Making *Maṇḍalas* in South Asia as Physical Constructs

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I recently came upon notes from a lecture I gave for a symposium, "*Maṇḍala: Spaces and Symbols of Enlightenment*", at The Asia Society, New York,[1] that summarizes thinking I have done over many years, both before and since, on the physical applications of *maṇḍala* planning in South Asia—the *maṇḍala* as a practical, constructional tool. I share these thoughts here.[2]

I would like to emphasize that the '*maṇḍala*' diagram used for building, named and described in the *Bṛhat Saṁhitā* in the sixth century CE (Meister 2003b: 253), is described both as a 'constructive device' and as a 'palimpsest' of past meanings. Its application as a proportioning mechanism for laying out cities, mansions, and temples is there briefly but quite explicitly spelled out (Meister 1985a).

I would like here to introduce the use of the square gridded *maṇḍala* in ancient India as a practical tool for building (Meister 1979; 1985a; 2003b). Already by the fourth century BCE, texts called *Śulba Sūtras* described a practical system of geometry that allowed architects to build cardinally oriented altars for ritual use. The geometry that these texts describe provided pragmatic and technical means to control the construction of a square altar using simple tools: a gnomon—a vertical post that casts a shadow to determine cardinal orientation—and simple pegs and ropes to draw circles on the ground to locate corners of the square that was being constructed, much like the plane geometry we may have studied in junior high school. A simple diagram (Fig. 1) can easily reconstruct the use of a gnomon, pegs, and cords to locate a square as described in fourth-century BCE *Śulba Sūtras* (Bose, Sen, Subbarayappa 1971). Fig. 2 shows a stone altar slab of the third century BCE reinstalled on top of a brick platform of the Gupta period, ca. fifth century CE, to mark the place of the Buddha's enlightenment at Bodh Gaya.

These early constructional texts, however, expressed no magical or ritual agendas. They provided instead practical constructional means to control the ground for such agendas. They gave man the ritual means to reconstruct the world himself. As such, this geometry begins architecture, and those who control it (called *sūtradhāras*, those who govern the cords used for construction) are India's first architects. The practicality of this geometric construction, however, clearly intersects with a series of mythic cosmologies in ancient India, which describe the world as created from a point, spreading in cardinal directions to form a fixed square universe, and along a vertical axis (what in Europe is called an *axis mundi*) to separate the earth and heavens (Menon 1932; Meister 2013). Altars built for ritual use are models of this created universe. Several texts suggest that "all the surface of

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[1] 25 October 1997, in association with the exhibition "Mandala: The Architecture of Enlightenment" [http://asiasociety.org/new-york/exhibitions/mandala-architecture-enlightenment].

[2] For problems and progress in interpreting texts later than the *Bṛhat Saṁhitā*, see Meister 1985b; Hardy 2009.

the earth is altar, but for sacrifice one must pick a spot and build an altar there" (Apte 1923: 14, citing the *Āpastamba Śrautasūtra*; Kramrisch 1946: 17, referring to *Śathapatha Brāhmaṇa* I.2.5.7).

This underlying cosmography can be seen homologously expressed in ancient India in the worship of trees with altars, by such monuments as the pillars set up by the Mauryan emperor Aśoka in the third century BCE (Irwin 1976), and later by the upper altar and central axis used to crown the north Indian temple. The altar at Bodh Gaya (Fig. 2) is incorporated as part of a shrine for the present the Bodhi tree, marking the place of the Buddha's enlightenment.

Such a cosmology has also a cosmogony—that is, it deals also with issues of cosmic origin—and the vertical axis is seen sprouting with a potential of growth and transformation, marked by the lotus capital crowning the Mauryan pillar or the ribbed *āmalaka* seed set on the temple's crown (Meister 2013).

This potential is both cosmic and human—marking both the world's cycles and the aspirations of the worshiper for personal transcendence. *Yūpas*—posts to which animals for sacrifice were tied—were ritually climbed by those performing the sacrificial ceremony to place flour-made flowers on their peak to mimic the transformation the soul must undergo (Coomaraswamy 1939).

In sculptural representations of the first few centuries BCE/CE, square altars used for specific cult rituals also appear, such as one from Mathura (Fig. 3) that shows a brick altar and a *liṅga* column with one face—here the axis of Śaivite worship—open to the air in front of a tree. The Buddhist reliefs also often show altars under trees, marking the presence of the Buddha by an emblem suggesting the spot where the Buddha meditated or achieved his enlightenment. They also, however, sometimes used the same formula to show a shrine to other beings, such as the local nature spirit or *yakṣa* to whom the miraculously born baby Buddha was presented shortly after his birth (Fig. 4).

