. The similarities and the different patterns of association among Bubrah, Lumbung, Sewu Temples as well as the association between the Buddhist temples around Borobudur and those around Sewu Temple need to be studied” (Izza and Munandar, 2017).

Here in the following, using Google Earth as did by Magli, we can consider the direction of the line form Borobudur to Ngawen temple. The azimuth is 86,86 degrees (87 degrees).



Then we can show the direction of the lines linking Borobudur, Mendut and Pawon temples. The azimuth Borobudur-Mendut is 82,97 degrees (83 degrees). And the azimuth Borobudur-Pawon is 83 degrees too.





The two azimuths Borobudur-Mendut and Borobudur-Ngawen, as obtained from Google Earth, are different of four degrees. For this reason, if a processional road existed from Ngawen to Borobudur, the Magli's conclusion of a link of it with the path of the sun does not exist. Some could question the use of satellite imagery. But this is what Magli did. Some could tell that here the natural horizon is not considered. This is true, but the azimuths are different. Some could add that we do not consider Earth curvature and atmospheric refraction (these factors are quite relevant for sunrise and sunset azimuths). But, in the same manner, Magli has not considered these two factors affecting the observations.

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