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Theoretical Computer Science 281 (2002) 609–628
Theoretical Computer Science
www.elsevier.com/locate/tcs

Śrī Yantra Geometry

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0. Introduction

Śrī Yantra (pronounced Shri Yantra) is a sacred diagram of Tantric Hinduism. Its symbolism is explained in Zimmer [18,20]. It consists of three concentric parts:

- An inner figure of interpenetrating triangles. This figure, symmetric in its vertical central axis, contains both upward-pointing triangles (*vahni*), symbolizing the male element ("Purusha", the Cosmic Person), and downward-pointing triangles (*śakti*), symbolizing the female aspect ("Prakṛiti", i.e. energy) of divinity. There are 4 male triangles, and 5 female ones. Their inter-penetration symbolizes the complementarity of the opposite principles in creating the illusion of duality through ignorance, whereas the general symmetry and balance of the whole figure symbolizes the more profound reality of Unity of God through its various unfoldings.
- Two concentric rings, holding a regular lotus (*padma*) design. The inner pattern bears 8 lotus petals, the outer one 16. These patterns symbolize the sanctity of the inner diagram, used as instrument (*yantra*) in yoga meditation; such diagrams are abstract analogues of the more profusely decorated tibetan thankas [20].
- A triple Greek-like key-pattern, the *bhūpura*, or *śiśirita* (shivered) frame. It symbolizes the ground-plan of a temple with 4 square openings, in the 4 directions of space. This sanctuary is the seat (*pīṭha*) of one's chosen deity (*iṣṭa-devatā*), representing one's Higher Self.

The Śrī Yantra diagram is a sacred symbol of Tantric Hinduism, and it is traditionally used in yoga meditation exercises. The original edition of Zimmer [18] had erroneous descriptions of Śrī Yantra, according to the later English translation [20]. Unfortunately, that one is also marred with errors in diagrams, and unclear references to inside-out construction instructions for the drawing of the triangular central pattern. The present paper presents a more systematic approach to the formal definition of Śrī Yantra.

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PII: S0304-3975(02)00028-2

1. In search of Śrī Yantra

1.1. Drawing experiments

Our first approach was completely experimental: the author tried to draw Śrī Yantra in free hand, and failed. A more systematic attempt with a computer drawing system also failed. The only reliable model available then was the frontispiece figure in [20], all the other diagrams in the book being obviously erroneous, or at least significantly different from the frontispiece figure. Instructions for drawing the diagram led to various inexact drawings, such as the False Śrī Yantra shown in Fig. 1.

Using the Macintosh package FreeHand, and by precisely measuring Zimmer's frontispiece diagram, a correct Śrī Yantra was then produced, shown below as Fig. 2, and measured to serve as an initial approximate configuration.

1.2. A more rigorous geometric analysis

The difficulty of the above experiments had left us undecided as to whether Śrī Yantra was indeed uniquely defined in the real plane, under-specified, or even impossible. Using the notation XA for the horizontal coordinate of point A in Fig. 1, and

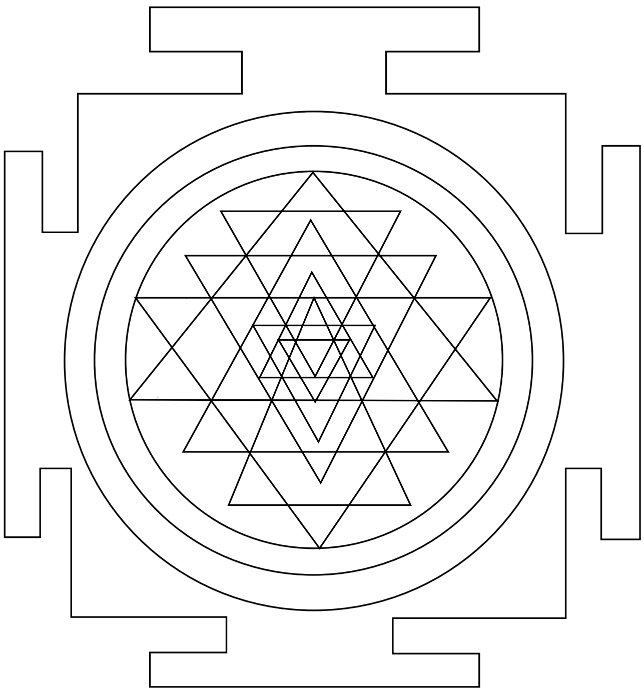

Fig. 1. False Śrī Yantra.

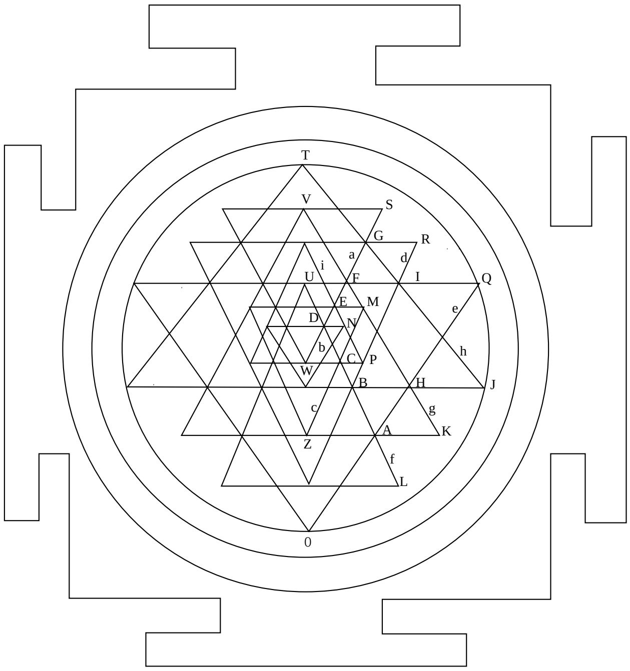

Fig. 2. Approximate Śrī Yantra.

YA for its vertical coordinate, and writing $A\&B \to c$ for "points A and B determine the line c joining them" and $a\times b \to C$ for "lines a and b determine their intersection C", we compute a system of real coordinate constraints as follows. α is the inner circle of the diagram.

