

**Sacred Geometry in Chess and the Design of the Hindu Temple**

by

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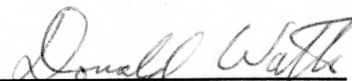
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## A C K N O W L E D G E M E N T

This research is the result of playing a finite game which was played within an infinite game. It is an effort of all the players (my three committee members and myself) chose to play the game of "thesis" (the finite game) for the original purpose of ending the play. Eventually the nature of this finite game changed to an infinite game, one which I will be continuing to play long after this document is finished.

The time was fixed, the place was specified, the boundaries were set, and the rules were published, prior to play. There were many times in the course of play when I tried go beyond or alter the boundaries and, in doing so, reached a level of no progress. It was the encouragement and expertise of my advisors, the Masters of the game, who gave me a new start every time I needed one. I take this opportunity to thank my major advisor, Professor Donald Watts and the other members on the committee, Professor Gary Coates and Professor Richard Hoag. I also thank Professor Kenneth Jones (Department of History, Kansas State University) for his guidance.

My gratitude also goes to the audience (family and friends) whose help and encouragement made it possible to play the game far away from my home. I appreciate the help offered by the Weigel and Farrell libraries at Kansas State University.

## P R E F A C E

This research is a fundamental step forward in the field of "sacred geometry" which explores the relationships between the game of chess and the design of Hindu temples in terms of their implicit geometries and the meanings of their forms.

The first chapter introduces the subject and describes the intent of research, the hypothesis, the research focus and the methodology employed for conducting the investigation. The second chapter briefly describes the fundamentals of Indian sacred art and sacred society which helps to form a basis for the comparison of chess and the Hindu temple. The third chapter introduces the game of chess, reviews its history, general structure, theory and the rules of the game. It also describes the system of geometry constructed by the rules of the game and the meanings of this geometry. The fourth chapter introduces the concept of the Hindu temple and describes its elements, theory and the rituals of temple worship. A step-by-step geometrical analysis of the temple plan is also provided as part of Chapter IV, based on the geometry of chess. The last two chapters involve comparisons between chess and the Hindu temple, and conclusions drawn from the preceding chapters.

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# I. I N T R O D U C T I O N

## i. Intent of Research

There are architectural principles that transcend different cultural expressions. These principles are based on elemental and primordial factors and demonstrate how structure on the physical level is integrated with the structure on the metaphysical level. The metaphysical laws that comprise a universal language and are the fabric of all sacred traditions in architecture are number, geometry, harmony and astronomy. These four sciences, referred to as the Quadrivium in the west, have been the vehicle through which esoteric principles of traditional sacred societies were transmitted<sup>1</sup>. The field of geometry is one of the earliest manifestations of ancient civilizations. "Geometry" means "measuring of the earth". The activity of measuring the earth became the basis for a science of natural law as it is expressed in the archetypal forms of circle, square and triangle. In ancient times magic, religion and science were inseparable and since geometry was connected with the ability to measure, it was considered as a branch of magic<sup>2</sup>.

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<sup>1</sup> Critchlow, Keith and Lawlor, Robert. Geometry and Architecture, Massachusetts : Lindisfarne Press, 1980. p. 5.

<sup>2</sup> Pennick, Nigel. Sacred Geometry: Symbolism and Purpose in Religious Structures, Northamptonshire : Turnstone Press Ltd., 1980. p. 7.

When we look at the architectural heritage of India, we find a rich reservoir of mythical images and beliefs which still give rise to different architectural forms. The Hindu temple is the most characteristic example of the development of Hindu sacred architecture and its art. The architecture of the Hindu temple is a synthesis of many different beliefs and cultural expressions. The temple is intended to operate as a link between the world of man and that of god.

There was an extensive use of geometry (Sulva-sutra) in the design of the Hindu temple. Geometry was considered an expression of the structure of the universe and a means of affecting the interplay between the world of man and that of god (universe)<sup>3</sup>. The temple was constructed correctly according to a system of geometry so that it could be expected to function in harmony with the geometrical basis of the universe. The entire system of geometry which Danish scholar Tons Brunes<sup>4</sup> terms "Ancient Geometry" was a closely guarded secret kept only by the brahmins (priests) who resided in the temple. To better understand the architectural form and meaning of the Hindu temple it is necessary to investigate the system of geometry and the rules of design which regulated the

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<sup>3</sup> Michell, George. The Hindu Temple- An Introduction to its Meaning and Forms, London : Eleck Books Ltd, 1977. p. 73.

<sup>4</sup> Brunes, Tons. The Secrets of Ancient Geometry - and its use, 2 Vols. Copenhagen : Rhodes International Science Publications, 1967. The author has done an extensive research on the subject of ancient geometry.



size, position and proportion of the formal elements of the temple plans. Analysis of this geometric system is one of the main objectives of this thesis.

Hindu temples have always been the center of all artistic and religious activities of the Hindu Community. The temple assembled the nation's creative, thinking leaders around tasks demanding speculation, meditation and intelligence. Members of the temple played a variety of games during their leisurely hours, among which chess was the most popular game. Initially the game of chess was one of the closely guarded secrets of the temple because of the games' structure and mystical origin in the temple culture. The temple was the perfect environment for the origin of such an intellectually challenging game like chess<sup>5</sup>. Chess, to those ancient players was, however, far more than merely a game. The game had enormous educational importance since it stimulates, develops and disciplines thought. It was a powerful weapon of intellectual culture. The games' creator(s) were evidently familiar with the ancient geometry since the game and its structure follow a clear geometric system of order and proportion. In fact, evidence strongly suggests that both the temple and the game of chess are based on the same geometrical forms and principles.

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<sup>5</sup> Brunes, p. 236.

The intent of this research is to investigate the relationships between the geometry implicit in the game of chess and the geometric system which regulated the design of the Hindu temple. By comparing the game of chess to the design of the Hindu temple through an analysis of the geometry which underlies both of them, it is my hope to better understand the meaning of geometry to the traditional Hindu society which was based on a sacred point of view. The research will specifically test the hypothesis mentioned below,

### **Hypothesis**

The architecture of Hindu temples built about 900 A.D. in the early Chola period has a direct congruence with the game of chess in terms of their geometries and the meanings of their forms.

### **ii. Research Focus**

This research is focused on two major areas. First is the study of the geometry invested in the game of chess, and second is the study of the geometric system which regulated the design of the Hindu temples chosen for this research. This study will also explore the meaning in the geometry of both the game of chess and the temple. The study is focused on the development of a selected few Shiva temples of South

India built in the early Chola period during the 9th century to the 10th century A.D.. Substantial research and documentation has been done on the Hindu temples constructed in the Chola period which is also the major source of the drawings needed for the purpose of the geometric analysis. The Chola dynasties ruled the south Indian peninsula for over two hundred years and contributed significantly towards the architecture of Hindu temples.

Chola temples of this early phase inherit general principles and forms from Southern Indian architecture. The overall plan of the temple consisted of the main sanctuary enclosed in a square form which is the shell of the sanctuary, and an entrance hall attached to this shell (see p. 32).

### **iii. Research Methodology**

The methodology employed for conducting this investigation consists of four phases, each consisting of sequenced steps.

#### **Phase I: Analysis of the Structure, Implicit Geometry, and Meanings of the Game of Chess**

The first phase of this study is divided into two parts. The first part consists of a discussion of the history, general structure, theory and rules of the game. The second part is divided into four steps of geometrical analysis of chess. The first step involves the geometric structure of the game. The second step involves construction of the geometry formed by the movements of the Castle, the Knight, the Bishop and the Queen. The third step shows the geometric relationships among these four elements of chess and identifies the meaning of their geometries. The fourth step shows the results and conclusions made from the above steps.

#### **Phase II: Analysis of the Structure, Implicit Geometry, and Meanings of the Hindu Temple**

The second phase is divided into two parts. The first part reviews the meanings, formal elements and theory and rituals enacted in the Hindu temples built in the early Chola period. The second part is divided into three steps of geometrical analysis of the temples. The first step involves the selection of a theoretical base for the method of geometric

analysis of the temple plans. The second step shows the geometric analysis of the temple plans and the last step shows the results and conclusions made from the above steps.

**Phase III: Comparative Analysis of the Geometry and  
Meaning of Chess and Temple**

The third phase involves comparisons of the geometry and the meaning of chess and the Hindu temple. The comparison of their different aspects is made in three different steps. Both Chess and the temple are compared as forms of art. The second step shows their relationships in terms of their geometry. The third step views their common meanings.

**Phase IV : Conclusions**

The final phase involves the making of conclusions from the above phases.

## II. SACRED ART AND SACRED SOCIETY

Originally all art was "sacred"<sup>6</sup>. The portrayal of a divinity was the fundamental thesis of all traditional art. The function of sacred art was to translate religious experiences and a metaphysical conception of world and of human existence into a conceptual form represented through the mediation of artistic expression<sup>7</sup>. Art in India was seen as a way of life whose central aim is moksha, liberation. For the Hindu, life is essentially a spiritual progression towards ultimate liberation, the state of the union of atman, the individual self, with God (Brahman) which leads to the liberation of the soul. Its central purpose is the realization of identity with the Absolute within ones' own living body. Art is one means of attaining the goal of moksha. Around the 9th century, in Hindu India, the arts (poetry, drama and dance, painting, sculpture and music) were all sacred and gave wings to the aspirations for spiritual awakening of the soul. The theory of "art for art's sake"<sup>8</sup> scarcely influenced or determined Indian art. These works of art were the visions or mental images seen while in deep contemplation which reflected the way of life and the ideals of the society.

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<sup>6</sup> Eliade, Mircea. Symbolism, the Sacred and the Arts, New York : Crossroad Publishing Company, 1985. p. 55.

<sup>7</sup> *ibid.*, p. 55.

<sup>8</sup> The Hindu artist who created the images of gods did not make them for art's sake but for use in worship.

In India, sacred art was the form imposed by the artist on life. Creating the work of art is a ritual whereby the artist transforms himself and his substance by performing the rites of art. The Hindu artist sees the visible world around him and the invisible world within him. His intuition reveals the image and his awareness clothes it with features that have the shape of man and his work and evoke the presence of God. The name is God, the work of art is the body and house in which the Formless<sup>9</sup>, the goal of release (moksha) and the source of all form reveals itself<sup>10</sup>.

The temples are the halting places in the approach towards the goal of moksha. They are meant to be seen while moving, from images to images, into the sanctuary, in a straight line of procession from the light of day into deepening superluminous darkness. The rites of approach and circumambulation performed by the ritual movement within the temple, fix and define the shape of the plan. The images are shaped by sculpture and paintings whose "relationship expresses in line, proportion and color the love (bhakti) of the Absolute, to which gods and myths owe their existence"<sup>11</sup>.

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<sup>9</sup> Bharatha Iyer, K. Indian Art, Bombay : Asia Publishing House, 1958. p. 1. "God was conceived as Formless, as an Immanent Principle, as Pure Intelligence. The whole universe is His Form and countless are his attributes".

<sup>10</sup> Kramrisch, Stella. The Art of India, London : The Phaidon Press, 1954. p. 26.

<sup>11</sup> Kramrisch, p. 13.

The Hindu name for any art is shilpa which means "variegated artistic work" comprising art, skill, craft, labor, ingenuity, rite and ritual, form and creation. The number of the arts is unlimited, but they are summed up under sixty four<sup>12</sup> major headings which include the visual arts, music, the dance, drama, acrobatics and dress making, and the more comprehensive art of making love. All these subjects, the sixty four techniques (kala) and the thirty two sciences (vidya), are related to the Veda, the sum total of all Hindu knowledge and skill.

All the arts in India, were known to be interconnected by movement<sup>13</sup>. The figures of Indian sculpture and painting are modelled on breath, the life movement (chetana), the principle of all living, moving form, precipitated into measured lines and volumes<sup>14</sup>. The parallel between external nature (macrocosm) and inner nature (microcosm) of man is represented in art. The play between inner unconscious movement of life within the plastic body and the outer movement of the body by an act of will within the space encircled by that movement is

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<sup>12</sup> The sixty four arts are listed in Vatsyayana, Kama-sutra. This investigation will show the significance of sixty four (8X8) as expression of totality in both the game of chess and the design of the Hindu temple.

<sup>13</sup> *ibid.*, p. 27.

<sup>14</sup> *ibid.*, p. 15. "The rhythmic, breathing quality of form was the test of work of art, for it contains the life-movement of the subject".



reflected in the figures of sculpture and painting by the precise language of basic shapes and geometrical signs<sup>15</sup>. The figures were given the bodies and movements of dancers. In Indian religion and philosophy, Nature in her creative aspect was known in the image of a dancer. The movement of a dancer is seen as Nature personified.

This thesis will illustrate how movement plays a fundamental role in the structure and organization of both the game of chess and the design of the Hindu temple. The rules of the game and the rituals enacted in the temple are based on a specific movement which can be understood as "inner reality", a metaphysical pattern which determines the physical structure. This inner reality was recognized as the expression of divine plan and was the basis for all sacred traditions.

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<sup>15</sup> Kramrisch, p. 13.

### III. THE GAME OF CHESS

#### i. Introduction

Chess is one of the oldest games existing in the history of humankind. It is often referred to as the king of games and the game of kings. Many documents support the idea that the place of origin of the game lies in India, somewhere between 1500 B.C. to 600 A.D.<sup>16</sup> The game is mentioned in India's oldest and most revered collection of laws and history<sup>17</sup>. In its earlier day the game was known as Chaturanga (an adjective, compounded of the two words chatur, four and anga, member), that is, the four members of an Indian army, which were elephants, horses, chariots and foot soldiers.

Chess was originally not a game for common citizens. The game was one of the guarded secrets of the temple and it was played by only those people (priests, kings and philosophers) who were associated with temple activities<sup>18</sup>. The game had enormous educational and spiritual importance. As mentioned

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<sup>16</sup> Kramrisch, Stella. The Hindu Temple Vol. I, Delhi : Motilal Banarasidas, 1967. p. 48. The game of chess, asthapada the board of 8x8 squares was known in Vedic India (1500 B.C. - 1000 B.C.), supported by Kaye, Hindu Astronomy ASI, Mem.18, pg 151., Murray, H.J.R. A History of Chess, London : University Press, 1962. pp. 26-42., Brunes, 1967. p. 235.

<sup>17</sup> Jones William. Asiatic Researches Vol. II., This book is based on the translations of Bhavishya Purana.

<sup>18</sup> Brunes, p. 236.

earlier, the game was made on the model of war and had military importance. Chess was consulted in the time of war, where military tactics were about to be employed. The game was "the most effective media for teaching players about administration, decision making, prudence, caution, strategy, circumspection, vigor, courage, force, endurance and bravery"<sup>19</sup>.

Around 600 A.D., chess existed in a number of countries under slightly different names. The names and positions of the individual pieces have changed occasionally, but their significance and direction of movement have not changed through centuries<sup>20</sup>. Brunes says that the stable form of the game has been due to the positioning and the specific movement of the pieces according to certain rules of ancient geometry. He has observed in his study of "Ancient geometry" that these ancient, simple forms of geometric diagrams have withstood the changes of time<sup>21</sup>.

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<sup>19</sup> Murray, p. 209.

<sup>20</sup> *ibid.*, p. 21, 81, 776. The chess played in Medieval Europe was a direct descendent of the Indian game of chess played in the 7th century A.D. with the same arrangement and method of play. The Queen and the Bishop have exchanged their Medieval rules and privileges for the moves which they still retain in the modern form of chess.

<sup>21</sup> Brunes, p. 236.

**ii. Elements**

The game is played on a square board divided into 64 squares with each side of the board divided into 8 squares. Each player begins with sixteen men, eight "Pieces" and eight "Pawns", which are initially set up as shown in figure 3.2 below. The two players are called White and Black after the color of their pieces. Of these eight pieces, there are two Ratha (Castles), two Ashwa (Knights), two Gaja (Bishops), one Mantri (Queen), one Raja (King)<sup>22</sup>.

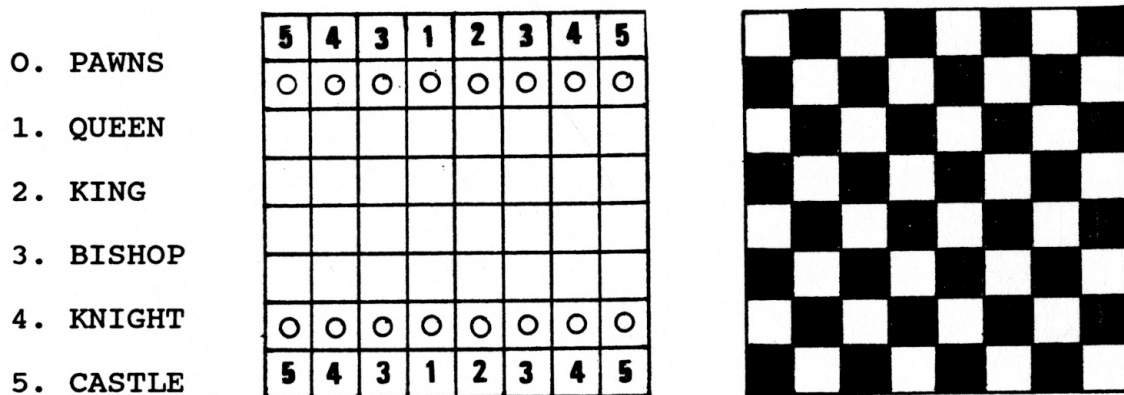


fig. 3.2

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<sup>22</sup> It is customary to capitalize the names of the pieces in chess literature.