Underlying these simple cubical altars is a diagram that texts by at least the sixth century CE call a '*maṇḍala*'—that is, primarily and pragmatically, a map, a plan, a mechanism to be used for construction. Yet, like the ancient geometry used in the square's construction, such a plan also maps the universe. A grid of 64 squares (Fig. 5), was assigned in the sixth-century CE *Bṛhat Saṁhitā* (Varahamihira 1865) as the '*vāstupuruṣa maṇḍala*' appropriate for building a temple. It puts at its center a place for *brahman*, ancient India's designation for a universal underlying sanctity. Around its edges were a variety of ancient deities to guard that sacred center.

Vāstu is the science of building; the *maṇḍala* is *vāstu*'s tool. '*Puruṣa*' in the compound phrase '*vāstupuruṣamaṇḍala*' means 'man' and in one legend of the origins of the world refers to a demon whose flayed body becomes the earth, the first altar, pinned face down by the *maṇḍala*'s protecting deities. Shown face up in many diagrams of the *maṇḍala* (that is, transformed by the act of sacrifice) this demon becomes the '*vāstupuruṣa*', the protecting spirit of each building. By this logic, the act of building is an act of remaking; the created universe is the first altar; and each new construction is also an act of sacrifice. (Fig. 6).

Only by the fifth century CE do architects turn this diagram to a new use, for building

temples that act as shelters for approachable and variable forms of divinity (Fig. 7). The application of India's ancient diagram of construction—the *vāstumaṇḍala*—for this new purpose is eminently practical, described for the first time in one sixth-century compendium of ancient lore, the *Bṛhat Saṁhitā*. Of a 64-square grid, the sanctum is made to occupy the central sixteen (4x4) squares; the central four (2x2) squares are the seat of *brahman* (Fig. 5). This makes the walls half the width of the sanctum in thickness. We can see such a simple altar-like temple, Temple 17, built in the fifth century CE at the Buddhist site of Sanchi (Fig. 7), and more precisely elaborated by the seventh century at Bhubaneshwar in Orissa, where the placement of the corners of the square plan can be found chiselled into the foundation platform (Meister 1979; 2011).

In South India over many centuries architects may have instead used an even-numbered grid—prescribed in the *Bṛhat Saṁhitā* for the construction of cities and palaces—at times to build great 'Meru' (a mountain) like temples (Pichard 1994). This grid can produce an expanding ring of ambulatory paths and enclosures, as could be measured at Gangaikondacholapuram (Fig. 8), or the rings of enclosing walls and gateways, as in the temple-city of Madurai, that expand such large temple compounds out into the city. A similar use of this expanding concentric rectilinear grid also helped define the sacred precincts of the great temple cities of Cambodia as *maṇḍala*s (Meister 2003a).

In North India, however, architects made the temple tower itself into a condensed *maṇḍala*—a cosmic 'black hole'. They began to use the *maṇḍala* for temple construction in very specific ways (Meister 2003b). First, they directly mapped the *maṇḍala*'s potent interior onto the exterior walls of the temple, projecting the width of the sanctum as a *bhadra* offset on each wall, then the measure of the central 2x2 squares reserved for *brahman* (*brahmasthāna*) in the *vāstumaṇḍala* was projected from the *bhadra* walls as offsets (*pratibhadra*s) framing doors, or door-like niches, where images related to the inner deity could be placed (Figs. 5, 6), most precisely in our survey in the Gopādri region of Central India, but found also elsewhere, sometimes with different understandings, less or more precisely applied (Meister in press)—for the first time in the ninth century measuring the grid across the breadth of the projecting *bhadra*s, rather than marked by the corners of the temple's fabric (Fig. 9) (Meister 1979; 1985a; 2003b). (Memories of both '*karṇa*-' and '*bhadra-vyāsa*' measures remain in the living tradition in Western India according to MA Dhaky.)[3]

The proportions of the *maṇḍala* also extended into the temple's elevation, tying the sacred plan of the temple to its 3-dimensional realization. The space of *brahman* extends like an invisible pillar to emerge above the altar—measuring the inner sanctum at the temple's top. This relationship between the proportions of the grid and the temple's symbolic structure still allows for architectural evolution, however, and temple architecture from the seventh to the eleventh century increasingly makes visible the temple's role, in Stella Kramrisch's words, to be a 'monument of manifestation' (Fig. 10).