We choose YQ, XF, YP, XA and YJ as parameters, and we compute: $YQ\times\alpha \to Q$; $Q\&O \to e$; $YF = YQ$; $YJ\times\alpha \to J$; $J\&T \to h$; $XA\times e \to A$; $YJ\times e \to H$; $YQ\times h \to I$; $XU = 0, YU = YQ$; $U\&A \to f$; $YP\times f \to C$; $F\&H \to g$; $0T\times g \to V$; $XW = 0, YW = YP$; $F\&W \to a$; $a\times f \to D$; $a\times h \to G$; $YJ\times f \to B$; $XZ = 0, YZ = YA$; $C\&Z \to c$; $c\times g \to M$; $I\&B \to d$; $d\times 0 \to YL$; $f\times YL \to L$; $d\times YP \to P$; $a\times YM \to E$; $P\&E \to i$; $a\times YV \to S$; $g\times YA \to K$; $i\times YD \to N$; $d\times YG \to R$.

The parameters are consistent if point $(0, YG)$ is on line i, which gives one extra constraint. We thus obtain a problem with 4 degrees of freedom, which admits several solutions. However, we have to take into account the further constraints that the various points of the diagrams should lie inside the circumscribing circle α, we thus have a very shallow range for the 4 real parameters, leading to solutions which are æsthetically close to Fig. 2. A standard Newton approximation solution of the constraint on G from various initial solutions leads to the following particular solution, where the diameter of circle α is taken as unit length:

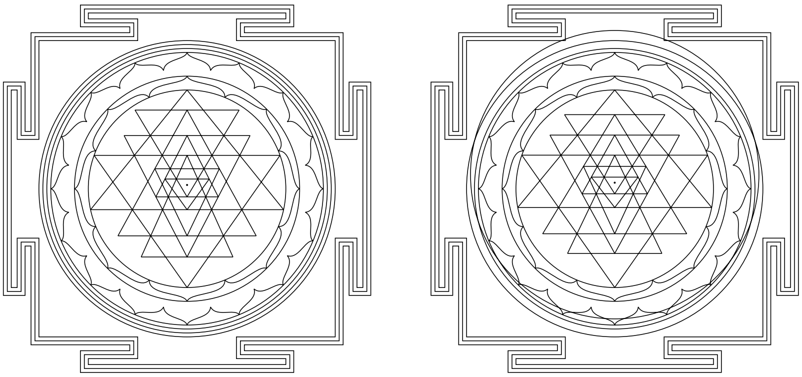

Fig. 3. Two exact Śrī Yantras.

Definition. *Classical Śrī Yantra* is defined by: $YF=0.668$, $XF=0.126$, $YP=0.463$, $XA=0.187$, $YJ=0.398$, $YL=0.165$, $YA=0.265$, $YG=0.769$, $YV=0.887$, $YM=0.603$, $YD=0.551$.

This investigation solved our query:

Theorem. *Śrī Yantra is an under-determined Euclidean plane geometry problem with* 4 *real parameters*, *admitting an infinity of solutions around the Classical Śrī Yantra*.

The wider variation of the various solutions is on YL, and this obviously affects the æsthetic rendering of the diagram, and consequently its esoteric powers. It became clear at this point that a synthetic study of the above solutions was essential in getting a more precise approximation to the traditional diagram.

1.3. Graphic synthesis of solutions

The graphic description language Postscript [1] was chosen for the graphic synthesis of the solutions. The mathematical analysis of the previous section pertains only to the triangular area. The circular, as well as rectangular patterns, were obtained by measurements from the original model from the frontispiece figure in [20]. The lotus patterns were also obtained by a trial-and-error fiddling with the Postscript Bézier cubic curve primitives. The relevant Postscript code is given in the appendix.

We show below two examples of figures which are particular solutions of the Śrī Yantra equations (Fig. 3). In the left figure point V is very high, whereas in the right one point N is very close to line c. The tension between these two pitfalls is the essential difficulty in drawing the right diagram.

1.4. Æsthetic feedback

An æsthetic analysis of the resulting figures was carried out, leading to more experiments aimed at reaching an optimum feeling of harmony from the contemplation of the

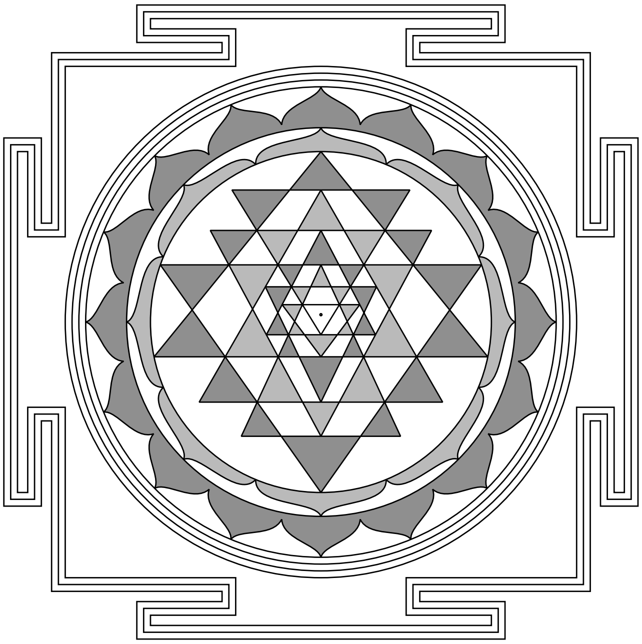

Fig. 4. Classical Śrī Yantra.

diagram. The main worry was the seemingly mandatory inflexion in the slope variation of the upward diagonal lines e, d, c, b, a, and symmetry (but to a lesser extent) of the downward diagonal lines f, i, g, and h. This essentially experimental study converged to the definition given above of Classical Śrī Yantra, and the corresponding rendition is given below in Fig. 4.

1.5. Bibliographic search

The initial hope of the above mathematical analysis of the yantra was to formally describe a parametric situation admitting multiple solutions which could be optimized according to an aesthetic criterion. However, even though the first part of the conclusion was reached, see the Theorem above, the shallow range of solutions made it absolutely impossible to optimize the diagram to the extent, for instance, that the various triangle slopes vary in a monotonous fashion.