### iii. Theory and the Rules of the Game of Chess<sup>23</sup>

#### a. Theory

The object of the game is to checkmate<sup>24</sup> (defeat) the opponent. A player can have a greater advantage over the opponent when he controls a larger number of squares and mobilizes his pieces more efficiently. The player moves his pieces in such a way that each piece can have many possibilities of moving to other squares thus controlling the largest possible number of squares on the board. The player who controls a larger number of squares can move his pieces more freely and restrict his opponent's moves. As the pieces disperse across the board, it is most important to control the four **centermost** squares. The player who moves his pieces (chessmen) most efficiently first develops a position from which to strike effectively. So it is important to get each piece into its ideal place without loss of "tempo" (value of one turn to play).

The four aspects of intelligence, memory, visualization, organization and imagination, play an important role during the course of play. Memory is important to playing chess well because it is necessary to remember hundreds of previous

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<sup>23</sup> Adapted from Colliers Encyclopedia (Vol. 6), New York : Macmillon Educational Company, 1989. pp. 188-190.

<sup>24</sup> Check-mate, mate comes from the Sanskrit root mat which means to defeat.

positions and moves. Visualization is essential because the player is not permitted to move the pieces except for an actual move, so he has to visualize his future moves and their pros and cons. Organization which is one aspect of the process of reasoning, is also essential. The player organizes and unifies his attack in such a way that the pieces acquire maximum effectiveness. Imagination is the creative power with which the player creates mental images to maintain continuity from previous moves to future moves<sup>25</sup>.

#### b. Rules

The **Castle** can move any open distance along a file (a vertical row of squares) or a rank (a horizontal row). The **Knight** move is unique to the game of chess and may roughly be described as an L-shaped leap to the nearest square of the opposite color or, in other words, the Knight can move one to the side and two forward or two to the side and one forward or one forward and two to the side (see fig. 3.3).

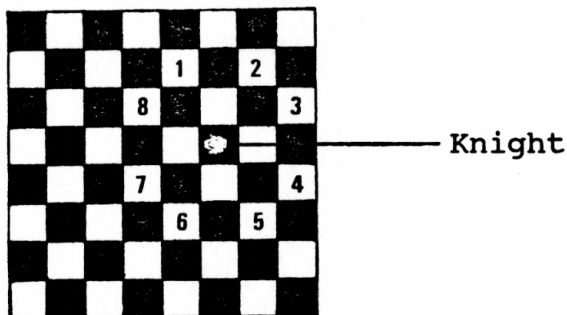


fig. 3.3

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<sup>25</sup> Fine, Reuben. The Psychology of The Chess Player, New York : Dover Publications, 1967. p. 19.

The **Bishop** can move any open distance along a diagonal. The **Queen** has the power of the Castle and the Bishop and thus can move any distance along a file or a rank. The **King** can move in any direction (even diagonally) but only one square at a time. The **Pawns** can move forward only and must stay on their original file except when capturing another piece.

#### iv. Geometrical Analysis of Chess

##### a. Chess board<sup>26</sup>

Chess is played on a square board of 8x8 squares checkered with white and black values. The geometric pattern of the square board can be understood as a "neutral" field of world creation. In itself the pattern is not just limited by being either the male principle (vertical lines) or the female principle (horizontal lines) but, rather embraces both principles in a totality. The black and white values contain the constant tendency towards fusion of the two principles. This apparent duality implies a larger unity which includes the two principles.

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<sup>26</sup> As understood by author.

### **b. Chessmen**

Historically chess was a game of war. The inventor of chess made the chess board to represent the battlefield upon which two armies are drawn up for the contest. The six players of the game represent the six essential classes upon which war turns. Of these the first is the King who rules; the second is the Queen who leads; the third is the Bishop, the fortresses; the fourth is the Knight which is the cavalry; the fifth is the Castle who commands and arranges the army and; the sixth is the Pawns, infantry, the foot soldiers. The shapes and forms of the pieces existed in different forms in different countries. The shapes of the pieces do not seem to have any esoteric significance<sup>27</sup>.

### **c. Positions**

The positions of the pieces refer to the theoretical arrangement of an army on the battlefield. The King and the Queen are in the center because they ought to be in the heart of the army. The Bishop is placed next to the King and the Queen because the strongest positions in the battle-field must be where the king and queen are. The Knight is positioned between the Castle and the Bishop because cavalry ought to be the defense of the fortresses. The Castle is placed next to the Knight because the commander ought to be in command of the

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<sup>27</sup> Murray, p. 222.



left and right wings<sup>28</sup>.

#### **d. Movements**

The rules of the game of chess are based on specific movements which generate geometric patterns. The geometric patterns constructed by the movement of the pieces is based on certain rules of ancient geometry (p. 13). The movement of the King and the Pawns is limited to one square at a time (p. 17) and so, it can generate a number of irregular lines. Therefore, the present study is focused only on the movements of the Queen, the Bishop, the Knight and the Castle since they have the greatest mobility on the board. The following figures illustrate the geometric patterns generated by the movements of the Knight, the Bishop, the Queen and the Castle respectively.

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<sup>28</sup> Murray, p. 222.

d.i. The Knight Movement

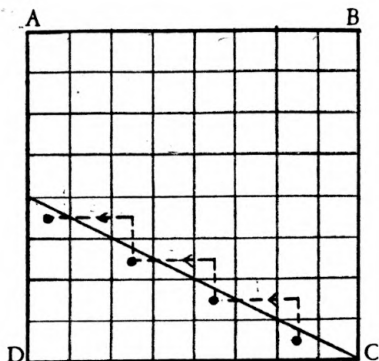


Fig. 3.4.ai

Diagram illustrating the movement of the Knight constructed by 3 consecutive moves, one forward and two to the side.

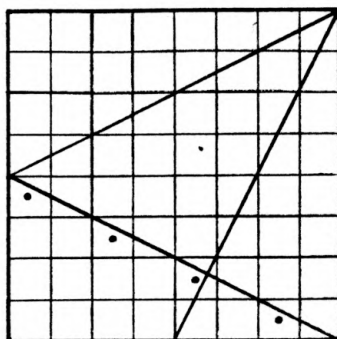


Fig. 3.4.aid

Pattern constructed by the movement of the other Knights. (Adapted from The Secrets of Ancient Geometry, (Vol II), by Tons Brunes.

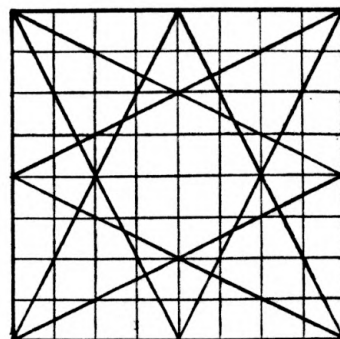


Fig. 3.4.aiii

Diagram with the four acute angled triangles showing the eight pointed star formed by eight possible moves of the Knight. (Author).

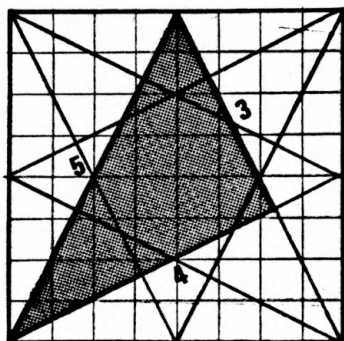


Fig. 3.4.aiv

Diagram of the Pythagorean 3,4,5 triangle inscribed in the eight pointed star. (Author).

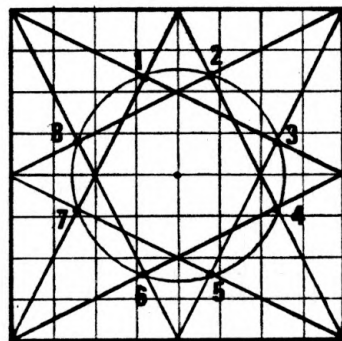


Fig. 3.4.av

Diagram showing the construction of circle by connecting points 1 to 8. The ratio of the diameter of circle to the side of square is 1 to 1.6. (Author).

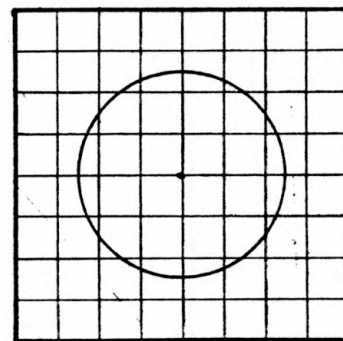
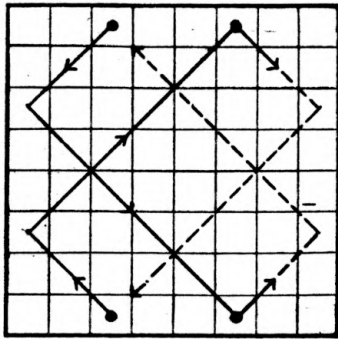


Fig. 3.4.avi

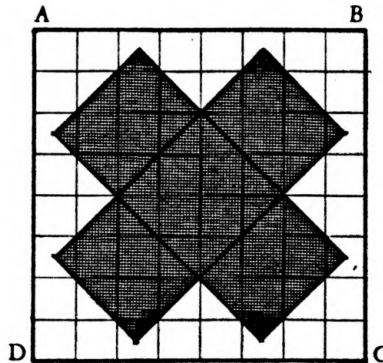
I will use the term "Golden Circle" to refer to this circle of the diagram. The ratio of 1 to 1.6, approximates the Golden Proportion which is 1.618.

**d.ii. The Bishop Movement**



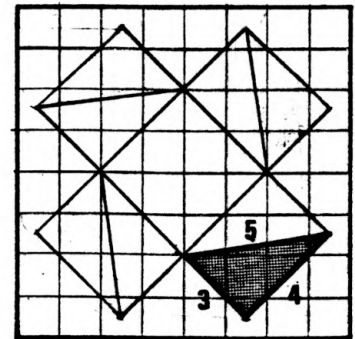
**Fig. 3.4.bi**

Diagram illustrating the extreme movement of the Bishop (four consecutive moves).



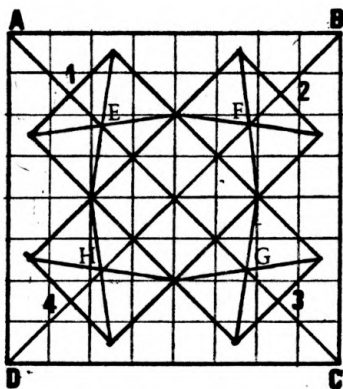
**Fig. 3.4.bii**

Diagram constructed by the movement of the Bishops. The area of the shaded figure is half the area of square ABCD.



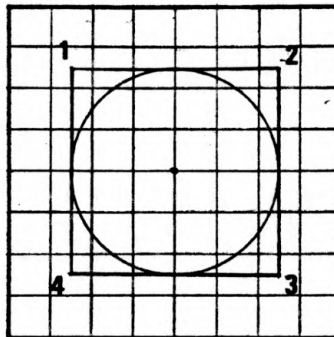
**Fig. 3.4.biii**

Diagram of the Pythagorean 3,4,5 triangle inscribed in the figure formed by the Bishop movement. (Author).



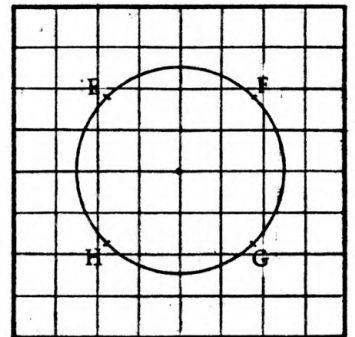
**Fig. 3.4.biv**

Diagram showing the location of points 1,2,3,4, plotted by inserting the diagonals of square ABCD.



**Fig. 3.4.bv**

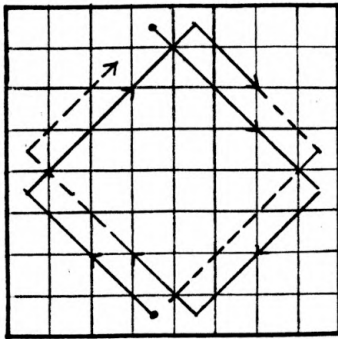
Diagram showing the square constructed by joining points 1,2,3,4. The circle inscribed in square 1234 is the Golden Circle. (Author).



**Fig. 3.4.bvi**

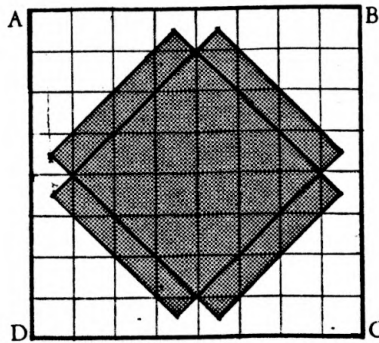
Diagram showing the circle constructed by points A,B,C,D. (from figure 3.4.biv), which is the Golden Circle. (Author).

**d.iii. The Queen Movement**



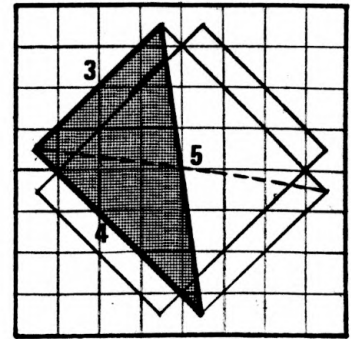
**Fig. 3.4.ci**

Diagram illustrating the extreme movement of the Queens formed by 4 consecutive moves.



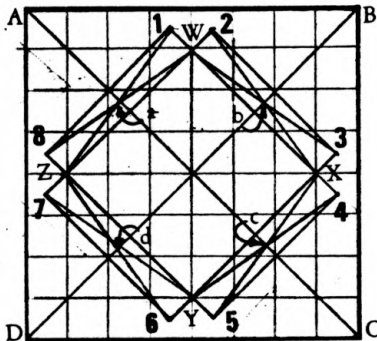
**Fig. 3.4.cii**

Diagram constructed by the movement of the Queens. Area of the shaded figure is 30 units compared to the area of square ABCD.



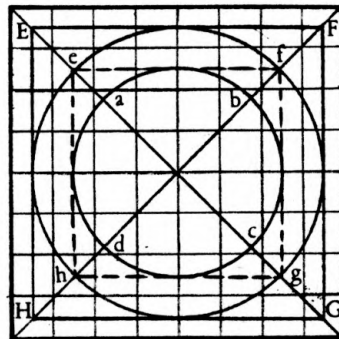
**Fig. 3.4.ciii**

Diagram of the Pythagorean 3,4,5 triangle constructed in the figure formed by the Queen movement. (Author).



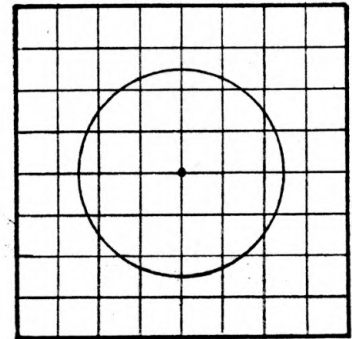
**Fig. 3.4.civ**

Insert diagonals of rectangles 1WZ8, 23XW, X45Y, Y67Z to get points a,b,c,d.



**Fig. 3.4.cv**

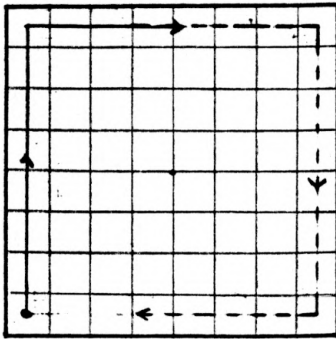
Draw square EFGH by connecting points 1 to 8. Insert circle in square EFGH. The inscribed square efgh contains the circle formed by points a,b,c,d. (see fig.3.4.civ).



**Fig. 3.4.cvi**

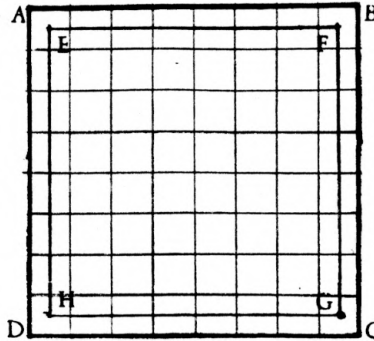
Diagram showing construction of circle drawn by connecting points a,b,c,d, which is the Golden Circle.