[3] Courtesy personal communication.

From the seventh, to the ninth, to the eleventh century, however, even as the walls' proportions change, the grid of the interior sanctum often governs the central buttresses of the temple's enclosure (Fig. 9). Perhaps most remarkably in later monuments in Cambodia do we see combined the temple as both geography and place, as city and a condensed cosmology (Meister 2003a). It is this power of place, I think, that makes the later traditions of painting *maṇḍala*s as a focus for meditation so potent (contrast Bafna 2000).

In North India, however, throughout this period, architects continued to elaborate temples in other ways, experimenting with rotating the square to create an octagon, as first on Muṇḍeśvarī hill in Bihar early in the seventh century (Meister 1981), or as a means to define additional buttresses and offsets (Fig. 11). At Muṇḍeśvarī, in fact, evidence for both the constructing geometry of the square and the constricting measure of the grid can be interpolated (Figs. 1, 5, 18; Addendum). These can make the temple an increasingly powerful physical sign of the immanence and potential for transformation that worship in one makes possible.

In the eighth century stone temple to Śiva at Indor, Madhya Pradesh, architects used three turned squares to design the walls, producing twelve buttresses — with corners of the turned squares between—on which to place images of Śiva's family and *dikpāla*s to guard the sanctum (Meister 1984a) (Fig. 11). Turning the square of the *maṇḍala* in this way is described in some texts in terms of the three 'stellar' cities that Śiva saves and that make up the cosmos (Meister 1984b)—in this sense linking the cities' turning plans to the geometric mechanisms used to construct the initial square of the *maṇḍala* diagram.

In the eleventh century at the Udayeśvara temple at Udayapur, Madhya Pradesh, eight turned squares elaborate the temple's plan, making the temple into a spinning fortress, guarded invisibly by its magical, if also practical, geometry (Figs. 13, 14) (Meister 1983; 1985b).

This method of rotating-square construction, both physical and signifying, also appears in parts of South India, as in Karnataka in the twelfth century at Dambal, where both the sanctum and fronting hall used 'turned-square' plans, breaking the temple into a representation of the infinite points that make up the cosmos (Figs. 15, 16).

Even in the fifteenth century, architects of the Sun temple at Ranakpur in Rajasthan (Dhaky 1966) still used turned squares, as if to measure the daily path the sun takes along its rotating walls (Fig. 17). In all these temples, however, the relationship of the stable square of the sanctum to the rotating outer walls continues to be measured by the *maṇḍala* diagram's square grid. The compound of the neighboring great Jain Temple at Ranakpur, also built in the fifteenth century, makes continuing use of the *maṇḍala* for planning abundantly clear. The temple complex as a whole has become the *maṇḍala*, and worshipers become officiants within that cosmic world.

Building with *maṇḍala*s is both an interior and exterior act. Buildings that architects have designed using them map both a micro- and a macrocosm. They can both be entered and climbed upon (Meister 2006). They bring together the inner space of the heart and the outer shape of the cosmos in physical and practical ways, bringing the world and worshiper into physical consonance.

Addendum

One reviewer has remarked that "many temples follow different grids, often different for the sanctum and outer wall of a single shrine." I agree with that, of course, and at times have demonstrated it (Meister 1984a; 1985a). The evidence embedded in the material construction of stone temples over more than a millennium following their introduction and over vast territories of the sub-continent might guarantee such variation (Meister 1997). I have instead in my work been more struck by the widespread evidence of the empirical application of both constructing geometry and a constructive grid over that vast time and territory.

This application has been tested as widely as my time and fieldwork have made possible. Most significantly may have been an early attempt to test the measurement of a monument with an unusual plan, the 'octagonal' temple on Muṇḍeśvarī hill, Bihar (Meister 1981). An inscription from the temple is often interpreted to provide a date of 636 CE.