Doubts thus began to enter the mind of the author as to the precise definition of Śrī Yantra. Even a serious study such as [20] contained inconsistencies. It defines descriptions of it, culminating in Fig. 10, which is clearly different from its final colour rendition presented in the frontispiece. The frontispiece figure conforms to the mathematical analysis given above, and thus we may ascertain that it is a precise graphical rendition of Classical Śrī Yantra. But the awkward sloping of the innermost shakti triangle of the latter makes it less harmonious in some sense than the smoother design in Fig. 10 of this work, similar to the False Śrī Yantra shown above.

The inside-out instructions, attributed to Bhāskararāya's *Nityāśodaśikārnava*, are clearly misleading, since there is no hope, except by extraordinary luck, to get points J and Q on the circle α determined by its diameter $0T$. Actually, this text can only be considered as an approximate description of Śrī Yantra, and by no means as precise instructions for its geometrical construction.

It was not clear at this point as to which of the two designs was the traditional one. It was not a priori obvious whether the more exact, or the more harmonious drawing, was to be preferred. The frontispiece in [20] is credited to [12], but was added by the translators, and is absent from the original edition [18]. The first lead was to follow Zimmer himself, who later consigned his observations on Myths and Symbols in Indian Art and Civilization in a volume edited after his death by Joseph Campbell [19]. There, Fig. 36 (also reproduced on the front cover) is a version of the False Śrī Yantra. The credits attribute this figure to Sir John Woodroffe, judge at the Supreme Court of Calcutta, who published tantric works under the pseudonym Arthur Avalon. Indeed, this figure may be found on the cover of [17], published in 1914.

The next available reference was the work of Daniélou [3]. The relevant diagram is represented in the French edition on p. 537, which we shall call the Reverse Classical Śrī Yantra, since it is indeed a geometrically precise yantra, but it is shown upside down. The diagram is called Shrî Cakra in this work, i.e. Fortunate Circle, while alluding to its other name of Shrî Yantra, translated as Diagram of Beauty or Harmony. It is said that the Shrî Cakra represents the Universal Goddess. At this point it seemed that the Classical Śrī Yantra was indeed the correct rendition, but the vertical orientation was in doubt, especially with respect to the remarks on incorrect orientation in footnote *q* p. 161 of [20].

One of the most confusing sources is Rao, who discusses the diagram under the name Śrīchakra, in the chapter Devi of the first volume of his extensive study of Hindu iconography [4]. In this work are presented a hand-drawn Reverse Classical Śrī Yantra as Plate XCVII, and the photograph of a genuine Classical Śrī Yantra metallic plate engraving from the Śrīṅgeri Maṭha as Plate XCVIII.

Evidence for the correct orientation was found in Renou [14], article 1166, which says that the most efficient yantra, *çrîyantra*, is composed of 5 downward and 4 upward triangles. The accompanying Fig. 28, p. 581 is, however, a False Śrī Yantra, apparently identical to Avalon's original one. The text refers to Zimmer as its main source.

Further evidence for the correct orientation was found in a book on Tantra Art [7], where a Classical Śrī Yantra in the form of a Rajasthan painting from the late 18th century is reproduced as Plate 7. It is mentioned that, according to the Tantrasara, this yantra should not be drawn during nighttime. Plate 51 of the same source shows a copper plate rendition from South India, dated 17th–18th century. It is stated that the ultimate object of meditation on this yantra is to realize the unity of the meditator's individual soul with the Goddess. The text of this work gives mysterious instructions for drawing the diagram: "Taking the positive pentagon (and its negative ally, the pentacle) and drawing diagonals from (a) centre to angles, and (b) from centre to sides, two series of ten lines, having two lengths only, appear. This design is called Sri Yantra." It goes on in describing still more mysterious relationships between the proportions of the diagram and the musical scales (*ragas* and *raginis*) of Indian music.

Finally, most doubts were dispelled by reading Pott's scholarly work on Yoga and Tantra [11]. It is remarked there that Zimmer's figures were incorrect, but it is asserted rather strangely that the drawing instructions are correct! A correct diagram is presented decorated with letters of the Devanāgarī alphabet, as Fig. 7. We note that this diagram is pretty close to the left diagram in our Fig. 3, with point S almost on circle α. We also remark that the bindu is drawn there as a small circle, following Rao. We note that Pott refers to a good illustration of Śrī Yantra in Kundangar [5].

Another book on the art of Tantra, by Rawson [13], presents first a copper plate, as Fig. 49, and then a Rajasthan drawing, c. 1800, decorated with *mantras* (magic formulas), as Fig. 50. Although called Śrī Yantra, this drawing is rather remote from the classical one, since it possesses only 3 *vahni* triangles, and 4 *śakti* ones. But Fig. 65 shows a splendid Classical Śrī Yantra drawn as a gouache painting on cloth, from Nepal, c. 1700. Described as "a diagram of the continuous process of Creative Generation", this beautiful painting is illustrated with images of gods in various geometric positions. Its colour rendition is significantly different from the frontispiece from [20]. In particular, the triangular sub-patterns are all red, and not alternating red and blue. The text presents a metaphysical interpretation of the diagram, based on the *Kāmakalāvilāsa*. This text, whose complete translation is given in the appendix, is obscure, to say the least.

Further information is provided in The Tantric Way [8]. Besides previously referenced representations, we note a 3-dimensional bronze rendition. It corresponds to what Rao calls the Meru form of the Śrī Yantra [4]. Similar 3-dimensional crystal or metal representations may be found in North India and Nepal.

We finally mention that numerous books on symbolism mention Śrī Yantra, but they usually show incorrect representations of it, either reproducing the False Śrī Yantra from [19] (e.g. Campbell), or its upside-down inverse (e.g. Jung).

Another geometric study of the diagram has come recently to our attention [2]. But this study mentions only approximate constructions, and dubious angular relationships with the Great Pyramid of Cheops.

2. Semantics of Śrī Yantra

We shall now briefly comment on the ritual significance of the diagram.

2.1. A sacred symbol of Devī

We first follow Rao [4]:

"The worship of *yantras* is common throughout India; perhaps the most important of these *yantras* is the *Śrīchakra*. It generally consists of forty-three triangles interestingly

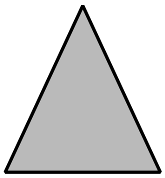

Fig. 5. *Vahni* triangle.