**d.iv. The Castle Movement**



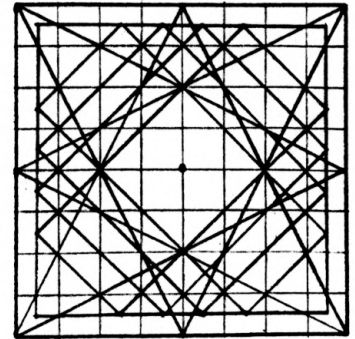
**Fig. 3.4.di**

Diagram illustrating the extreme movement of the Castle formed by 4 consecutive moves.



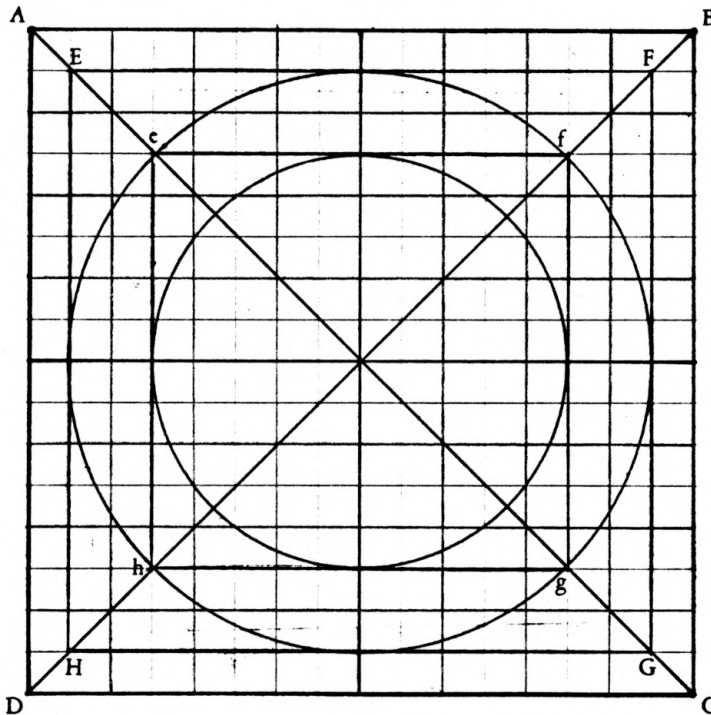
**Fig. 3.4.dii**

Diagram showing square  $abcd$  constructed by the Castle movement. (Author).



**Fig. 3.4.diii**

Diagram constructed by superimposing all the four diagrams constructed by the movements of the Castle, the Bishop, the Knight and the Queen.



**Fig. 3.4.div**

Diagram showing the relationship of all four movements to each other. (see fig. 3.4.dii, 3.4.cv, 3.4.bv and 3.4.avi).

## **v. Implicit Geometry and its Meanings**

The patterns generated by the movements of the players in the game of chess are based on the square, the circle and the classic Pythagorean 3,4,5 right angle triangle. All these basic geometrical forms can be generated easily by the straight edge and compass, the two tools which geometers have used since the dawn of history<sup>29</sup>.

### **a. Circle<sup>30</sup>**

The circle is referred to as the mother figure from which all other figures are generated. The circle was the earliest geometrical form known to the human race. It is a form visible in everyday life as seen in nature. The circle is a symbol of pure, unmanifest spirit space. It also symbolizes Time or Eternity.

### **b. Square<sup>31</sup>**

The symbolic opposite of the circle is the square. It is a symbol of the manifest and comprehensible world. A cross within the square would represent the four cardinal directions and the diagonals would divide it into eight triangles known as the eight fold division of space.

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<sup>29</sup> Pennick, p. 17.

<sup>30</sup> *ibid.*, p. 18.

<sup>31</sup> *ibid.*, p. 18.

### c. The 3,4,5 Triangle

A right angle triangle with all three sides equal to whole numbers was traditionally called the "Sacred Triangle", sacred meaning fixed or permanent<sup>32</sup>. Later it was known as the 3,4,5, Pythagorean triangle upon which rests the rationality of our mathematical thought. This triangle was known and used by the Egyptians to construct right angles.

The geometry implicit in the game of chess shows some geometric relationships between the square and the circle, specifically "the squaring of the circle". The practice of the squaring of the circle was very important to ancient geometers because it is a means to express the relationship between the infinite, unknowable spiritual qualities, as represented by the circle, and the known as symbolized by the finite square<sup>33</sup>. The squaring of the circle is a practice which seeks, with only the compass and straightedge, to construct a square of very nearly equal perimeter to the circumference of a given circle, or which is nearly equal in area to the area of a given circle. Also, since the circle is an incommensurable figure based on the value of pi, it is impossible to draw a square that is more than approximately

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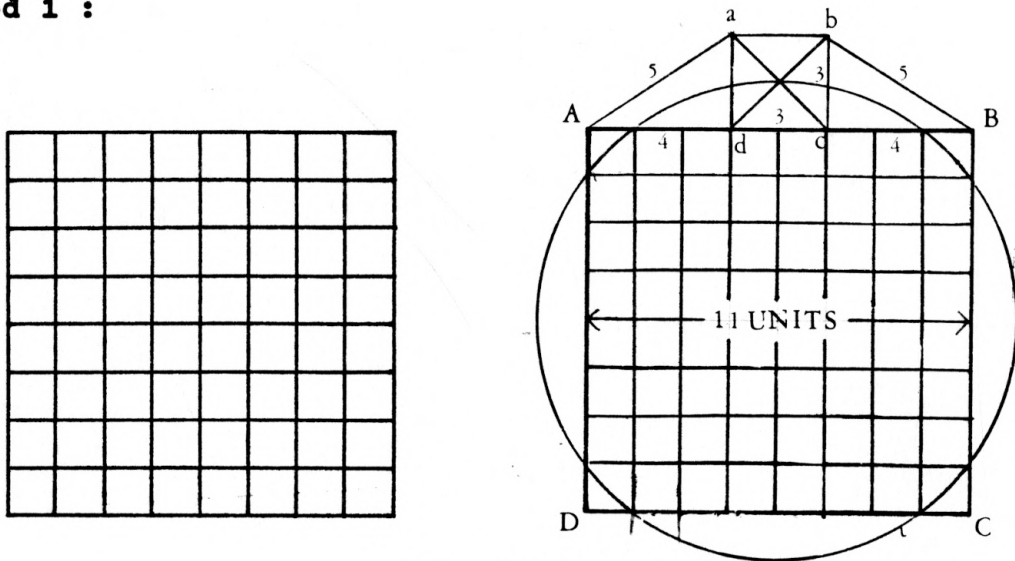
<sup>32</sup> Lawlor, Robert. Sacred Geometry : Philosophy and Practice, New York : The Crossroad Publishing Co., 1982. p. 38.

<sup>33</sup> *ibid.*, p. 74.

equal to it in perimeter or area<sup>34</sup>. The following diagrams illustrate the application of this geometric process to construct a square and circle of nearly equal areas and perimeters using only the straight edge and compass.

**a. Construction of a square and circle of very nearly equal perimeters<sup>35</sup>**

**Method 1 :**



**fig. 3.5a**

The pattern of chess board and the proportion of the triangle 3, 4, 5 have been used to construct a circle and square of nearly equal perimeter (within 0.04%).

A square is drawn on the shortest side of the 3,4,5 triangle bcB, and a replica (ada) of the same triangle bcb is drawn on the opposite side of square abcd. This construction creates

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<sup>34</sup> Lawlor, p. 74.

<sup>35</sup> Author.



a base line of 11 (4+3+4) units. Draw a square of this dimension (11x11). A circle is drawn from the center of square ABCD so that its circumference passes through the center of the smaller square abcd.

Perimeter of the circle =  $14 \times \pi = 43.98229$  units.

Perimeter of the square =  $11 \times 4 = 44$  units.

**Method 2 :**

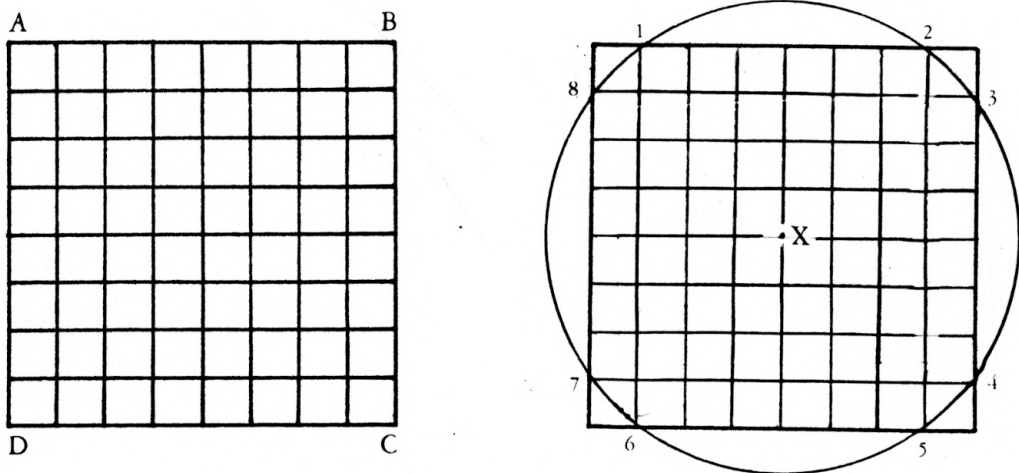
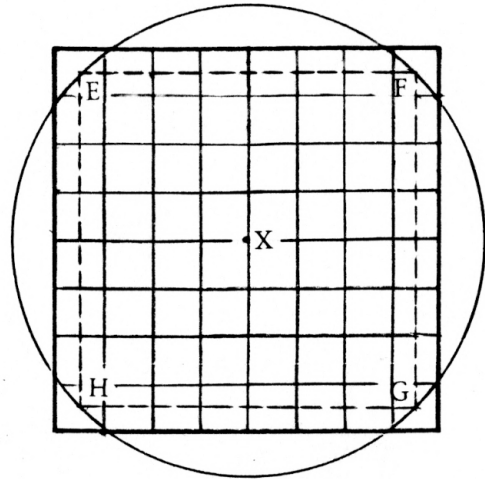
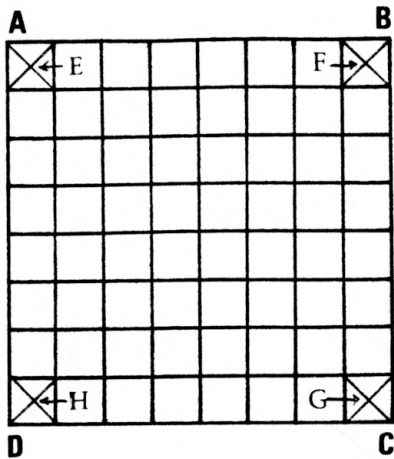


Fig. 3.40

Diagram showing the division of chess board into 64 equal squares. Draw a circle connecting points 1 to 8 with X as center and radius equal to X1. The perimeter of the circle is nearly equal to that of the square (within the difference of 0.584 square units).

**Method 3 :**



**fig. 3.5c**

Diagram showing the symbol selected from fig. 2.3dii. Draw a circle around square EFGH with X as center and radius equal to XE. The perimeter of the circle is nearly equal to that of the square (within the difference of 0.887 square units).

b. Construction of a square and circle of very nearly equal areas<sup>36</sup>

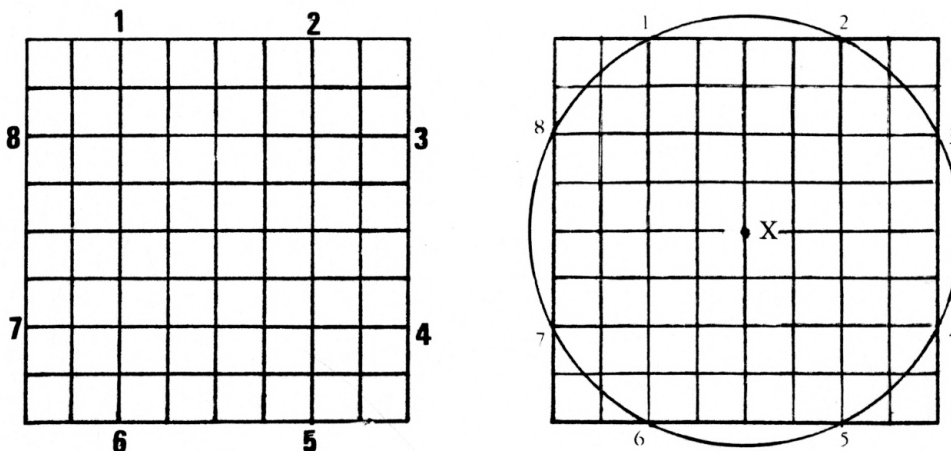


fig. 3.5d

Diagram showing the division of chess board into 64 equal squares. Draw a circle connecting points 1 to 8 with X as center and radius equal to X1. The area of the circle is nearly equal to that of the square (within the difference of 1.168 square units).

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<sup>36</sup> Author.

#### IV. THE HINDU TEMPLE

##### i. Introduction

In the early Chola period, the Hindu temples were the center around which all artistic and intellectual activity of the Hindu people was concentrated. They served as places for education with teachings directed to the attainment of a higher state of being, spiritually as well as intellectually. General education within the temple was of great importance and involved the recital and teaching of sacred texts. Music and dance also formed part of the daily rituals of the temple.

"From the Hindu point of view, the lives of human beings are merely stages in the progression towards ultimate moksha (liberation) from an illusory world"<sup>37</sup>. The temple is a place of transit where man may progress from the world of maya (illusion) to knowledge and truth. The purpose of the Hindu temple is to provide a link between God and man. "It is the place for the meeting and marriage of heaven<sup>38</sup> and earth<sup>39</sup>, where the whole world is present in terms of measure, and is accessible to man"<sup>40</sup>.

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<sup>37</sup> Michell, p. 49.

<sup>38</sup> Heaven, pure, unmanifest spirit space symbolized by the circle (p. 24).

<sup>39</sup> Earth, manifest and comprehensible world symbolized by the square (p. 24).

<sup>40</sup> Kramrisch, p. 7. Stella Kramrisch is a highly

## ii. Elements

The temple where the god makes himself visible is conveyed by the very terms used to designate a temple (see fig. 4.2a) : the vimana<sup>41</sup> or the prasada, seat of god, devagriham (a house of god) or devalaya (a residence of god). The prasada<sup>42</sup>, square in form, is the shell of the sanctuary, the garbhagriha<sup>43</sup>. The garbhagriha is a small dark chamber<sup>44</sup>, square or circular in plan. It is not only the house of the Germ or Embryo of the temple, it refers to man who comes to the Center and attains the light of consciousness in its darkness. The living presence of the principle of life, the jiva (individual soul), is symbolized by the image or lingam placed in the center as a concrete form of Shiva (the Divine) in the sanctuary. The temple is approached through a pillared

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respected authority on the subject of Hindu art and architecture.

<sup>41</sup> Vimana : well measured.

<sup>42</sup> Kramrisch, p. 136. Prasada: "The word denotes a settling down and a seat made of that which has settled down and acquired concrete form, the form of a dwelling, a residence, the seat of God".

<sup>43</sup> *ibid.*, p. 163. Garbhagriha comes from garbha means womb and griha means house. Garbhagriha is the womb of the higher Self. "The space is for the purpose of ultimate realization of the Supreme principle which is infinite and beyond all limits".

<sup>44</sup> *ibid.*, p. 164. "In the beginning the universe existed in the shape of darkness. The darkness in the garbhagriha is a necessary condition for the transformation which is wrought in the devotee. In darkness his change is effected, and a new life is attained".

hall, the mandapa<sup>45</sup>, where devotees gather at the time of worship. The mandapa is connected to the garbhagriha by a small transitional space, the antarala<sup>46</sup> which acts as a vestibule.