Definable deviations measured in Muṇḍeśvarī's plan make it possible to conclude that both a constructional geometry, using cord and circles to locate faces of an octagon, and a set of measurements determined by a grid, to locate the projecting faces of the cardinal entrances, were applied resulting in an 'octagon' measurably broader on the angled walls than across the cardinal entrances (Fig. 18, deviations marked by 'x').[4]

That responder also questions "evidence of builders having seen stellate plans as a rotation of the mandala." I have lightly cited above the "three 'stellar' cities Śiva saves that make up the cosmos" as analogous to the *Bṛhat Saṁhitā*'s application of a designated 9x9-square grid '*vāstumaṇḍala*' to plan palaces and cities (presumably also star-like ones) and the apparent chronogram of the Indor temple's rotating-square plan (Fig. 11), as well as earlier experiments (Meister 1984b). That these and later 'radial' plans struggle with the square grid (Figs. 13–17) rather than simply using plain geometry seems to me in itself an argument.

I end, however, repeating the palimpsest, that practical planning and talismanic potency can and do coexist.

[4] ASI to Restore Mundeshvari Temple, *The Times of India*, Feb. 23, 1910. [Before the monument is too radically reconstructed, I hope others will retest it and other monuments.]

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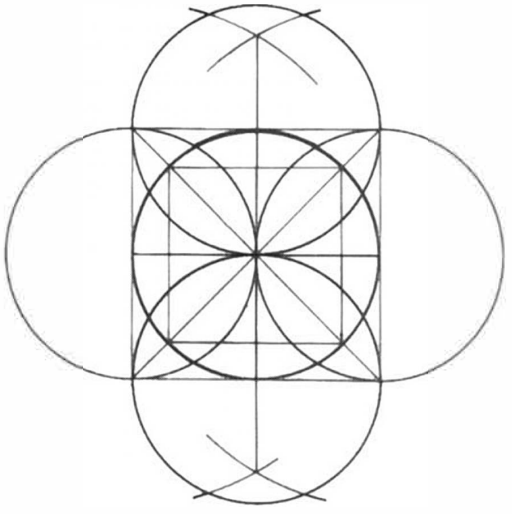

Fig. 1. Diagram of geometric construction using gnomon, pegs and cords to determine a square based on Śulba-Śūtra descriptions (author).

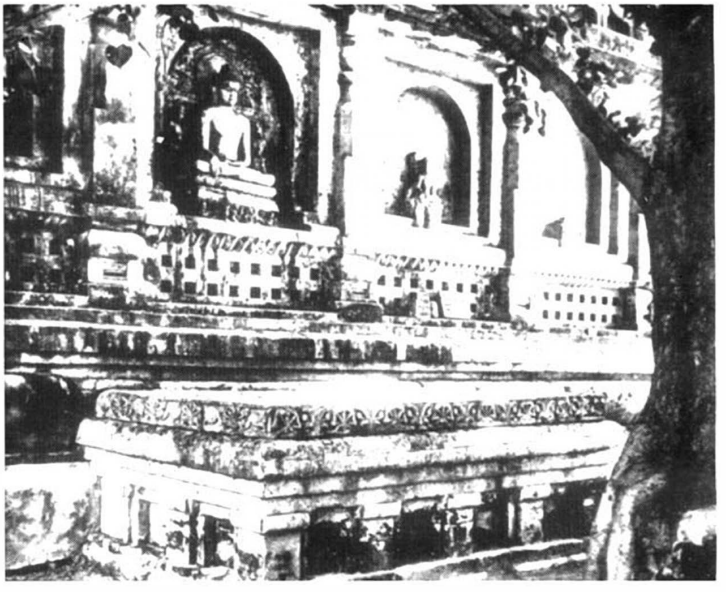

Fig. 2. Bodh Gaya, Bihar, Mahābodhi Temple, Mauryan-period stone altar remounted on a Gupta-period brick platform to mark the place of Buddha's Enlightenment (after A. K. Coomaraswamy, *La sculpture de Bodhgaya*, pl. 45).

Fig. 3. Mathura, U.P., relief with *linga* altar, 2nd c. CE (Lucknow, State Museum).

Fig. 4. Amaravati, A.P., Buddha life scenes, 3rd c. CE (British Museum).

Roga / Pāp	A-	Mu-	Bhal-	So-	Bhu-	Adi-	Diti / Agni
Śos	ha / hi	khya	lāṭa	ma	jaga	ti / Pa	rjanya
Asura		Rājay / Rud-	Pṛithv	dhara	Āpaḥ / Apav		Jayanta
Varuṇa		Mi-	Brahman		Arya-		Inūra
Kusumad		tra	Brahman		man		Sūrya
Sugrīva		Jaya / Indra	Vivasvant		Sav / Sāvit		Satya
Dauvār	Bhringa-	Gan-	Ya-	Bṛihat	Vila-	Pū-	Bhriśa
Pit / Mṛiga	rāja	dharva	ma	kshata	tha	shan	Antar / Anila

Fig. 5. 64-square grid *vāstumaṇḍala* with *brahman* and *padadevatā*s (after Varahamihira/Kern).