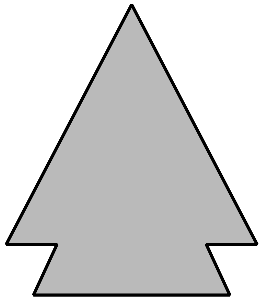

Fig. 6. Arrow.

arranged in a plane and may also be produced in three other different forms called Mēru, Kailāsa and Bhū. The Mēru is the same as the plane *Śrīchakra* in plan; but the various triangles, surrounding the innermost one, are piled one over another in different planes so that the whole becomes shaped into the form of a pyramid. The topmost layer of the Mēru contains a circle called the *bindu*. If associated with the eight *mātṛikā* deities the Mēru becomes the Kailāsa; and with the *Vāsinī* deities it becomes the Bhū. The *Śruti* or Vēdic revelation itself supports the worship of *yantras* (*cf. Taitt. Āran.*). The drawing of the famous *yantra* known as the *Śrīchakra* is given herein ... This and other *yantras* are generally engraved on some metallic plate, preferably one of gold; silver and copper also are often enough employed. The *Śrīchakra* engraved on metallic plates is an object of worship. In South Indian temples of the medieval and later periods, there are shrines called by the name of *Śakti-pīṭhālayas*, in which there is a *pīṭhā* or smaller altar very much resembling the common *bali-pīṭha* whereon the oblations of formal worship are usually offered in temples. It is said that these *bali-pīṭhas* associated with the *Śakti-pīṭhālayas* contain inside them the plate on which the *Śrīchakra* is engraved. Regular *pūjā* is offered to the *Śakti-pīṭha* at least twice a day. In as much as this is thus an object of worship, it has been treated in this work as an icon.

The other *yantras* are engraved upon thin silver, gold, silver or copper plates, which are rolled into a cylinder and then put into a golden or other metallic case so that they may be worn on the body of the person with a view to avoid diseases, possession by devils, and other such evils, which, it is supposed, they have the power to ward off. Occasional worship is also offered to this case containing the magical *yantra*, and the wearer's faith in its efficacy may well effect cures in many cases."

2.2. Analysing the three basic symbols

The inner triangular area of Śrī Yantra consists of concentric areas, formed from three basic symbols: the triangle, the arrow, and the fir tree, depicted, respectively, in (Figs. 5–7).

These three basic figures, together with their upside-down symmetric duals, form by successive intersections the concentric areas into which the triangular pattern de-

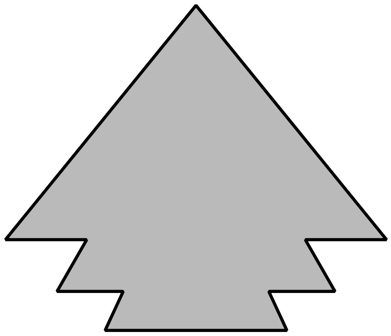

Fig. 7. Fir tree.

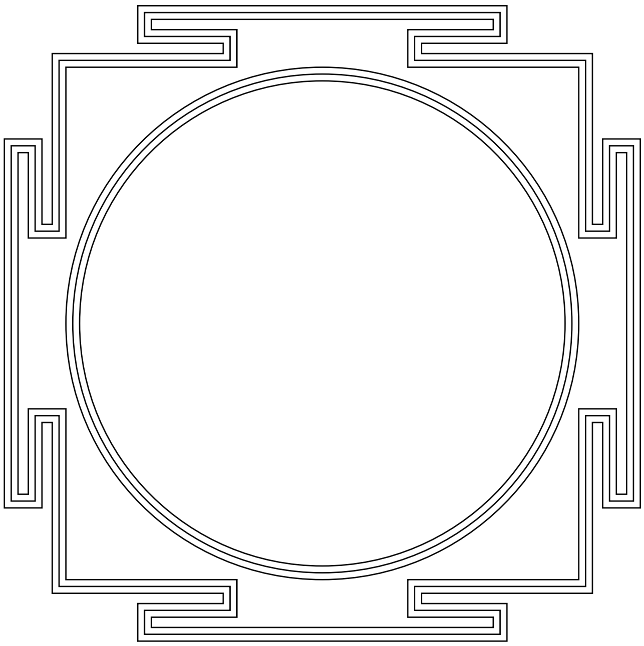

Fig. 8. *Trailokya-mohana chakra*.

composes itself. Such an area is called a *chakra* or wheel (Figs. 8–10). The first step of initiation in Śrī Yantra consists in identifying these areas, instead of the confusing jumble of triangles. For instance, Fig. 14 is formed from a triangle and a reversed arrow. Figs. 12 and 13 are formed with two opposite arrows, and Fig. 11 is formed from two opposite fir trees. It is remarkable that our Postscript program (see appendix) actually uses this analysis for the colour rendering of these rings.

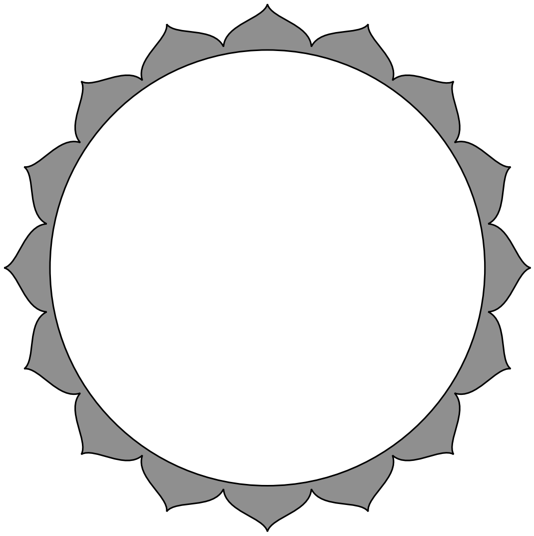

Fig. 9. *Sarvāśāparipuraka chakra*.