1. Platform
2. Prasada
3. Garbhagriha
4. Lingam
5. Antarala
6. Mandapa
7. Entrance

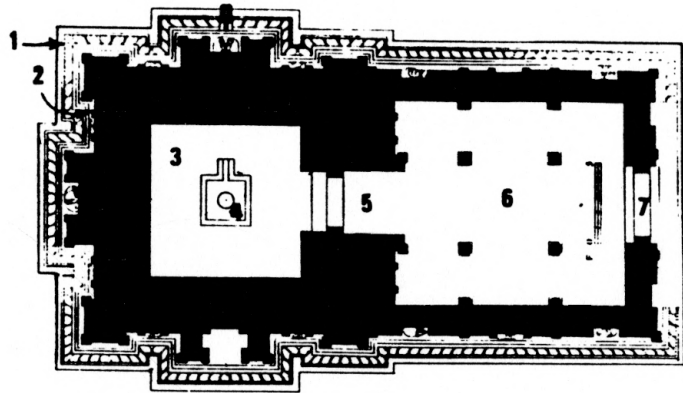


fig. 4.2a Typical Plan

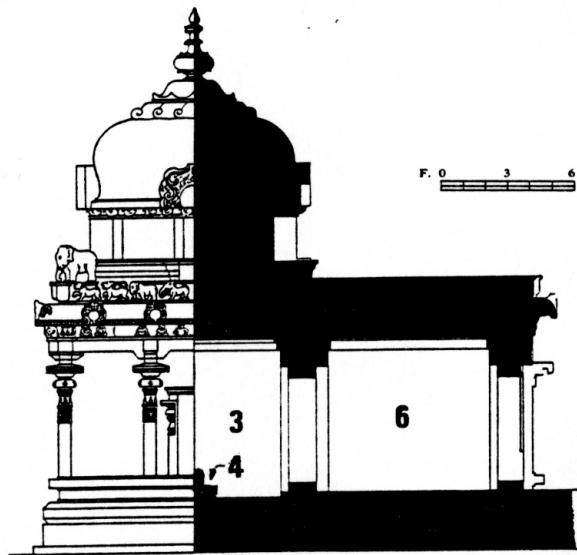


fig. 4.2b Typical section

<sup>45</sup> Mandapa come from mandap which means hall.

<sup>46</sup> Antarala come from antar (inner) and ala (chamber).

### iii. Theory and Ritual of the Temple

#### a. Theory

The Hindu temple is built on the principle of the Vastupurusha Mandala. The mandala<sup>47</sup> is a metaphysical plan which determines the physical form of the temple. The form of the Vastupurusha Mandala is a square (see fig. 4.3b). The Vastupurusha Mandala consists of three parts, Vastu, Purusha and Mandala, which are as follows:

"Vastu is the extent of Existence in its ordered state and is beheld in the likeness of the Purusha"<sup>48</sup>. Purusha is the primordial man, the seed image of Brahma, the supreme creator himself, and is analogous to the cosmic man. The plan of the building is in the likeness of the Purusha, or of the totality of manifestation. This primordial man of the Vedas is the creator of the world: "From his speech were born the divinities- earth and fire; from his breath- space and air; and from his eyes- heaven and the sun; from his ears- the quarters and the moon; from his mind- the waters"<sup>49</sup>.

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<sup>47</sup> Ancient geometry begins with Unity (circle). Mandala is the division of the unity circle into the comprehensive forms of square, hexagon, octagon etc. The square mandala is a closed polygon symbolical of all cyclical time, the day, the month, the year, the wider cycles marked by the recurrence of eclipses. For further reference read The Hindu Temple by Stella Kramrisch, pp. 29-39.

<sup>48</sup> *ibid.*, p. 21.

<sup>49</sup> *ibid.*, p. 68.

Mandala represents an energy field. And as in the case of the black holes of outer space, at the dead center of the vortex is the Nothing which is Everything. It is both shunya (zero), the absolute void, and bindu (point), the world seed and the source of all energy. The word mandala denotes any closed polygon. A mandala can be converted into a triangle, hexagon, octagon, and circle of equal area.

In ancient India, the mandala was used as the generating order for both sacred and secular buildings<sup>50</sup>. Each mandala is a perfect square, subdivided into identical squares. This subdivision creates a series of squares having side lengths as 1, 2, 3, 4, 5.....up to 32<sup>51</sup> units (see fig. 4.3a). The series of mandalas (squares) corresponds to the geometrical method of gnomonic expansion, a method known to the Greeks. "A gnomon is any figure which, when added to an original figure, leaves the resultant figure similar to the original"<sup>52</sup>.

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<sup>50</sup> Kramrisch, p. 47.

<sup>51</sup> Each of the 32 types of mandala has its own significance. The complete series is not acknowledged everywhere. The 32 mandalas correspond to the 32 asanas (positions) of Yoga practice. For further references read Kramrisch, 1962 pp. 58-59.

<sup>52</sup> Lawlor, p. 65.



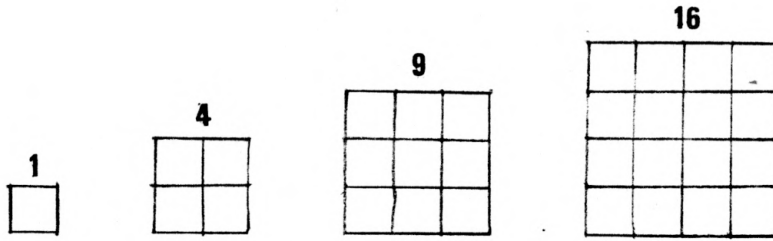


fig. 4.3a

The most sacred mandala is the plan of 64 squares<sup>53</sup> and is used for the construction of shrines. The order of the celestial world as established on earth is illustrated by the yantra of 64 squares. "The mandala of 8x8 squares forms the basis on which rests the temple in which the universe has its image, and man his place of transformation"<sup>54</sup>. In the mandala of 64 squares, 8 directions of space are held by 8 Vastupurushas<sup>55</sup>, 8 Suns<sup>56</sup>, 8 Planets<sup>57</sup> and 8 Nakshatras<sup>58</sup>.

This diagram of the Vastupurusha Mandala (see fig. 4.3b) is

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<sup>53</sup> Kramrisch, p. 46.

<sup>54</sup> *ibid.*, p. 50.

<sup>55</sup> *ibid.*, p. 30. Eight Vastupurushas are, the 8 divinities situated at the 8 regents of space, Wilderness, Flag, Crow or Smoke, Lion, Dog, Bull, Monkey, and Elephant.

<sup>56</sup> Eight Suns : During the 8 quarters of the day, from sunrise to sunrise, the sun enters one by one the 8 quarters.

<sup>57</sup> *ibid.*, p. 38. Eight planets of the Hindu system are the Sun, the Moon, Rahu- the Demon of Eclipse, Mars Mercury, Jupiter, Venus and Saturn.

<sup>58</sup> *ibid.*, p. 38. Eight Nakshatras (the constellations) are Alesa, Kritika, Bharani, Magha, Dhamistha, Rohini, Phalguni, and Sravana.

the symbol of the macrocosm. The architectural edifice is made after this mandala. The mandala is the example of Man in a sitting posture with his head in one cardinal direction and his feet in the other. The navel is the center of the square in which the figure of man is drawn. The four centermost squares belong to Brahma, the Supreme Creator. A profound significance is attached to these central four squares of the mandala. It is in this place where the worshipper may experience transformation as he comes into a direct contact with the cosmic order. This center is materialized in the temple sanctuary by the lingam, a stone emblem which is composed of a short rounded cylindrical pillar with rounded top to form of an erect phallus (symbolizing Shiva, the male principle) which is put on a round pedestal (symbolizing Shakti, the female principle).

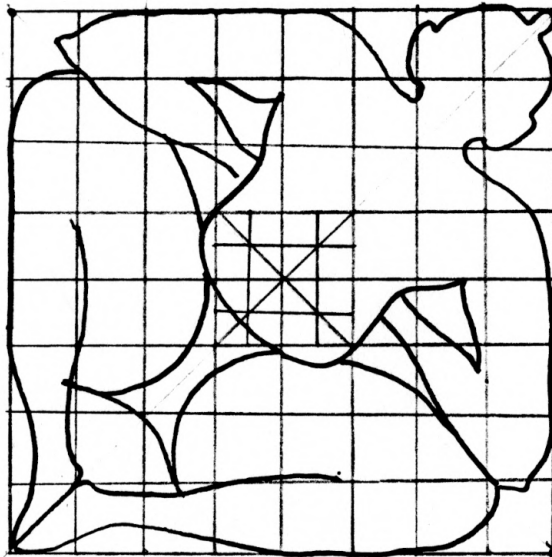


fig. 4.3b

## **b. Rituals of Temple Worship<sup>59</sup>**

Devapuja, the worship of the God (deva), forms the focal point of the religious activities enacted in the Hindu temple. The main purpose of the performer of the ritual is to achieve a unity of the Self and the Divine which leads him to ultimate liberation. A typical ceremony for an ordinary day consists of four celebrations which take place at sunrise, noon, sunset and midnight. The priest who wishes to perform the rituals prepares himself for the acts of purification necessary to go through the transformation in order to be able to identify himself with the Divine. The ceremony begins with the symbolic opening of the door of the main sanctuary in which the image of the Divine is housed. The sanctuary is then entered with sounding bells and the clasping of hands in order to drive away evil spirits and to attract the attention of the Divine. Then various mantras (verbal formulae), bijas (sacred syllables) and symbolic hand gestures are performed to concentrate the power of the Divine. The Divine presence is comforted with the rituals of the bathing and dressing of the sacred image and the offerings of refreshments. The image is then consecrated with oils, camphor and sandal wood, and entertained with moving flames (arati). Several pradakshinas (circumambulations in clockwise direction) are executed around the image or the temple itself. Finally the sanctuary door is closed for the Divine to sleep. The same process is repeated

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<sup>59</sup> Michell, p. 65.

at the other times of the day.

Movement of the worshipper and priest which takes place during the rituals within the temple is of great importance. The passage through the doorways of the sanctuary is symbolically connected with idea of the transition from the temporal (level of profane existence) to the eternal (level of profound realities). The movement inward towards the center of the sanctuary defines the orientation of the temple which is usually along an east-west axis. Symbolically, one proceeds from the East (Sunrise, the beginning) to the West (the darkness) where the dark sanctuary is located. The ritual of circumambulation is "a rite constituting a bodily participation in movements and prayer"<sup>60</sup>. Sometimes this ritual movement is translated into architectural elements in the form of ambulatory passageways. The image of the Divine placed in the center of the sanctuary functions as the focus of the other dynamics which are realized through a process of symbolic association. The sacredness of the image expresses itself as a force that radiates its energy outward from the center of the sanctuary in four cardinal directions along which the secondary images of the Divine are positioned within the sanctuary.

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<sup>60</sup> Michell, p. 66.

#### iv. Geometric Analysis of the Temple

The Hindu temples built in the Chola period (800 A.D. to 900 A.D.) are selected for the purpose of this analysis. The analysis is limited to those temple plans where the most information is contained. Also, the three dimensional form of the temple is the manifestation of all theories that underlie the plan. The second reason is to limit the scope of study. The drawings needed for the geometric analysis of the temple plans are copied and traced directly from the book : Encyclopedia of Indian Temple Architecture<sup>61</sup> by The American Institute of Indian Studies, edited by Michael W. Meister, 1983.

The theoretical base for the method of geometrical analysis comes from that of Tons Brunes and his book The Secrets of Ancient Geometry, (vol.I). He has developed a few geometric constructions which he uses as a tool (or template) for the geometric analysis. The following geometric constructions are developed from the geometry of chess (see chapter III) that will be used as a tool for the analysis of the temple plans.

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<sup>61</sup> This book is a major work done on the Temples of South India in association with the Archeological Survey of India.

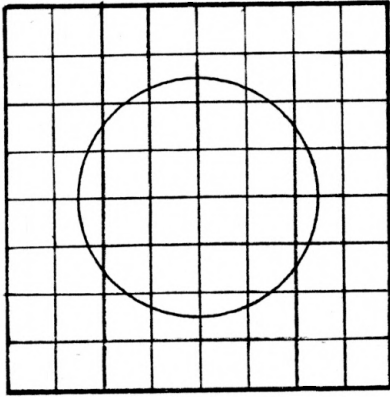


fig. 2.3.avi

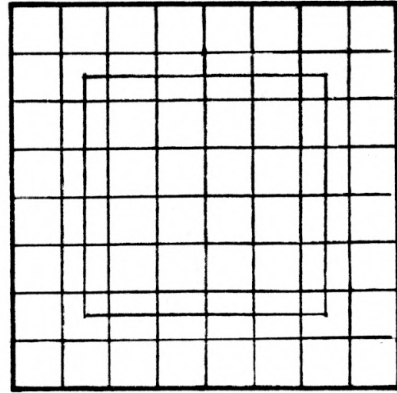


fig. 2.3.bv

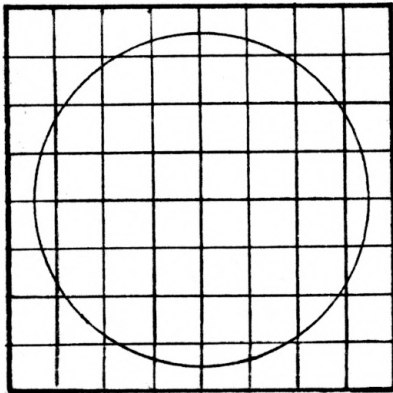


fig. 2.3.cv

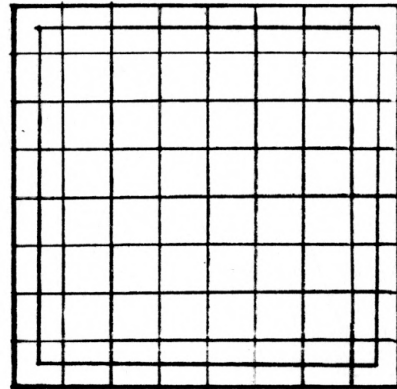


fig. 2.3.dii

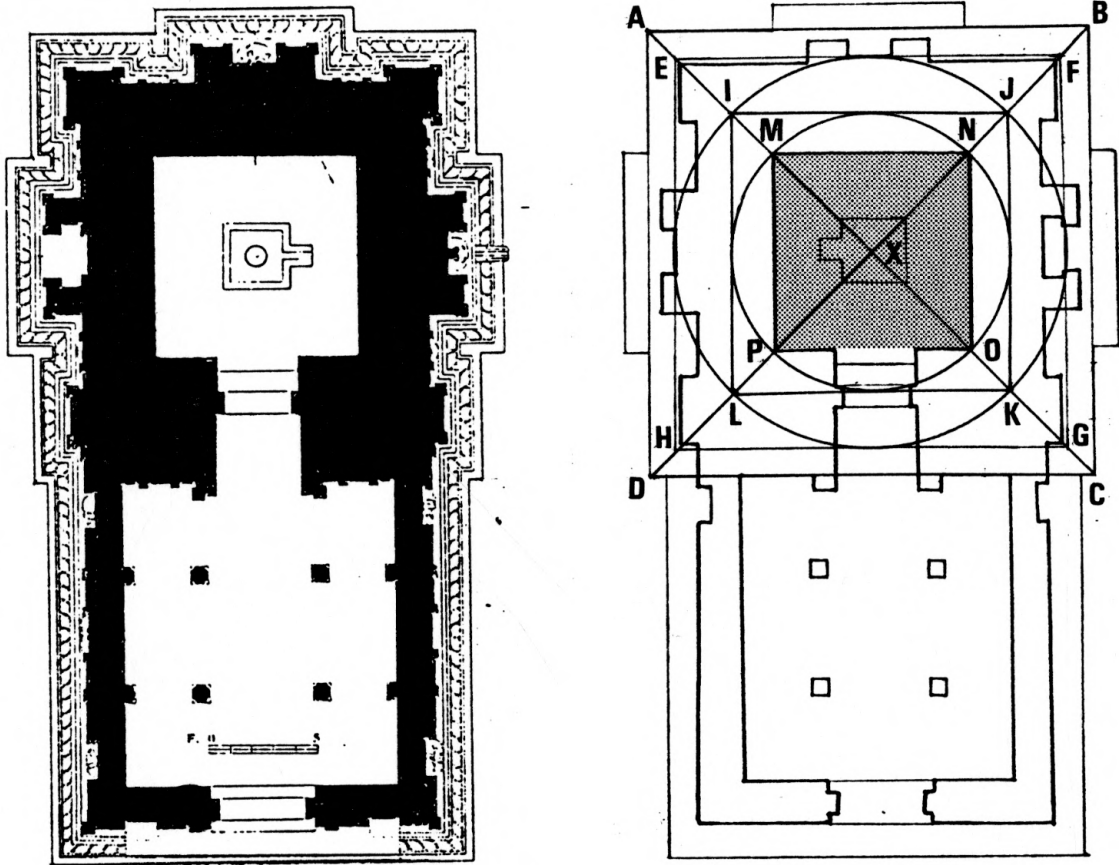
Every effort has been made to check for accuracy and consistency in the analysis of these plans. The following pages describe the geometric analysis of one temple plan<sup>62</sup>.

The analysis will show:

1. The method of locating the square of the garbhagriha
2. The method of determining the width of the antarala
3. The method of determining the size of the lingam

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<sup>62</sup> Refer to Appendix B for the description of the geometric analysis of the remaining Temple plans.



**fig.4.4a** Plan : Nagesvarasvami Temple, Kumbhakonam (Adapted from Encyclopedia of Indian Temple Architecture, Philadelphia : University of Pennsylvania Press, 1983. p. 160).

**A. Method of locating the garbhagriha**

1. The width of the temple base (platform) is taken as the width of chessboard.
2. Draw exterior square ABCD as shown in figure.
3. Insert diagonal AC and BD. The point of intersection, X,

determines the ritual center of the sanctuary. The point above which Shiva's symbol, the lingam, is erected.