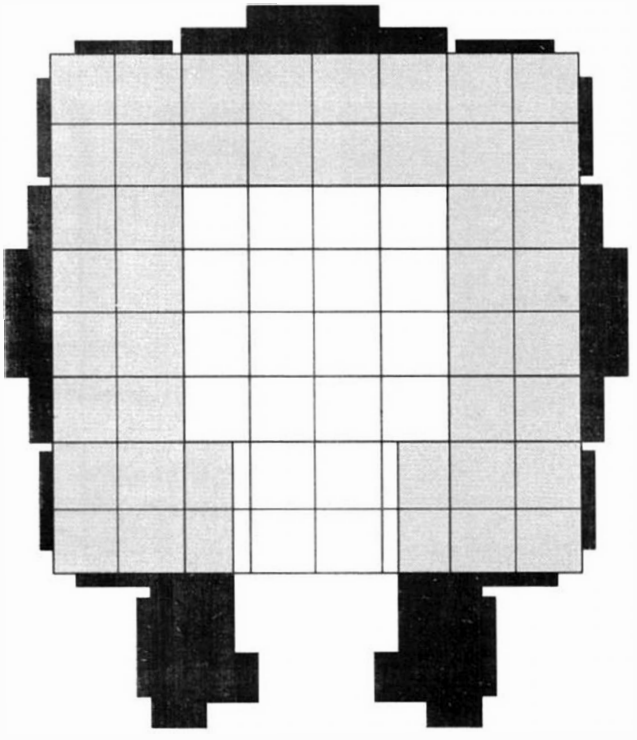

Fig. 6. Pipad, Rajasthan, Piplāḍ Mātā Temple, ca. 725, ground plan with constructing grid (author).

Fig. 7. Sanchi, M.P., Temple 17, ca. 425 (author).