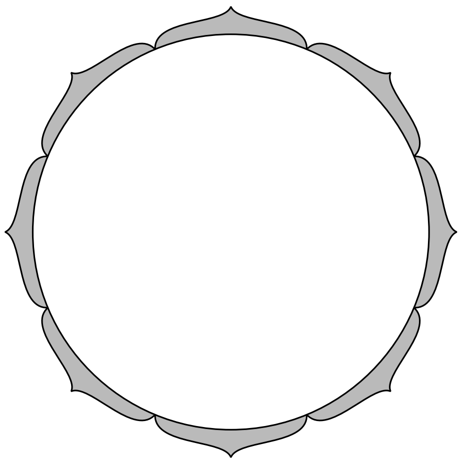

Fig. 10. *Sarva-śaṅkshobhana chakra*.

Let us now examine these concentric rings in an outside-in approach, corresponding to the standard use of Śrī Yantra in meditation practice.

2.3. An outside-in walk

An elaborate description of the constituents of the diagram, basically consistent with the terminology from Zimmer [20], is given in The Tantric Way [8]. It goes as follows.

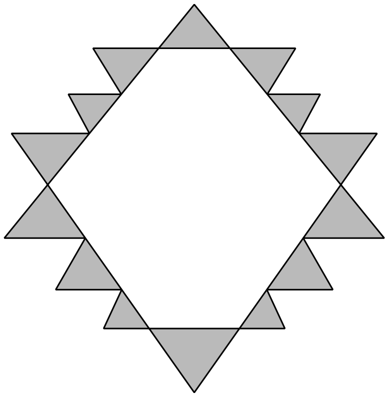

Fig. 11. *Sarva-saubhāgyadāyaka chakra.*

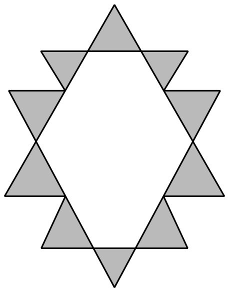

Fig. 12. *Sarvartha-sādhaka chakra.*

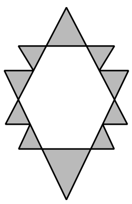

Fig. 13. *Sarvarakshākāra chakra.*

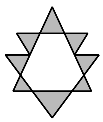

Fig. 14. *Sarva-rogahara chakra.*

"The Śrī Yantra is called 'Nava Chakra' since it is composed of nine circuits, counting from the outer plane to the bindu. Through contemplation on the Śrī Yantra, the adept can rediscover his primordial sources. The nine circuits symbolically indicate the successive phases in the process of becoming. They rank from the earthly plane and rise slowly step by step to the final point, the state of supreme joy. By entering into the élan vital of the yantra, the adept reintegrates with it. The nine

Fig. 15. *Sarva-siddhīprada chakra.*

Fig. 16. *Bindu : Sarva-ānandamaya chakra.*

circuits within Śrī Yantra move from the gross and tangible to the sublime and subtle realms.

The outermost periphery consists of a square, with four gates, coloured white, red and yellow. This is the Bhūpura, the ground-plan, of the Śrī Yantra.

Inside the square are three concentric circles, girdles [*mekhalā*]. The space between the square and three girdles is the Trailokya-mohana, or the Enchantress of the Triple World, chakra; at this stage the adept is infatuated by aspirations and desires.

Next are two concentric rings of sixteen and eight lotus petals, respectively. They are called Sarvāśāparipuraka chakra and Sarva-śaṅkshobhaṇa chakra, indicating fulfillment of desire.

The fourth chakra, Sarva-saubhāgyadāyaka, or Giver of Auspiciousness, projects the realm of possibilities in spiritual ascent. It consists of the fourteen triangles forming the outer rim of the complex interlocking of triangles.

The next two chakras are each constructed of ten triangles. Called Sarvartha-sādhaka and Sarvarakshākāra, Accomplisher of All purpose and Giver of Protection, they indicate a stage when inner realization begins to dawn.

The seventh chakra, consisting of eight triangles, is called Sarva-rogahara, Remover of All Desires and Ills, and represents the stage when the adept is free from earthly bonds and is at the threshold of the inner circle of realization.

An inverted triangle is the eighth chakra, Giver of All Accomplishments, of Sarva-siddhīprada; it denotes a stage before the consummation of realization. All the triangular chakras are coloured red, to represent radiant energy or the dynamic and fiery element of the cosmos.

The last chakra, the Bindu, is known as Sarva-ānandamaya, Full of Bliss. It is the *sanctum sanctorum*, abounding in joy, in which the adept participates in union. The point is light itself, beyond all colours, and is therefore represented as colourless" (Figs. 15 and 16).

At the end of this spiritual search, one feels like the pilgrim who has completed his ascent of the Borobudur 3-dimensional mandala, and finally contemplates the final crowning stupa, symbolizing Emptiness.

We note that the colour descriptions differ from the frontispiece figure in [20], where the chakras alternate blue and red, the outer one being yellow. Also, we note that the bindu in both works is described as a mere dot, whereas Rao [14] describes it as a small circle.

2.4. *Yantra as an instrument of worship*

Now let us turn to Zimmer [19]:

"In Hindu devotional tradition, "yantra" is the general term for instruments of worship, namely, idols, pictures, or geometrical diagrams. A yantra may serve as (1) a representation of some personification or aspect of the divine, (2) a model for the worship of a divinity immediately within the heart, after the paraphernalia of outward devotion (idol, perfumes, offerings, audibly uttered formulæ) have been discarded by the advanced initiate, (3) a kind of chart or schedule for the gradual evolution of a vision, while identifying the Self with its slowly varying contents, that is to say, with the divinity in all its phases of transformation. In this case the yantra contains dynamic elements.

We may say, then, that a yantra is an instrument designed to curb the psychic forces by concentrating them on a pattern, and in such a way that this pattern becomes reproduced by the worshiper's visualizing power. It is a machine to stimulate inner visualizations, meditations, and experiences. The given pattern may suggest a static vision of the divinity to be worshiped, the superhuman presence to be realized, or it may develop a series of visualizations growing and unfolding from each other as the links or steps of a process".