4. Draw a square by connecting points E,F,G and H (refer to the diagram constructed by the Castle movement).
5. Insert circle tangent of square EFGH. (the Queen movement).
6. Inscribe a square by connecting points I,J,K and L. (the Bishop movement).
7. Insert circle tangent of square IJKL. (the Golden circle).
8. Join the point of intersection at M, N, O and P to locate the square of the garbhagriha.



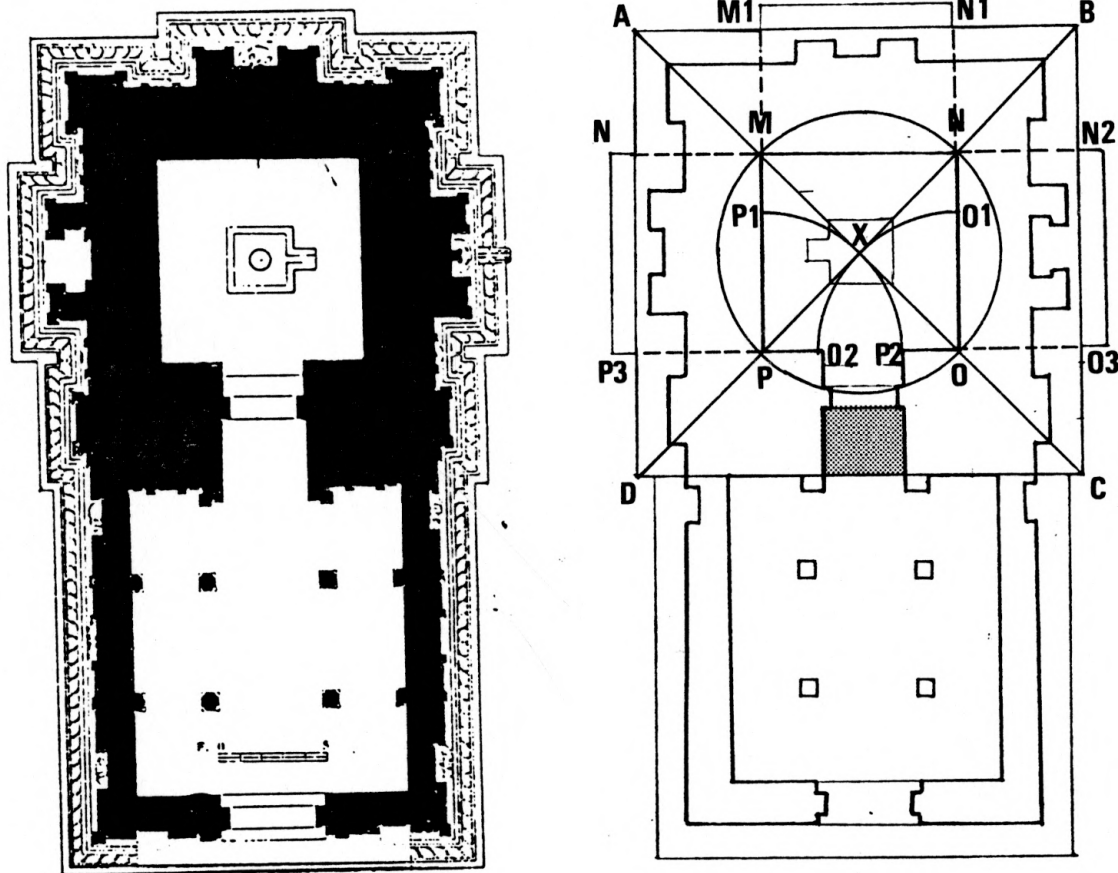


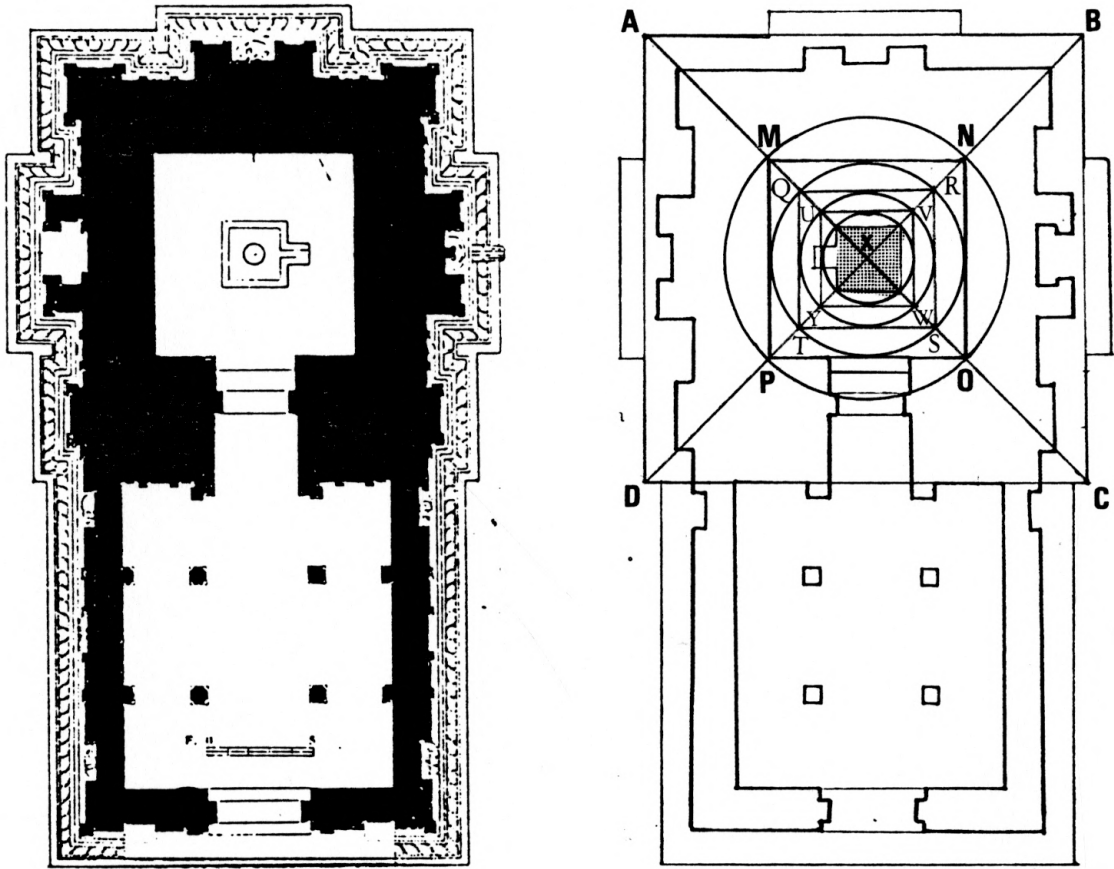
Fig.4.4b

**B. Method of determining the width of the antarala**

1. With point P as center and radius = PX (the radius of the Golden Circle) draw arc P1, P2. (from fig. 4.4a).
2. Repeat the step with point O as center and radius = OX Draw arc O1, O2. This geometric construction was named the "Sacred Cut" by Brunel because it combines the circle with the square. Brunel connects the sacred cut geometry to references in Plato's Timaeus as well as to the work of

Pythagoras and other Greek philosophers.

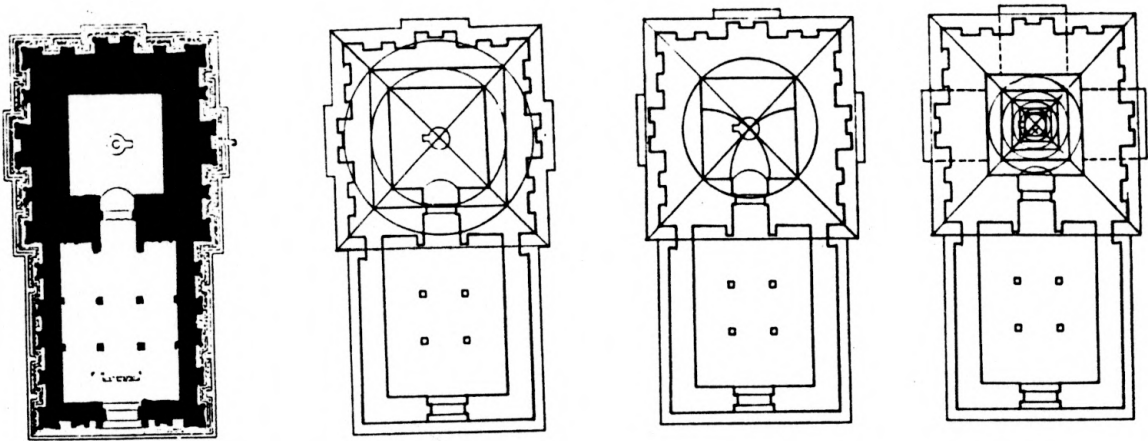
3. The distance between points O2 and P2 determines the width of the antarala.
4. Extend points M to M1 and M2, N to N1 and N2, O to O3, P to P3. The distance between M1 and N1, N2 and O3, M2 and P3 marks the width of the offsets.



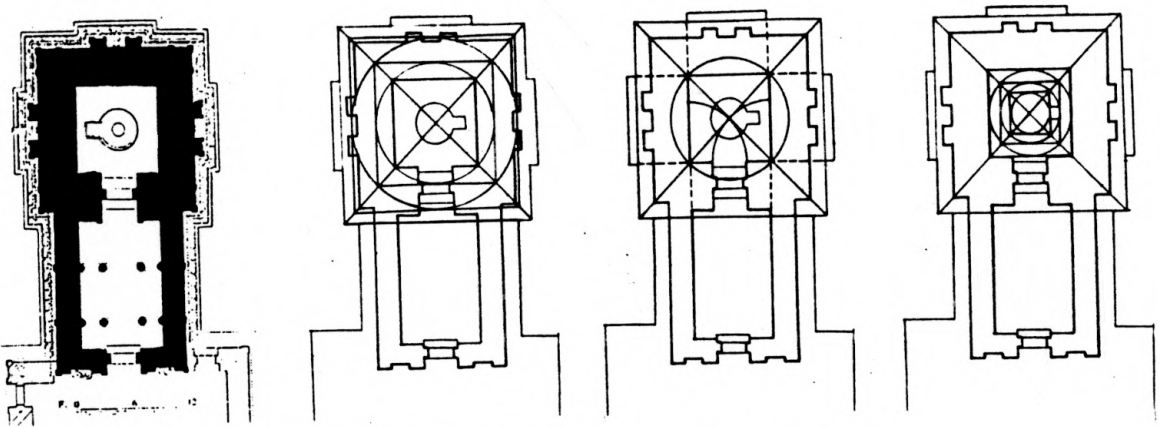
**Fig.4.4c**

**C. Method of determining the size of the lingam**

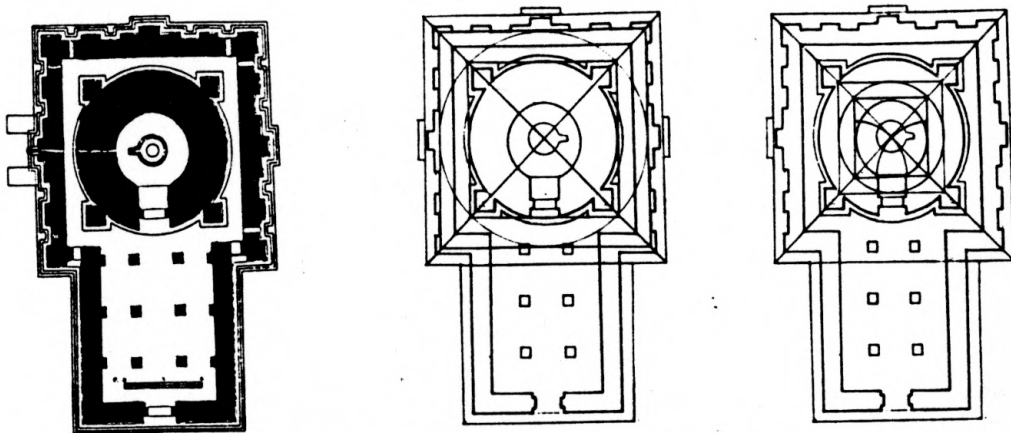
1. Inscribe circle tangent to square MNOP.
2. Insert square QRST to circle drawn in step 1.
3. Inscribe circle tangent to square QRST.
4. Insert Square UVWY to circle drawn in step 3.
5. Inscribe circle tangent of square UVWY.
6. Insert square to circle drawn in step 5 to determine the size of the lingam.



**Fig. 4.4d Analysis of Brahmapurisvara Temple**



**Fig. 4.4e Analysis of Agastisvara Temple**



**Fig. 4.4f Analysis of Vijayalya- Colisvara Temple**

## v. Implicit Geometry and its Meaning

As can be seen from the preceding analysis a consistent pattern of geometric constructions regulates the planning of the temples built in the early Chola period. The geometry implicit in the design of these temples possesses a system of order which has a direct geometric congruence with that of the game of chess. Additionally, both are based on the circle and the square (see fig. 4.5a).

The preceding geometric analysis provides sufficient evidence of its deliberate use by the architects of the Hindu temples to determine the size, position and proportions of many formal elements in the composition. The following figure shows the geometrical construction on which the design of ground plans of the temples are based.

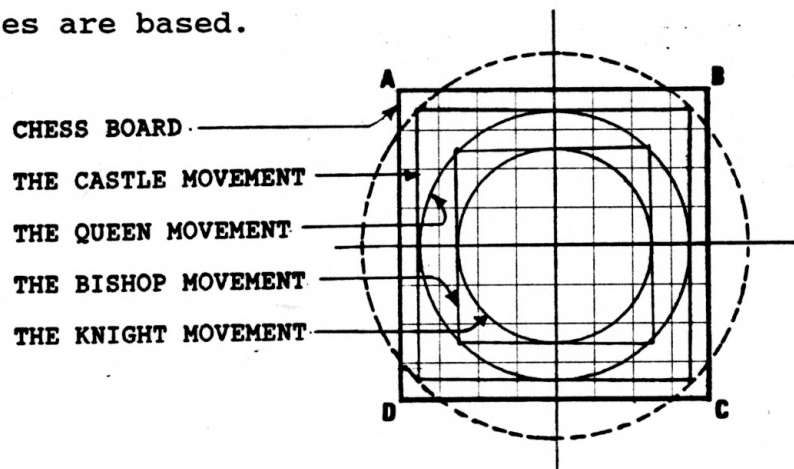
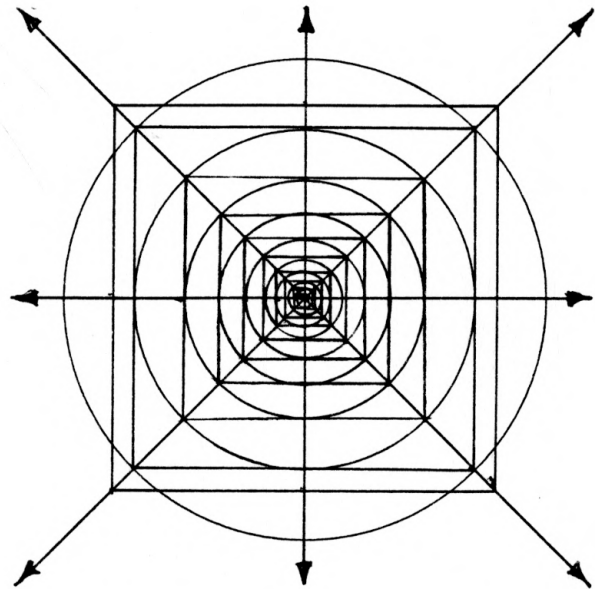


fig. 4.5a

The diagram shows the geometric relationship between the square and the circle. It expresses the fundamental truth about the square which presupposes the circle and also results

from it<sup>63</sup>. The relationship of the second largest square to the largest square is expressed by the "parent circle" of the second largest square. The perimeter of this parent circle is very nearly equal to that of the largest square. As seen in earlier chapter (p. 25), the practice of constructing the square and the circle of nearly equal perimeters was known as "the squaring of the circle". This was "a means to express the infinite (the circle) by relating it to the known (the finite square)" and implies unity between the material world and the spiritual life.



**fig. 4.5b**

Metaphysically the pattern can be understood as a succession of increments of growth in the archetypal form of circles and squares in which the center or "nucleus" is a source of expanding energy from which the invisible lines of force radiate outwards in concentric circuits. The concentric lines of the diagram define its volume and create a rhythmic unity.

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<sup>63</sup> Kramrisch, p. 22.

The circle and curve belong to life in its growth and movement and the square indicates the mark or order, of finality to the expanding life<sup>64</sup>. This center, as a source of radiating energy, that generates all form, is analogous to the lingam situated in the center of the temple sanctuary. It represents "the unity of the static (male, Shiva) and the kinetic (female, Shakti) cosmic principles, which expand to create the infinite universe of matter and spirit"<sup>65</sup>.