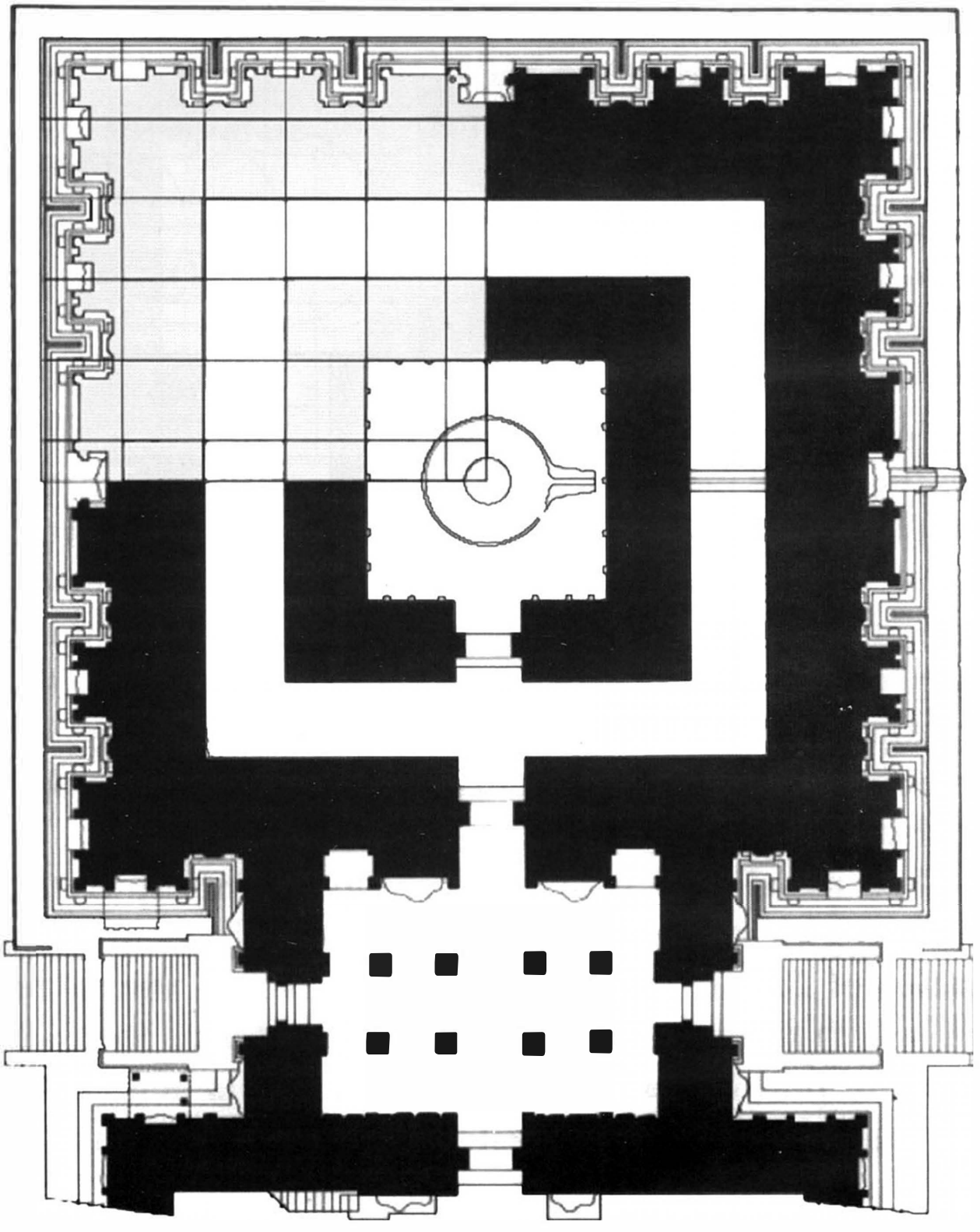

Fig. 8. Gangaikkondacholapuram, Tamilnadu, ca. 1035, sanctum plan with odd-numbered constructing grid (analysis author, ground plan courtesy Pichard).

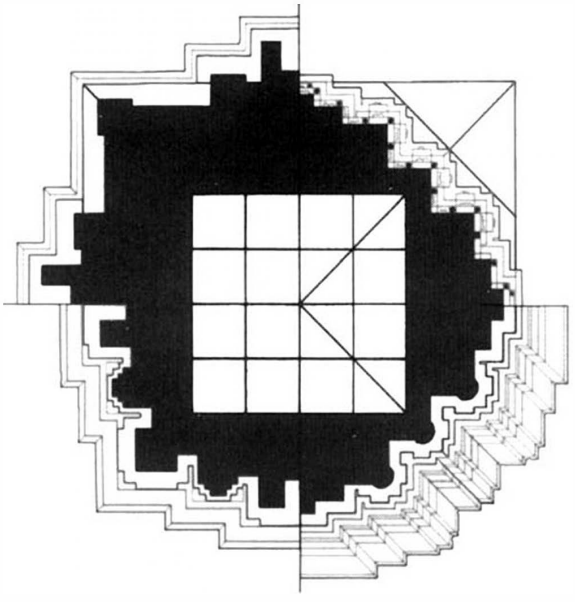

Fig. 9. Evolution of North Indian temple ground plans in relation to a 64-square *maṇḍala* grid: Mahua, U.P., Śiva Temple, ca. 675 (upper left); Bhavanipur, Rajasthan, Nakti Mātā Temple, ca. 850 (lower left); Kiradu, Rajasthan, Viṣṇu Temple, ca. 1000 (right, wall frieze and mouldings) (author).

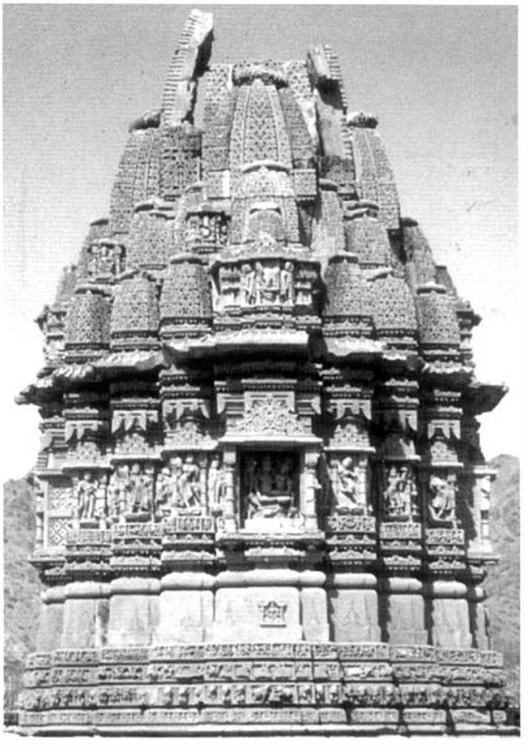

Fig. 10. Kiradu, Rajasthan, Śiva Temple no. 3, ca. 1000 (AIIS/Penn South Asia Art Archive).