The text goes on elaborating on the processes of enfolding and unfolding visions arising from meditation on linear yantras. Much more information on linear yantras in general, and Śrī Yantra in particular, are given in Zimmer's learned treatise on the relationship between Art and Yoga in the Sacred Images of India [20], where a full chapter is devoted to linear yantras. This work also explains that yantras must be consecrated by a breath-giving ceremony (*prāṇapratiṣṭhā*), where the deity, seen in one's own self by meditation, is installed as a vivifying element into the material image. Following the Gandharva Tantra [16], after Zimmer [20]:

"Next, after performing Prāṇāyāma [the preparatory breathing exercises], the Sādhaka [devotee] should take handfuls of flowers. The Devī should never be invoked without handfuls of flowers. The Sādhaka who controlled his Prāṇa will meditate on the Parameśvarī [that is, the Highest Ruler] as above described, in his heart, and seeing by Her grace that image, the substance of which is consciousness in his heart, let him think of the identity between the image manifested within and the image without. Next, the energy [*tejas*] of consciousness within should be taken without by means of the Vāyu-Bīja [the mantra "*yam*"] with the breath along the nostrils, and infused into the handful of flowers. Thus, issuing with the breath, the Devatā enters into the flowers [he is holding to his nostrils]. The Sādhaka should then establish the Devatā in the image or Yantra by touching it with those flowers".

2.5. Mantras

The photographic illustration given as Plate XCVIII in Rao [4] shows a Śrī Yantra bearing devanāgarī letters. This is analysed in Pott [11], which we cite here:

"Within the outline of the *bhūpara*, the square with projections, is a three-fold circle inside which is a sixteen-petalled lotus which in its turn envelopes an eight-petalled lotus. Within this latter lotus there is a figure consisting of nine juxtaposed triangles—the figure is indeed called by the name *navayonicakra*—which together make up the total of 43 small triangles of which Rao speaks. In these small triangles, just as on the petals of the 16-petalled lotus and with the exception of the nine innermost triangles, are the characters of the nāgarī alphabet, while on the petals of the eight-petalled lotus there are groups of characters, each letter provided with a bindu".

Pott gives at this point, as Fig. 7, a graphic rendition of the Śrī Yantra with nāgarī letters. This hand-drawn figure is an exact Śrī Yantra, resembling the one represented above as the left picture in Fig. 3. Actually, point S almost touches circle α. It is not a faithful rendition of Plate XCVIII from Rao [4], which is much closer to the Classical Śrī Yantra, contains further multi-syllabic mantras in the eight-petalled lotus, and finally shows all the inscriptions oriented circle-wise in the figure, as opposed to horizontally as in Pott [11]. This last author continues in describing the precise placement of letters on the diagram.

2.6. Mysteries of Śrī Yantra

It is clear that this investigation leaves many questions unanswered. The precise mantras, mudras, and divinities associated with Śrī Yantra and similar diagrams depend on sectarian traditions. This esoteric tradition is still largely hermetic. A symposium organized by CNRS in 1984 on mantras and tantras led to a published volume [9], in which an article by Tara Michael [6] describes one tradition of ritual use, taken from the Saundarya-Laharī, or Wave of Beauty hymn. The most complete erudite account available so far is the *Yoginīhṛdaya* (Heart of the Yoginī), published recently in French by André Padoux [10].

Although it is hinted in several sources that this symbol is very old, the author does not know of any published representation anterior to the 17th century, leaving open its date of creation. But the really puzzling enigma is: How could such a difficult geometric construction be invented at all?

We cannot resist quoting again The Tantric Way [8]. "Śrī Yantra, in its formal content, is a visual masterpiece of abstraction, and must have been created through revelation rather than by human ingenuity and craft".

3. Conclusion

This study offers a more precise analysis of Śrī Yantra than was previously available in the published literature. We offer this study as evidence of the non-triviality of bridging the cultural gap between Humanities and Science on the one hand, and Eastern–Western knowledge, or sensibility, on the other.

Appendix

We give here the full Postscript source of the Classical Śrī Yantra (Fig 17).