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<sup>64</sup> Kramrisch, p. 22.

<sup>65</sup> Khanna, Madhu. Yantra, The Tantric Symbol of Cosmic Unity, London : Thames and Hudson Ltd., 1979. p. 31.

## V. COMPARISON BETWEEN CHESS AND THE HINDU TEMPLE

### i. Forms of Art

It would be an offensively narrow idea to consider the historical use of chess as merely a game. It was a technique, a science, but more precisely it was and still is a form of art. "Chess is an "artificial" creation like that of music, art and literature. It is this opportunity for imaginative expression which links chess with the world of art"<sup>66</sup>. According to Cockburn chess is :

primeval, yet ever new, mechanical in operation (since it requires movement), yet effective only through the imagination; bounded in geometric space, though boundless in its combinations; ever developing, yet sterile; thought that leads to nothing; mathematics that produces no result; art without works (imaginary creations); architecture without substance<sup>67</sup>.

Marcel Duchamp says chess is :

the ideal work of art. It is the imagining of the movement or of the gesture that makes the beauty. A game of chess is a visual plastic thing, and if it isn't geometric in the static sense of the word, it is a mechanical reality<sup>68</sup>.

Duchamp says all chess players are artists who experience a mixture of two aesthetic pleasures : "the abstract imagery

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<sup>66</sup> Fine, pp. 18-19.

<sup>67</sup> Cockburn, Alexander. The Idle Passion, Chess and The Dance of Death, New York : Village Voice / Simon and Schuster, 1974. p. 76.

<sup>68</sup> *ibid.*, p. 189.



akin to the poetic idea of writing and the sensuous pleasure of that ideographic execution on the chessboard"<sup>69</sup>.

The four aspects of intelligence : memory, visualization, organization and imagination that dominate the game of chess (p. 15), I Believe, can also be considered as the basic, essential components that form the basis for experiencing and creating the meaningful form of art.

Memory is the necessary condition for the existence of arts<sup>70</sup> and for playing chess (p. 15). The memory of the past (experiences), present (existence) and future (expectations) forms the basis of the "language" of art<sup>71</sup>. Memory includes the idea of both "remembrance of the past" as well as the "reminder" to create the future. In chess, the player has to remember hundreds of previous moves and positions. Imagination is the artists' creative "power" with which he creates beautiful images in the mind. This act of imagining provides continuity from the past into the future and

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<sup>69</sup> Cockburn, pp. 189-190.

<sup>70</sup> McClung, William. The Architecture of Paradise : Survivals of Eden & Jerusalem, Berkeley : University of California Press, 1983. p. 148.

<sup>71</sup> Author. Memory, I believe, is "the source" in the process of creation (evolution) of "form" since one can not create something which one has not seen or experienced its "parent form" in the past. Memory is the means by which one brings meaning to the individual act of creation.

addresses them at the same time. Imagination is also the chess players' power with which the player creates mental images to maintain continuity from previous moves to future moves of the game. The artist visualizes and organizes the various elements of form to develop a "unified whole" with various rules of composition such as harmony, rhythm, repetition, variety, contrast, balance, movement, proportion, etc. For the player, visualization is an essential aspect. During the play, the player has to visualize his future moves and their pros and cons since he is not allowed to move the pieces except for an actual move. Organization, one aspect of the process of reasoning, is essential for the player to organize and unify his attack in such a way that the pieces acquire maximum effectiveness.

Chess playing is an artistic activity which creates beautiful games (situations) with just the head and brains. Chess is a unique form of art, a mechanical sculpture which is based on movement. As was stated in Chapter II, the sacred art of India is based on the theme of movement, which is also reflected in the form of the temple and the figures of sculpture and painting. The game of chess and the Hindu temple are two different examples of artistic expression of sacred art of India that have static as well as dynamic qualities.

## ii. Congruent Geometrical Structure

The structure of the game of chess shows some remarkable parallels with that of the Hindu temples built about 900 A.D. in the early Chola period. The following observations are based on the geometric analysis done in chapter IV.

a. The game of chess is played on a square board divided into 64 equal squares. The "game of temple architecture" is also "played" on the plane (platform), the mandala of 64 squares on which the temple is built.

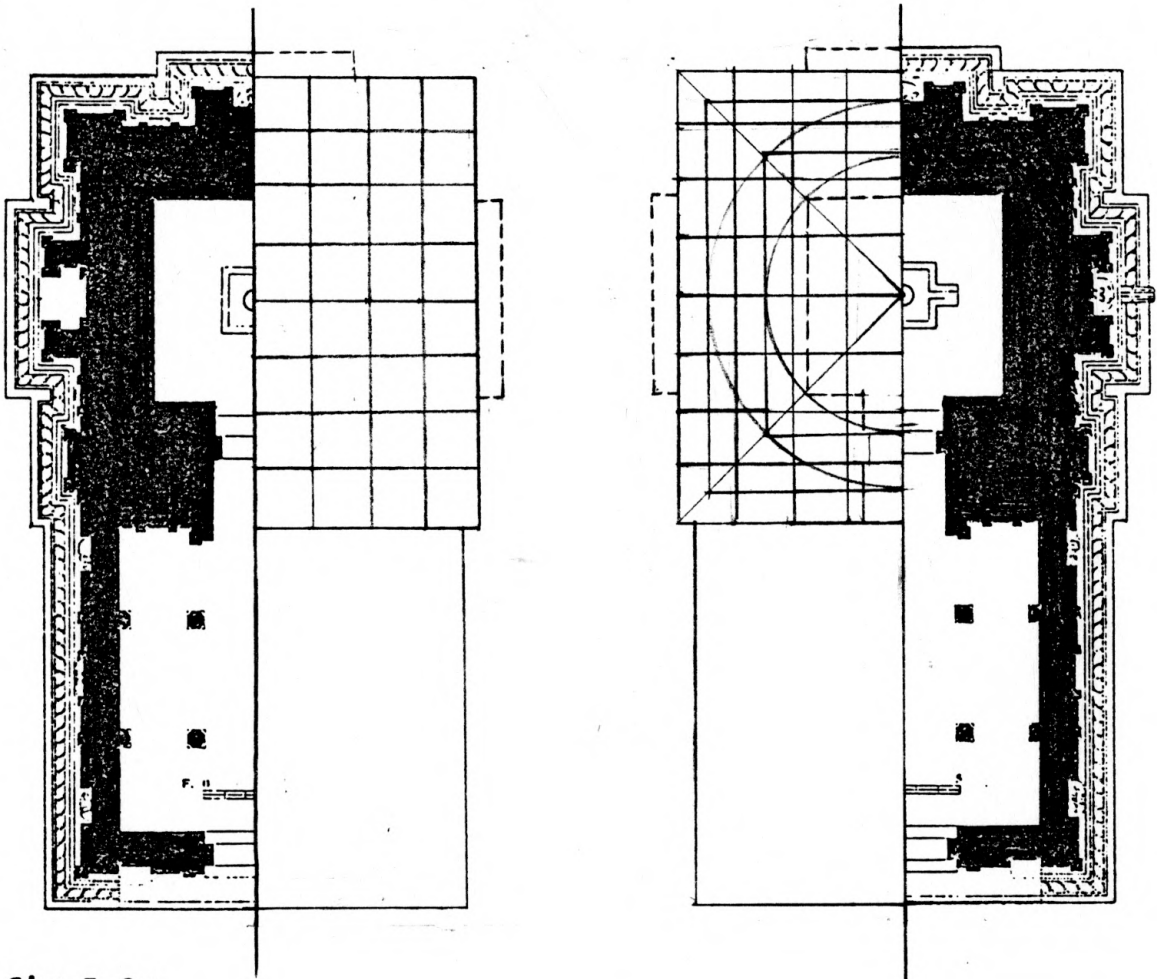


fig. 5.2a

The square of 64 (8X8) of the Vastupurusha Mandala is with reference to man's inner world, the microcosm, and with reference to the outer world (the universe), the macrocosm. In man's inner world the 8 squares are those of 8 forms of consciousness<sup>72</sup> and 8 means necessary to control the inclinations of the inner faculties<sup>73</sup>. In the universe the 8 squares are those of the 8 suns presided over by the 8 planets (see p. 35) from which "this universe is brought into appearance or existence, ordered in its total extent and consistent in its order"<sup>74</sup>. Numerically, the number 64 can be represented by 1 (6+4=10, 1+0=1). The number One represents the principle of absolute unity of the static and the kinetic cosmic principles. It has often been called the "pointal number" or the bindu, the world seed and "source" of all energy<sup>75</sup>.

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<sup>72</sup> 8 forms of consciousness : Manovijnana, the intellectual consciousness; Vijnana, the thinking faculty of the individual, in itself and by itself; Alayavijnana, the store-consciousness which gathers together and retains both individual and collective experiences; and the five sensory consciousness - corresponds to the impressions which, through our senses, the external world communicates to us.

<sup>73</sup> Kramrisch, p. 47. 8 means : Yama, restriction; Niyama, observances; Asana, sitting posture; Pranayama, breath control; Pratjahara, emptying the mind from external objects; Dharana, its subsequent concentration; Dhyana, keeping it concentrated; and Samadhi, merging and dissolving it in the object of its concentration.

<sup>74</sup> *ibid.*, p. 48.

<sup>75</sup> Lawlor, p. 12.

b. The visual domain in the game of chess is the center (the Golden Circle).

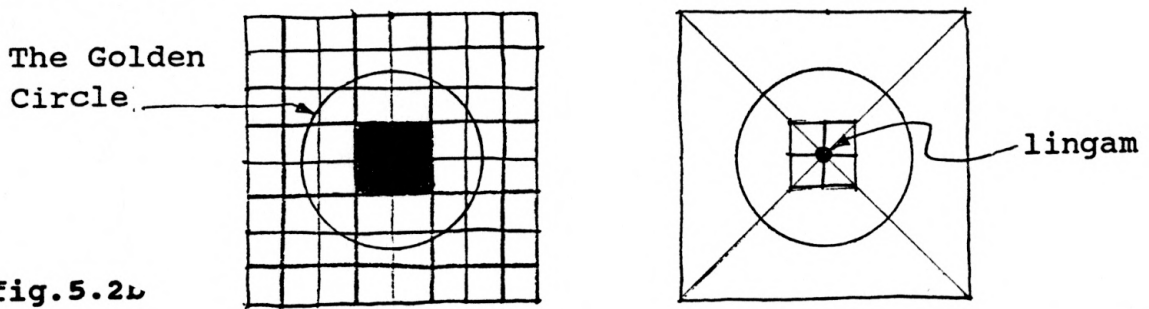


fig.5.2b

The player mobilizes his pieces in such a way that the area of influence of these pieces is the centermost squares of the board. Thus, the player gets an advantage over the other player. In the temple mandala of 64 squares, the central four squares are dedicated to the Supreme Creator, Brahma, on which the lingam is situated. The worship of the lingam forms the focal point of the religious activities enacted in the temple.

c. The geometry of both the temple and chess is based on the square and the circle. The Golden Circle constructed from the geometry of chess determines the size, position and proportion of garbhagriha which is the sanctuary and other formal elements of the ground plan of the temple (see pp. 41-45).

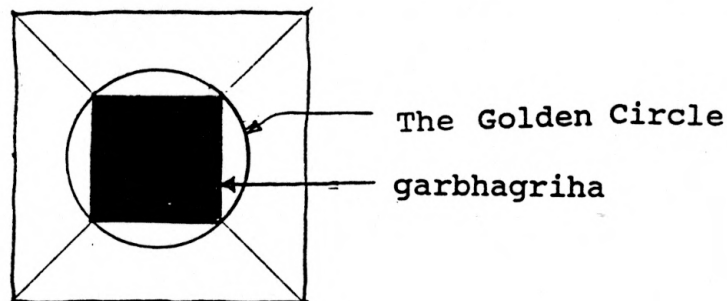


fig.5.2c

### iii. Common Meanings<sup>76</sup>

#### a. Chess

Man is mind<sup>77</sup>. Mind is the reason for what we see, smell, hear, touch and taste. In other words man does not exist without mind. The "game" of chess and life is a play of mind which makes man experience the visible (present) and the invisible (future). The game begins with an ordered state and a set of rules for playing it. Man, with his consciousness of duality and conflict, is the sole player of the game. The black and white pieces represent the two opposing sides of the game as well as the self-divided nature of the player, which creates the reason for the conflict between self and other acted out in the game of chess. The conflict of the opposites of self and other is the beginning of "war" (struggle for life). The particular field (chess board) of action is symbolic of the plane of manifest reality.

In the beginning, the nature of the game is "finite"<sup>78</sup>. The object of each player is to win the game. The game played

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<sup>76</sup> As understood by author.

<sup>77</sup> Man and Mind come from the same Sanskrit root "manas".

<sup>78</sup> Carse, James. Finite and Infinite Games, New York : The Free Press, 1986. p. 3. There are at least two kinds of "games". One is "finite" and the other is "infinite". Finite game is played for the purpose of winning and it must come to definite "end". An infinite game is played for the purpose of continuing play. It has no definite beginning or end.

from this point of view creates an experience of conflict and chaos. There are many permutations and combinations of "moves" by which the game can be played and there are many ways to lose. The sense of chaos created within the player is analogous to the chaos we experience during our lives when they are lived as a conflict of the opposites of pain and pleasure.

However, in order to "win" one has to transcend the limited point of view that keeps the player a prisoner of the board and the rules of the game. One has to transcend the egocentric point of view in which victory means the defeat of the other. Paradoxically, one can become a true player only when he or she (the separate self in conflict) no longer exists in conflict with the other, which can be done only by a progressively self-transcending act of detachment from fears, emotions, passions and attachments. When this state is achieved, the nature of the game has changed from "finite" to "infinite". The mature chess player gains this skill of self mastery through playing the game for the purpose of continuing play and emerges as a chess master as well as a master in the game of life.

There are a number of possibilities and strategies by which one can achieve the goal of mastering the game. One must develop an ability to imagine the invisible dynamic and

interactive geometry of the chessmen of both the black and the white sides. To become immersed in such an act of imagination is to enter into a contemplation. This contemplation can be understood as analogous to "Yantra meditation". A yantra is a geometric diagram symbolically representing the highest level of consciousness (absolute). By focussed contemplation on the yantra, the practitioner of yoga develops an ability to transcend his or her self in the state of union with the absolute (moksha). The yantra is a geometrical mandala that serves the process of self-transcending contemplation. It is possible to understand chess as a dynamic form of yantra contemplation in which the consciousness of the player becomes identified by imagination with the geometric fields implicit in the movement of the chess pieces.

During the course of playing the game you also come to realize that you must empathize with your opponent in order to anticipate his moves and counter them. In this way you begin to identify your self with your opponent and to expand your own sense of self to include both your own perspective as well as his point of view. Gradually you begin to see your opponent not as an enemy to be defeated but as one necessary polarity in the play of opposites of which you are a part. Then, you begin to realize that the pleasure of the game lies in the play between self and other. This pleasure found by playing the game can be understood as analogous to the ecstasy



of samadhi, the state of non-dual consciousness in which the separate and separative self, or ego, realizes its ultimate identity with Brahman, the Self or Consciousness itself. Such a lesson learned through chess could have served initiates in the Hindu temple as a form of teaching instruction about the nature of self-transcending spiritual practice, while simultaneously teaching them to aspire towards being an intellectually and psychologically balanced and mature individual.

#### **b. The Hindu Temple**

Life can be understood as a "game". Man, with his consciousness of duality, is the primary player of the game. The game of life begins in the world of everyday life in which the conflict of opposites (male / female, good / evil, black / white) is played out. The self-divided nature of the player is the reason for the conflict between self and other that is acted out in the game of life. Such a life is inevitably filled with struggle, conflict, seeking and suffering.

In the beginning, the nature of the game of life is "finite", just as it is in the case of chess. The object of the player is to "win" the game, to overcome the pain and suffering he experiences during everyday life. However, a life lived from this point of view creates an experience of conflict and chaos

in which the "player" is bound to lose. In the end, through death we lose everything and along the way no one escapes illness and suffering in all of its myriad forms.

In order to truly win the game of life, we have to cross the boundaries of the profane world which keeps us attached to fears, emotions, passions and other worldly desires. Like chess, the primary function of the temple is to provide the opportunity to experience another world. By entering the temple, it is possible to enter into a world of sacred space and time that is marked out from the chaos and conflicts of the profane world. The worshipper, (the brahmin priest) comes to the temple to join in the rituals and a spatial order where its architecture and rituals together help the worshipper to focus his attention on the image of God (lingam).