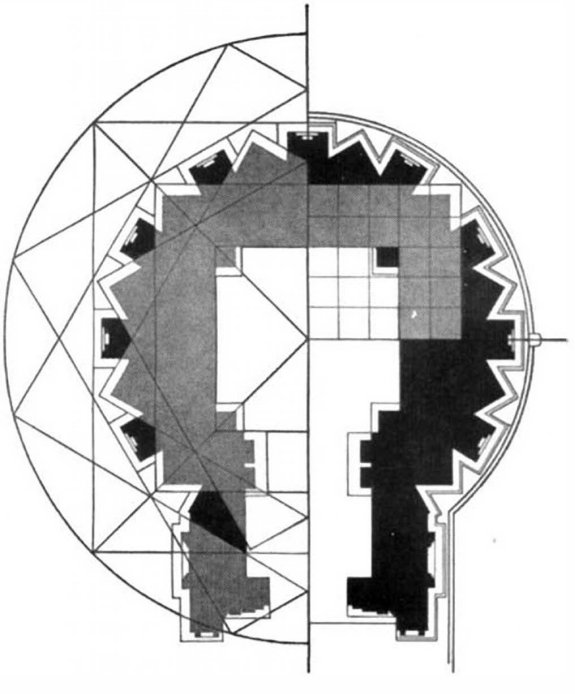

Fig. 11. Indor, M.P., Gargaj Mahādeva Temple, ca. 750, ground plan with constructing geometry and grid (author).

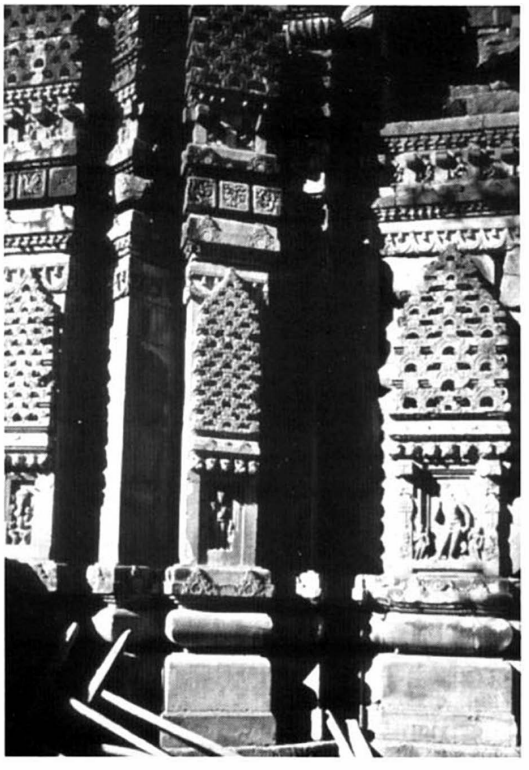

Fig. 12. Indor, Gargaj Mahādeva Temple, wall detail (author).

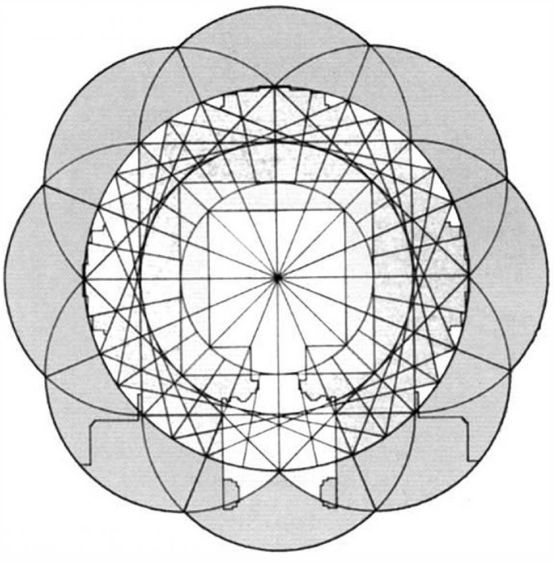

Fig. 13. Udayapur, M.P., Udayeśvara Temple, ca. 1081, constructing geometries (author).