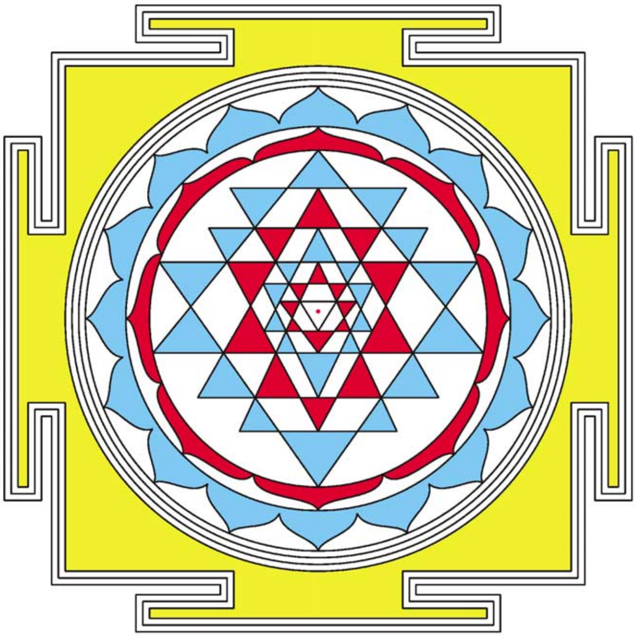

Fig. 17.

```
% Shri Yantra in Color Postscript Copyright G. Huet 1990

% Lines settings
0.52 setlinewidth % 0.35 for printer
0 setlinecap
0 setlinejoin
1.5 setmiterlimit
0 0 0 setrgbcolor

% Scaling
3.937          % 10 cm in inches
0.72           % 72 units in 1 inch
mul            % 1 mm in units
dup scale      % new unit=1mm
/UN 100 def    % unit=10cm

% Triangles
105 90 translate  % Origin at O

/YO 0 def /XO 0 def    % O=(0,0)
/YT UN def /XT 0 def   % T=(0,1)

% Inputs - Obtained by Newton approximation computed by Caml program
/YQ 66.77 def /XF 12.6 def /YP 46.27 def /XA 18.7 def /YJ 39.8 def
```

```
% Coordinates computations
% circle alpha 4*X^2+(2*Y-1)^2=1
/sq {dup mul} def % squaring
/alpha {UN sq Y 2 mul UN sub sq sub sqrt 2 div} def   % X=alpha(Y)>0

/XQ /Y YQ def alpha def            % Q on alpha; Q determined
                                   % Q & O determine e: Y*XQ=X*YQ
/YF YQ def                         % F determined
/XJ /Y YJ def alpha def            % J on alpha; J determined
                                   % J & T determine h: (1-Y)*XJ=X*(1-YJ)
/YA YQ XA mul XQ div def           % A on e determined
/XH YJ XQ mul YQ div def           % YH=YJ, H on e determined
/XI XJ UN YQ sub UN YJ sub div mul def   % YI=YQ, I on h determined
                    % XU=0, YU=YQ, U & A determine f: XA*(Y-YQ)=X*(YA-YQ)
/XC XA YQ YP sub YQ YA sub div mul def % YC=YP, C on f determined
                    % F & H determine g: (Y-YF)*(XH-XF)=(YJ-YF)*(X-XF)
/YV YF YF YJ sub XF mul XH XF sub div add def  % XV=0, V on g determined
                    % XW=0, YW=YP determine W
                    % F & W determine a: (Y-YP)*XF=(YF-YP)*X
/T1 XA YF YP sub mul def
/T2 XF YQ YA sub mul def
/YD T1 YQ mul T2 YP mul add T1 T2 add div def % D determined as a*f
/T3 XJ YQ YP sub mul def
/T4 XF UN YJ sub mul def
/YG UN T3 mul T4 YP mul add T3 T4 add div def  % G determined as a*h
/T5 YQ YJ sub def
/XB XA T5 mul YQ YA sub div def        % YB=YJ, B on f determined
                    % XZ=0, YZ=YA determine Z
                    % C & Z determine c: (Y-YA)*XC=X*(YP-YA)
/YM YP YA sub XF T5 mul YQ XH XF sub mul add mul T5 YA mul XC mul add
    XC T5 mul YP YA sub XH XF sub mul add div def % M determined as c*g
/XM YM YA sub XC mul YP YA sub div def
                    % I & B determine d: (Y-YJ)*(XI-XB)=(YQ-YJ)*(X-XB)
/YL YJ T5 XB mul XI XB sub div sub def        % (0,YL) sur d
/XL XA YL YQ sub mul YA YQ sub div def        % L on f determined
/XP XB YP YJ sub XI XB sub mul T5 div add def % P on d determined
/XE XF YM YP sub mul YF YP sub div def        % YE=YM, E on a determined
                    % P & E determine i: (Y-YP)*(XE-XP)=(YM-YP)*(X-XP)
/XS XF YV YP sub mul YF YP sub div def % YS=YV, S on a determined
/XK XF YA YF sub XH XF sub mul YJ YF sub div add def % YK=YA, K on g determined
/XN XP YD YP sub XE XP sub mul YM YP sub div add def % YN=YD, N on i determined
/XR XB YG YJ sub XI XB sub mul T5 div add def % YR=YG, R on d determined
/XD YD YP sub XF mul YF YP sub div def % D on a determined
/XG YG YP sub XF mul YF YP sub div def % G on a determined

% Input is correct if (0,YG) on i: YG=YP-XP*(YM-YP)/(XE-XP)

/red {gsave 1 0 0.1 setrgbcolor fill grestore} def % coloring in red
/blue {gsave 0 0.8 1 setrgbcolor fill grestore} def % coloring in blue
/yellow {gsave 1 1 0.1 setrgbcolor fill grestore} def % coloring in yellow
/eored {gsave 1 0 0.1 setrgbcolor eofill grestore} def % eo-coloring red
/eoblue {gsave 0 0.8 1 setrgbcolor eofill grestore} def % eo-coloring blue
/eoyellow {gsave 1 1 0.1 setrgbcolor eofill grestore} def % eo-coloring yellow
```

```
% Bindu - The bindu is not at the center of alpha, but at the center of the
% innermost triangle, assumed to be equilateral
/BIN YP YD 2 mul add 3 div def
newpath 0.6 BIN moveto 0 BIN 0.6 0 360 arc closepath red

% Drawing triangle (trikona)
 newpath
 0 YP moveto XD YD lineto XD neg YD lineto closepath stroke

% Drawing 8 star (vasukona)
 newpath
 XN YD moveto XD YD lineto XE YM lineto XE neg YM lineto XD neg YD
 lineto XN neg YD lineto 0 YJ lineto closepath
 0 YQ moveto XC YP lineto XC neg YP lineto closepath
 red stroke

% Drawing first 10 star (dasharayugma)
 newpath
 0 YG moveto XP YP lineto XC YP lineto XB YJ lineto XB neg YJ lineto
 XC neg YP lineto XP neg YP lineto closepath
 0 YA moveto XM YM lineto XE YM lineto XF YQ lineto XF neg YQ lineto
 XE neg YM lineto XM neg YM lineto closepath
 blue stroke

% Drawing second 10 star
 newpath
 0 YV moveto XH YJ lineto XB YJ lineto XA YA lineto XA neg YA lineto
 XB neg YJ lineto XH neg YJ lineto closepath
 0 YL moveto XI YQ lineto XF YQ lineto XG YG lineto XG neg YG lineto
 XF neg YQ lineto XI neg YQ lineto closepath
 red stroke

% Drawing 14 star (manvashra)
 newpath
 0 0 moveto XQ YQ lineto XI YQ lineto XR YG lineto XG YG lineto
 XS YV lineto XS neg YV lineto XG neg YG lineto XR neg YG lineto
 XI neg YQ lineto XQ neg YQ lineto closepath
 0 YT moveto XJ YJ lineto XH YJ lineto XK YA lineto XA YA lineto
 XL YL lineto XL neg YL lineto XA neg YA lineto XK neg YA lineto
 XH neg YJ lineto XJ neg YJ lineto closepath
 blue stroke

% Padmas
/PI 180 def /D1 7 def /D2 12 def /D3 2 def /D4 2 def /R1 50 def
/R2 R1 D1 add def /R3 R2 D2 add def
/R4 R2 D3 add def /R5 R3 D4 add def
/R6 R5 D4 add def /R7 R6 D4 add def

0 R1 translate % Origin at center of circles

/petal { % We assume we start at X3 Y3 neg
       X2 Y2 neg X1 Y1 neg R 0 curveto
       X1 Y1 X2 Y2 X3 Y3 curveto
```

```
       } def % One padma petal

/THETA0 PI 4 div def

% Inner 8-petal padma
/R R2 def
/THETA1 PI 8 div def
/U1 5 def /V1 8 def
/DELTA1 20 def /GAMMA1 5 def
/X1 R2 U1 DELTA1 cos mul sub def
/Y1 U1 DELTA1 sin mul def
/X3 R1 THETA1 cos mul def
/Y3 R1 THETA1 sin mul def
/X2 X3 V1 THETA1 DELTA1 sub cos mul add def
/Y2 Y3 V1 THETA1 DELTA1 sub sin mul add def

gsave
newpath X3 Y3 neg moveto
8 {petal THETA0 rotate} repeat
closepath

% Drawing circle alpha
R1 0 moveto 0 0 R1 0 360 arc closepath
eored stroke
grestore

% Outer 16-petal padma
/R R3 def
/THETA2 PI 16 div def
/U2 4 def /V2 6 def
/DELTA2 15 def /GAMMA2 5 def
/X1 R3 U2 DELTA2 cos mul sub def
/Y1 U2 DELTA2 sin mul def
/X3 R4 THETA2 cos mul def
/Y3 R4 THETA2 sin mul def
/X2 X3 V2 THETA2 DELTA2 sub cos mul add def
/Y2 Y3 V2 THETA2 DELTA2 sub sin mul add def

gsave
newpath X3 Y3 neg moveto
16 {petal THETA1 rotate} repeat
closepath

% Drawing circle beta
R2 0 moveto 0 0 R2 0 360 arc closepath
eoblue stroke
grestore

% Drawing circle gamma
newpath
R3 0 moveto 0 0 R3 0 360 arc closepath
% Drawing 3 outer circles
R5 0 moveto 0 0 R5 0 360 arc closepath
```

```
R6 0 moveto 0 0 R6 0 360 arc closepath
stroke
newpath
R7 0 moveto 0 0 R7 0 360 arc closepath

% Squares
/greek {L1 L1 neg moveto
        4 {L1 L3 neg lineto
           L1 L2 add L3 neg lineto
           L1 L2 add L3 L4 add neg lineto
           L1 L2 add L5 add L3 L4 add neg lineto
           L1 L2 add L5 add L3 L4 add lineto
           L1 L2 add L3 L4 add lineto
           L1 L2 add L3 lineto
           L1 L3 lineto
           L1 L1 lineto
           90 rotate} repeat
        closepath} def % Drawing a greek frieze

/W1 2 def % Spacing between greeks
/W2 3 def

% Inner greek
/L1 R7 def
/L2 W1 4 mul W2 add def
/L3 L1 3 div def
/L4 L1 L3 sub 2 div def
/L5 W2 def
greek eoyellow stroke

/transform {/L1 L1 W1 add def
            /L2 L2 W1 2 mul sub def
            /L3 L3 W1 add def
            /L5 L5 W1 2 mul add def} def

% Middle greek
transform greek stroke
% Outer greek
transform greek stroke

showpage
```