As in the case of chess, the moves of the worshipper (player) are concentrated on the center of the board; all the acts prescribed by the rituals of the temple worship are focused on lingam placed in the center of the sanctuary. The goal of the rituals of temple worship is to awaken a sense of identity with one's inner center (atman), which is not separate from God (Brahman). The rituals of sounding bells, chanting verbal formulae and sacred syllables, hand gestures, moving flames (arati), circumambulation....all are performed in order to

help the worshipper to realize his or her identity with the all-pervasive God. All the senses of the body and mind are "re-collected", gathered up and centered through a series of rituals (the "rules") of temple worship. The worshipper (the priest) can be viewed as analogous to a chess piece moving spatially on the field of the game of temple worship according to the geometrical order of the 8X8 mandala. Every move of the worshipper is focused on the Shiva lingam located in the center of the garbhagriha, which represents the ecstatic, bliss-filled and always fecund and creative union of Shiva (male principle) and Shakti (female principle).

In addition to rituals of devotional worship the practice of yogic techniques and meditation also formed a major part of the daily rituals of the temple. The focus of these practices is also upon centering. By means of this discipline of mental concentration the abstract center of the worshipper was brought together and focused on the center of the mandala of the temple, the place where God resides. This concentrated visualization allows the worshipper to be transformed by grace and to experience his inner identity with the single, immutable center, which is the center, or heart, of all apparently separate beings.

During the course of ritual worship, it is possible to forget the separate self and to become "ecstatic" i.e. to stand

outside of oneself. Then, gradually you begin to see that the opposites of life (self and other) are not eternally opposed but each is a necessary polarity (Shiva and Shakti) of a larger whole which constitutes the non-dual, creative source of cosmic nature and the world. The polarized "opposites" are not to be rejected or escaped from but are to be embraced as necessary to the "play" of life. The pleasure found by playing the game of life can be understood as analogous to the ecstasy of samadhi, the state of non-dual consciousness. When this state is achieved the nature of the game of life has changed from "finite" to "infinite". You begin to realize that the purpose of the game is to continue the play in which there are no winners or loser, only the lila, the pleasure of the game.

Rituals temple worship is a form of teaching instruction about self-transcendence : the aim is to identify one's self with a point (bindu, the invisible point of union of Shiva and Shakti) and to integrate and balance the expansion of this bindu into a totality, which is essentially a way towards inner awakening.

The symbols of Indian art, whether they are as monumental as the Hindu temple or as small as "the chess mandala" or a meditation yantra, echo the same fundamental truth and direct man's spiritual journey towards the goal of transformation and

self-transcendence. All the symbolic forms of the sacred culture of Hinduism stimulate the aspirant to identify and reveal his "inner center" which is identical with and not separate from the heart of every apparently separate thing in the universe.

## VI. C O N C L U S I O N S

As observed in the earlier chapters, the design of the Hindu temples built in the Chola period has a direct congruence with the design of the game of chess in terms of their geometries and their meanings. Both, chess and the temples are two manifestations of a commonly used geometric system of order and proportion. The system of geometry, which underlies them, appears so significant that it essentially encapsulates the very nature of the universe and at the same time links the world of the manifest and that of the unmanifest.

The 8X8 mandala of both chess and the Hindu temple contains the three basic geometric forms : the circle, the triangle and the square. Pennick refers to these fundamental forms as the basis from which all the diverse structures in the universe are composed. Each form possesses its own unique qualities and carries an esoteric symbolism which has remained the same since the dawn of humankind<sup>79</sup>. These "root" forms are considered "primordial" and they essentially incorporate the structure of the reality (truth) by which the universe is ordered and sustained. In ancient traditional societies these geometrical forms were held to be sacred mysteries of the highest order since they were explained as a "reflection of the innermost truths of the world being" and were kept secret

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<sup>79</sup> Pennick, p. 9.

from the eyes of the profane<sup>80</sup>.

The harmony contained in the system of sacred geometry was recognized as "the most cogent expression of a divine plan which underlies the world, a metaphysical pattern which determines the physical"<sup>81</sup>. This inner reality (transcendent of outer form) was throughout history the basis of religious buildings. The principles which underlie sacred geometry are fundamentally linked with the nature of the universe and linked with various mystical tenets based on the idea that "that which is in the lesser world (the microcosm) reflects that of the greater world or universe (the macrocosm)"<sup>82</sup>.

This idea of correspondences between macrocosm and microcosm is reflected in the design of the Hindu temple. As we have observed earlier, the design of the temple is based on a clear geometric system of order and proportion. Thus, "the universe is present in the Hindu temple in the form of proportions"<sup>83</sup>. The plan of the temple is regulated by the Vastupurusha mandala, a sacred geometric diagram which represents the structure of the universe (see p. 35). A symbolic connection is created by binding together the universe and its miniature

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<sup>80</sup> Pennick, p. 13.

<sup>81</sup> *ibid.*, p. 8.

<sup>82</sup> *ibid.*, p. 8.

<sup>83</sup> Lawlor, p. 92.

reconstruction, the temple, through the work of man. Thus it can be seen that the Hindu spirit is inclined to seek unity between the unmanifest (God) and the manifested universe, the material world.

The concept of unity is also accompanied in sacred architecture by an analogous symbolism of the fundamental square, the mandala. The mandala is always involves "the squaring of the circle" because the aim of squaring the circle is to represent the unity between the material world (the square) and spiritual life (the circle)<sup>84</sup>.

In ancient times, knowledge of geometry played a significant role in the cultural development of major ancient civilizations for many thousands of years<sup>85</sup>. The practice of geometry was an essential psychophysical technique of self development and a means to attain knowledge of both external and internal space and time<sup>86</sup>. In Hinduism, the Trinity of the first Gods, the Creators, is the manifestation of these basic geometrical forms, the square, the circle and the triangle<sup>87</sup>. The whole structure of Hindu society is based on

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<sup>84</sup> Cirlot, J. E. A Dictionary of Symbols, New York : Philosophical Library, Inc., 1962. p. 101, 293.

<sup>85</sup> Brunes, p. 9.

<sup>86</sup> Lawlor, pp. 14-15.

<sup>87</sup> Vedavyas, E. Hinduism in Space Age, Hyderabad : United Social Cultural and Education of India, 1987. pp. 11-115.



the square (the four Yugas, the four Vedas, the four Stages of life, the four Purposes of life, the four Classes (castes) of Hindu society, and even the four classes of architects)<sup>88</sup>.

"We must do what the Gods did in the beginning" says the Indian text, Satapatha Brahmana<sup>89</sup>. This Hindu adage summarizes all the theories underlying man's religious actions and intentions. God (the unmanifest) created man<sup>90</sup> (the manifest) from a desire to see himself and to adore himself. Man in his turn imitates "the paradigmatic gestures of the

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Brahma is the creator, Vishnu is the preserver and Shiva is the destroyer. Brahma has four identical faces looking at the four cardinal directions and represents the square. Vishnu is the space-time god, is represented by the circle. Shiva is the one with three eyes, the Triple god because he is connected with the Triple time : Future, Present and Past (represents the triangle).

<sup>88</sup> The four Yugas (aeon period of time) : Sat-yuga, Treta-yuga, Dwaper-yuga, and Kali-yuga.

The four Vedas (sacred texts) : Rig-veda, Sama-veda, Yojur-veda, and Atharva-veda.

The four Stages of life : Balyavastha (childhood), Kaumaryavastha (adolescence), Yauvanavastha (middle age), and Vanaprastha (recluse).

The four Purposes of life : Dharma (the discharge of duties and the responsibility of virtue), Artha (the acquisition of wealth for use), Kama (the enjoyment of the pleasures of life), and Moksha (freedom from a sense of want or desire).

The four Classes : Brahmin (priest), Kshatriya (warrior), Vaishya (business), and Kshudra (untouchable).

The four Classes of Architects : Sthapati (designing architect), Sulvagrahin (surveyor), Taksaka (sculptor), and Vardhakin (builder, plasterer and painter).

<sup>89</sup> Eliade, Mircea. The Sacred and The Profane, New York : Harcourt, Brace Jovanovich, Publishers, 1959. p. 98.

<sup>90</sup> Author. "Man exists only because God does, and vice versa".

Creator and repeats his action". Man defines himself as a "Creator", through his act of creation. He creates (the temple) for the Creator a dwelling place on a human scale, that characterizes and constitutes his own world (a microcosm) and the universe (a macrocosm). Man justifies his "action" by re-enacting Creation by which it is ordered and sustained. He justifies his "creation" by "geometrizing it" just as God "geometrized it" in the beginning.

# Appendix A

Map of South India showing the locations of the Hindu temples built in Chola period



## **Appendix B**

The following pages show the geometrical analysis of:

1. Brahmapurisvara Temple at Pullamangai, Chola period
2. Agastisvara Temple at Kilaiyur, Chola period
3. Vijayalya- Colisvara Temple, Narttamalai, Chola period
4. Shiva Temple, Pandrethan, Chola period

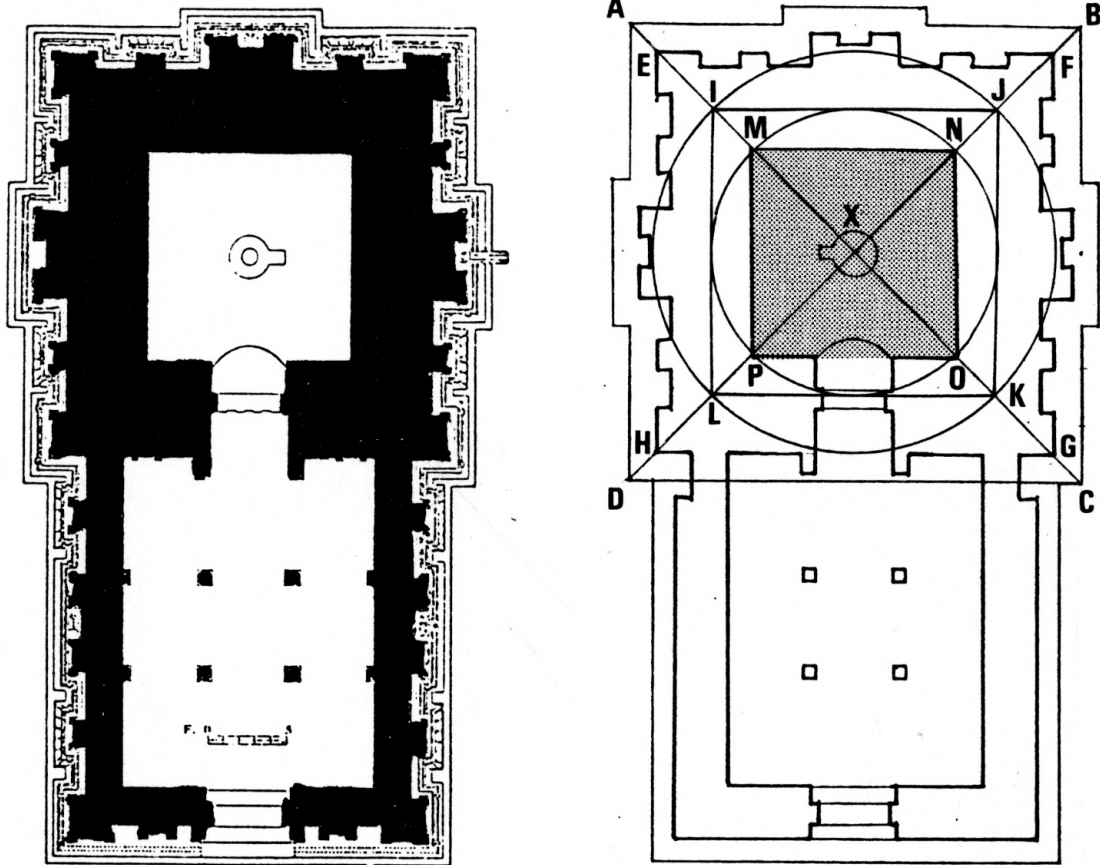


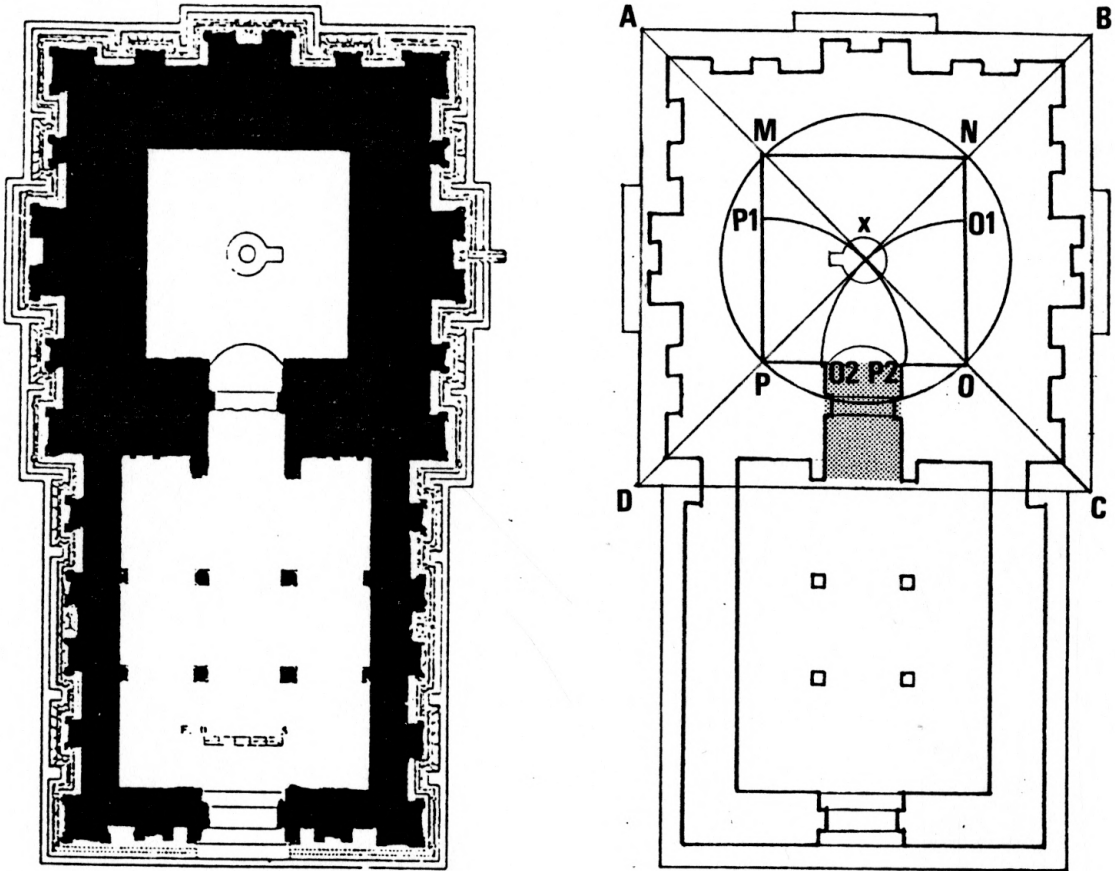
fig.B.1a Plan : Brahmapurisvara Temple, Pullamangai (Adapted from Encyclopedia of Indian Architecture, 1983 pg. 166).

**A. Method of locating the garbhagriha**

1. The width of the temple base (platform) is taken as the width of chessboard.
2. Draw exterior square ABCD as shown in figure.
3. Insert diagonal AC and BD. The point of intersection, X, determines the ritual center of the sanctuary. The point

above which Shiva's symbol, the lingam is erected.