Fig. 14. Udayapur, M.P., Udayeśvara Temple (AIIS/Penn South Asia Art Archive).

Fig. 15. Dambal, Karnataka, Dodda Basappa Temple, ca.1175 (author).

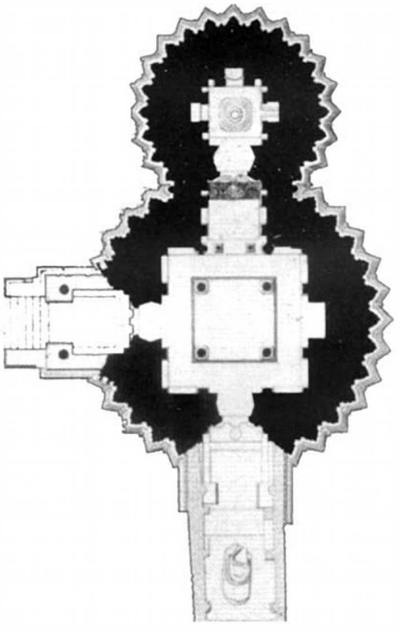

Fig. 16. Dambal, Dodda Basappa Temple, ground plan (after Cousens 1926, pl. 125).

Fig. 17. Ranakpur, Rajasthan, Sūrya Temple, ca. 1450, wall detail, turning-square plan (author).

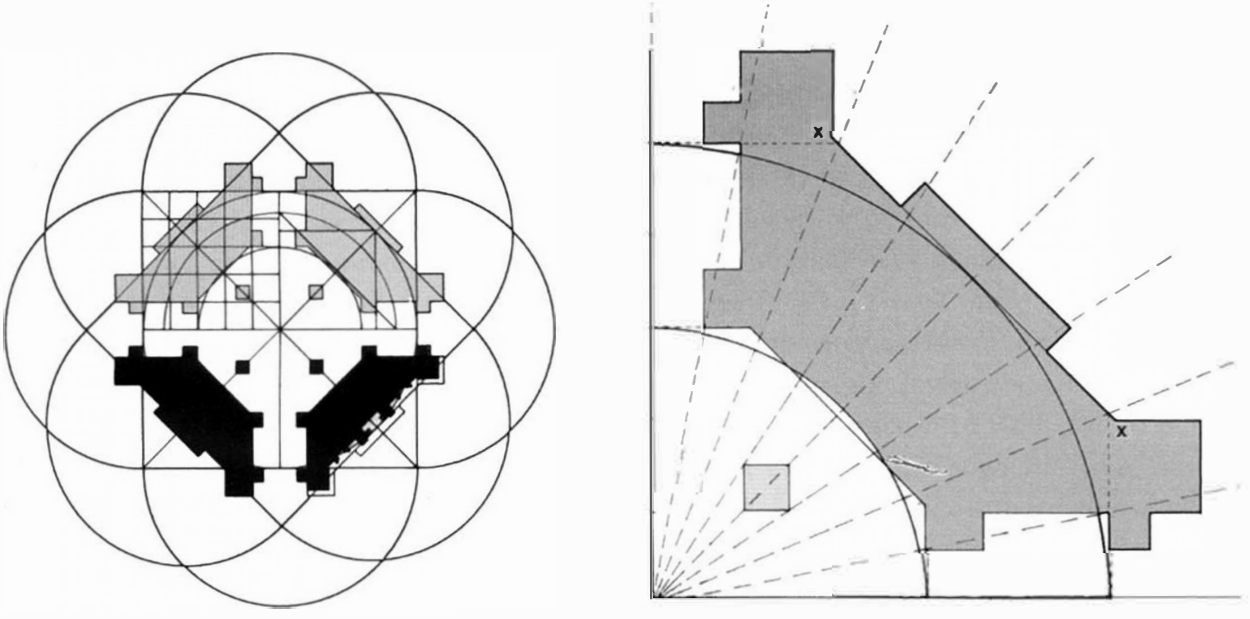

Fig. 18. Ramgarh, Bihar, Muṇḍeśvarī hill, Śiva temple, ca. 636, octagonal ground plan combining geometric construction with grid measure (adjustments noted at 'x') (author).