References

[1] Adobe Systems Incorporated, Postscript Language Reference Manual, Addison-Wesley, Reading, MA, 1985.

[2] N.J. Bolton, D.N.G. Macleod, The geometry of the Śrī-Yantra, Religion 7 (1) (1977) 66–85.

[3] A. Daniélou, Le Polythéisme Hindou, Buchet/Chastel, 1960.

[4] T.A. Gopinatha Rao, Elements of Hindu Iconography, Madras, 1914, Repr. Motilal Banarsidass, Delhi, 1985.

[5] K.G. Kundangar, Notes on Shri Maha Lakshmi Temple, Kolhapur, Bombay, 1929.

[6] T. Michael, Le śrīcakra dans la Saundarya-Laharī, in: A. Padoux (Ed.), Mantras et diagrammes rituels dans l'Hindouisme, Editions du CNRS, Paris, 1986, pp. 127–139.

[7] A. Mookerjee, Tantra Art. Publ. Ravi Kumar, Random House, New York, 1971.
[8] A. Mookerjee, M. Khanna, The Tantric Way, Thames and Hudson, London, 1977.
[9] A. Padoux (Ed.), Mantras et diagrammes rituels dans l'Hindouisme, Editions du CNRS, Paris, 1986.
[10] A. Padoux, Le Cœur de la Yoginī —Yoginīhrdaya, avec le commentaire Dīpikā d'Amrtānanda, Publications de l'Institut de Civilisation Indienne, Collège de France, 1994 (diffusion de Boccard).
[11] P.H. Pott, Yoga and Yantra, Their Interrelation and their Significance for Indian Archaeology, Martinus Nijhoff, The Hague, 1966.
[12] Punyānanda-Nātha, Kāma-Kalā-Vilāsa, With the commentary of Natanānanda-Nātha, trans. with commentary by A. Avalon. Ganesh & co, Madras, 1961.
[13] P. Rawson, The Art of Tantra, Thames and Hudson, London, 1973.
[14] L. Renou, L'Inde Classique, Tome 1, Ist edition, Payot, Paris, 1947, Repr. Maisonneuve, Paris, 1985.
[15] K.D. Samdup (Ed.), Śrī cakrasambhāratantra in: A. Avalon, Tāntrik Texts, vol. VII, Luzac, Calcutta, London, 1919.
[16] Shrīyukta Shiva Chandra Vidyārnava Bhattāchārya Mahodaya, Principles of Tantra (Tantra Tattva). With an introduction and commentary by A. Avalon, Luzac, London, 1916.
[17] T. Vidyāratna (Ed.), Prapañcasāratantra, in: A. Avalon, Tāntrik Texts, Vol. III, Luzac, Calcutta, London, 1914.
[18] H. Zimmer, Kunsform und Yoga im indischen Kultbild, Frankfurter Verlags-Anstalt, Berlin, 1926.
[19] H. Zimmer, (ed. by J. Campbel) Myths and Symbols in Indian Art and Civilization, Bollingen Series, Vol. VI, Princeton University Press, Princeton, NJ, 1946, Paperback edition, 1972.
[20] H. Zimmer, Artistic Form and Yoga in the Sacred Images of India, Princeton University Press, Princeton, NJ, 1984. (trans. by G. Chapple, J.B. Lawson)