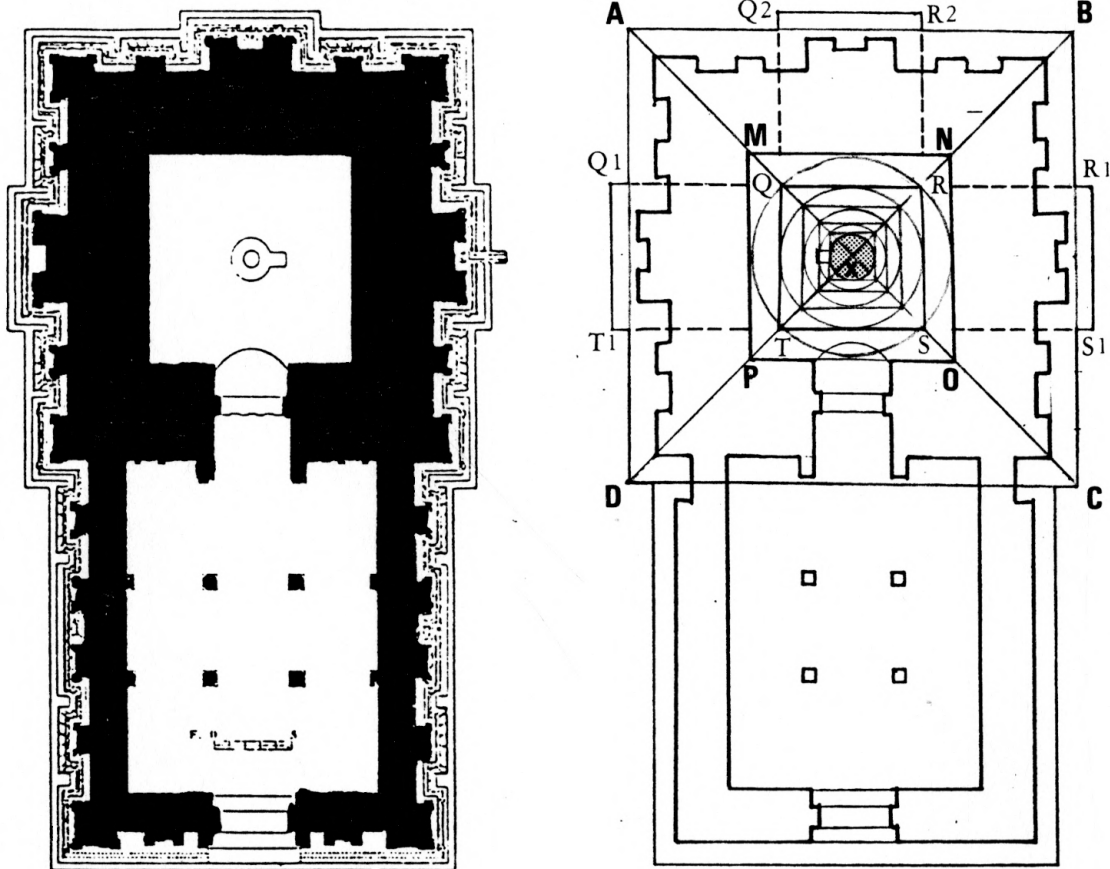
4. Draw a square by connecting points E,F,G and H (refer to the diagram constructed by the Castle movement).
5. Insert circle tangent of square EFGH. (the Queen movement).
6. Inscribe a square by connecting points I,J,K and L. (the Bishop movement).
7. Insert circle tangent of square IJKL. (the Golden circle).
8. Join the point of intersection at M, N, O and P to locate the square of the garbhagriha.



**Fig.B.1b**

**B. Method of determining the width of the antarala**

1. With point P as center and radius = PX (the radius of the Golden Circle) draw arc P1, P2. (from fig. C.1a).
2. Repeat the step with point O as center and radius = OX Draw arc O1, O2. (The sacred cut).
3. The distance between points O2 and P2 determines the width of the antarala.

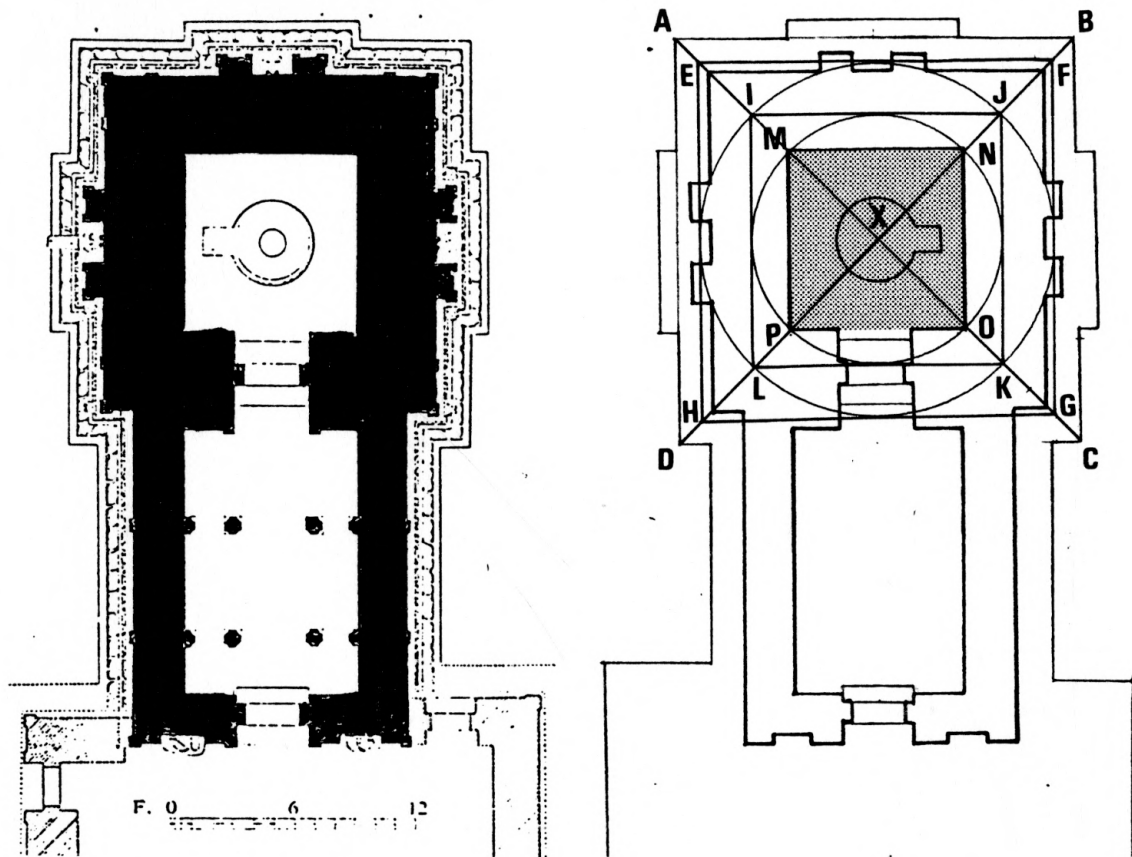


**Fig.B.1c**

**C. Method of determining the size of the lingam**

1. Inscribe circle tangent to square MNOP.
2. Insert square QRST at the point of intersection of the diagonals and the circle drawn in step 1.
3. Repeat step 1 and step 2 three times to get circle equal to the size of the lingam. Extend points Q to Q1 and Q2, R to R1 and R2, S to S1 and S2, T to T1 and T2. The distance between Q1 and T1, Q2 and R2, R1 & S1 marks the width of the offsets.





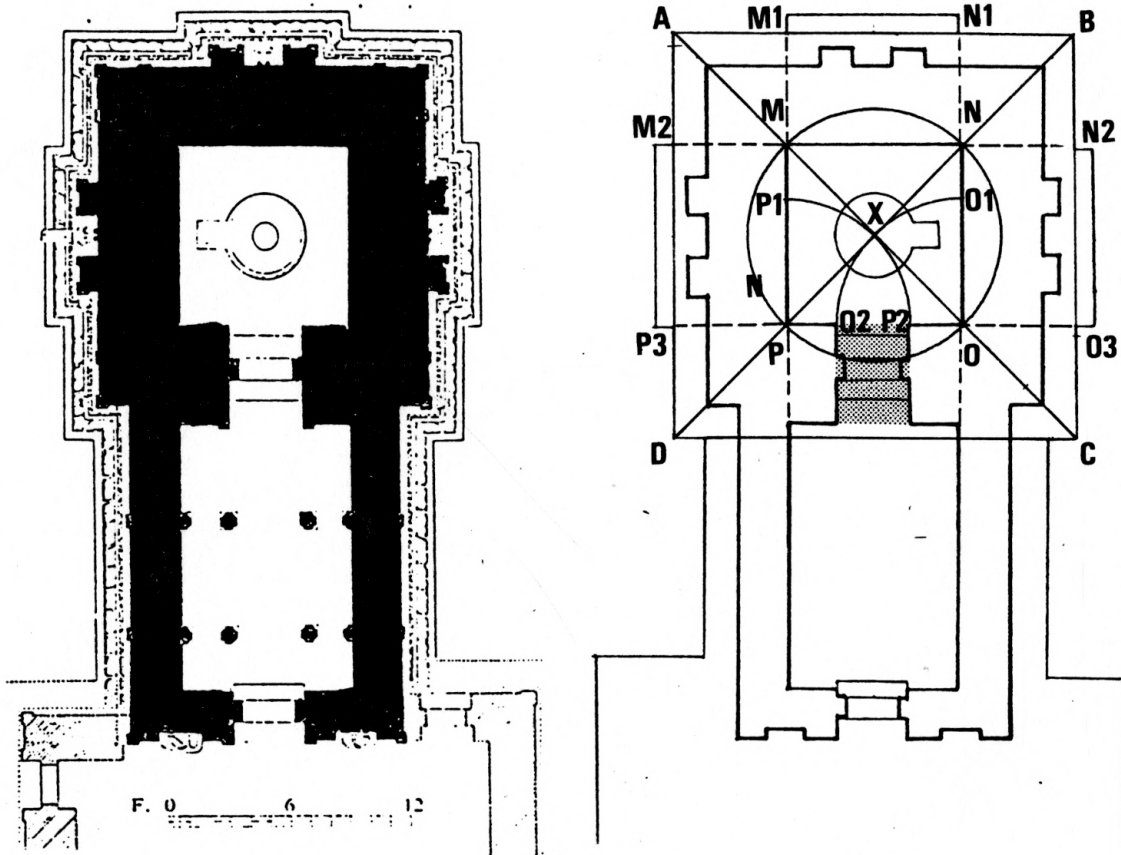
**fig.B.2a** Plan : Agastisvara Temple, Kilaiyur (Adapted from Encyclopedia of Indian Architecture, 1983 pg. 214).

**A. Method of locating the garbhagriha**

1. The width of the temple base (platform) is taken as the width of chessboard.
2. Draw exterior square ABCD as shown in figure.
3. Insert diagonal AC and BD. The point of intersection, X, determines the ritual center of the sanctuary. The point

above which Shiva's symbol, the lingam is erected.

4. Draw a square by connecting points E,F,G and H (refer to the diagram constructed by the Castle movement).
5. Insert circle tangent of square EFGH. (the Queen movement).
6. Inscribe a square by connecting points I,J,K and L. (the Bishop movement).
7. Insert circle tangent of square IJKL. (the Golden circle).
8. Join the point of intersection at M, N, O and P to locate the square of the garbhagriha.

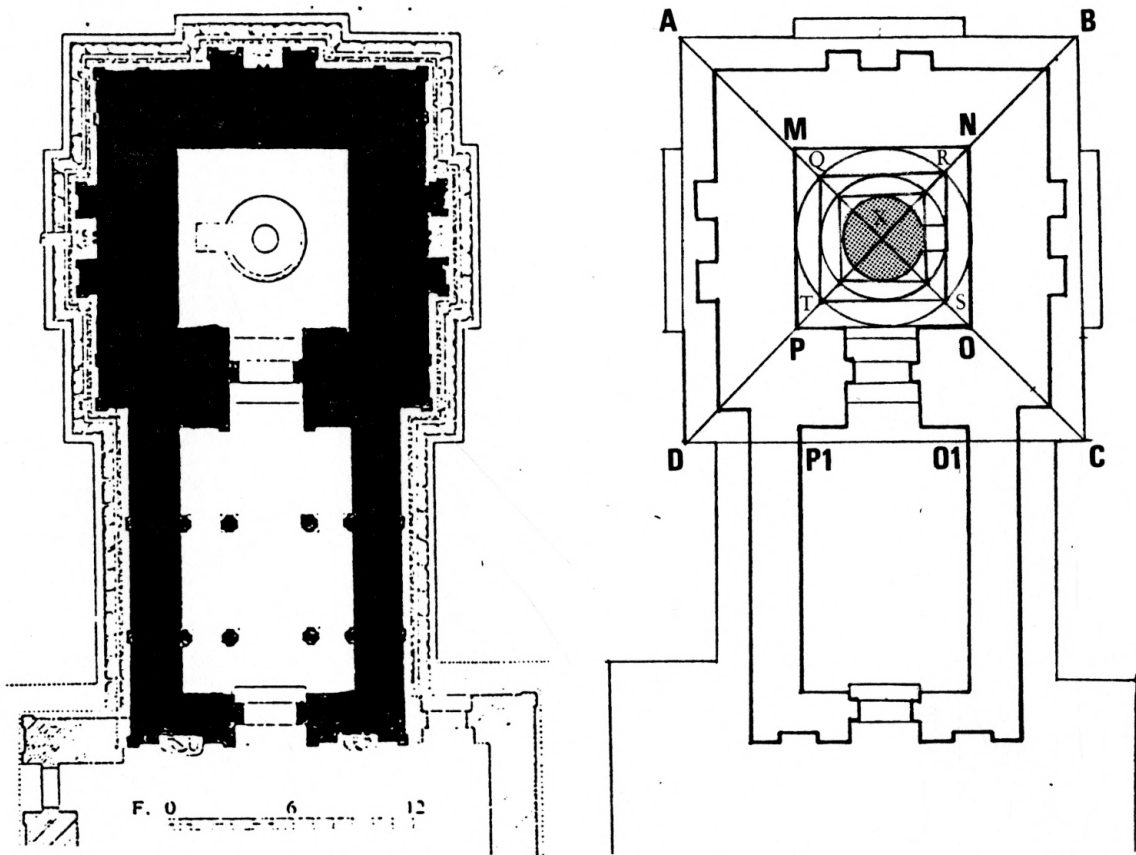


**Fig.B.2b**

**B. Method of determining the width of the antarala**

1. With point P as center and radius = PX (the radius of the Golden Circle) draw arc P1, P2. (from fig. C.2a).
2. Repeat the step with point O as center and radius = OX Draw arc O1, O2. (The sacred cut).
3. The distance between points O2 and P2 determines the width of the antarala.

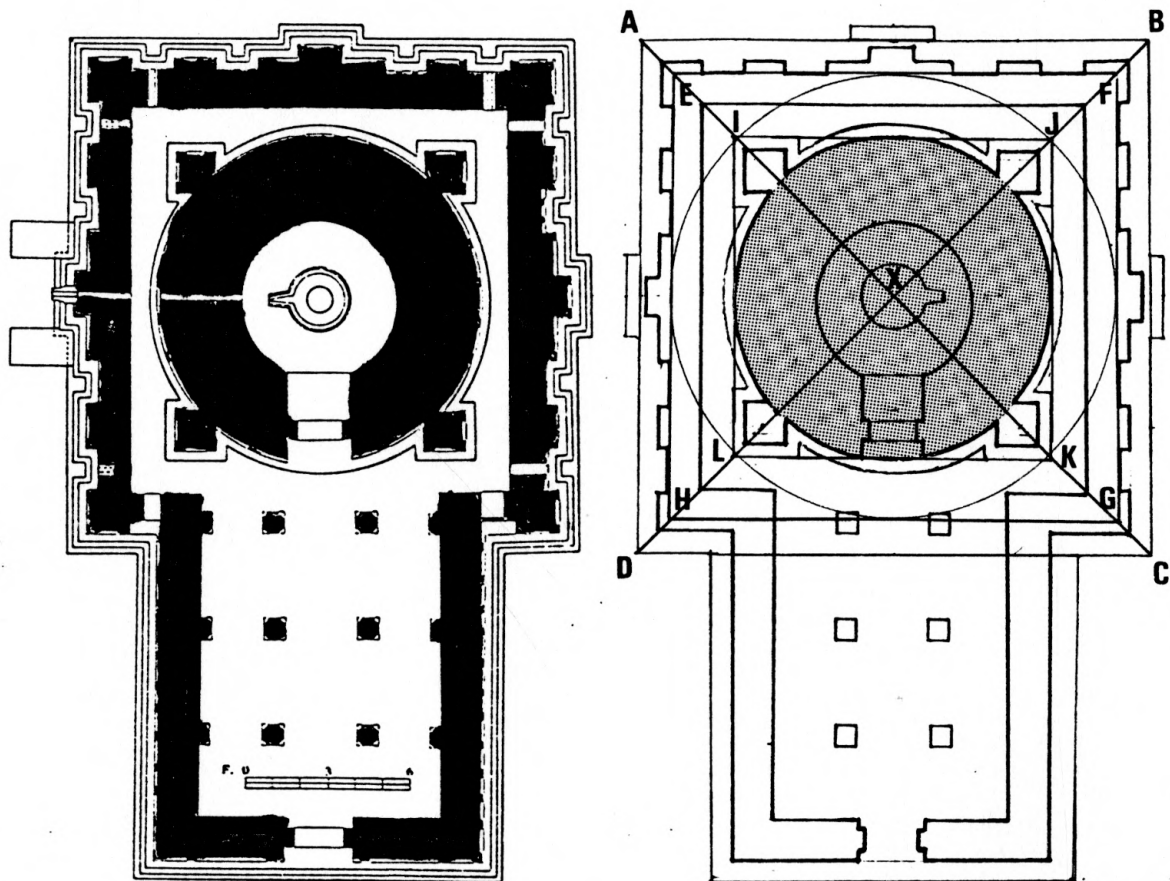
4. Extend points M to M1 and M2, N to N1 and N2, O to O3, P to P3. The distance between M1 and N1, N2 and O3, M2 and P3 marks the width of the offsets.



**Fig.B.2c**

**C. Method of determining the size of the lingam**

1. Inscribe circle tangent to square MNOP.
2. Insert square QRST at the point of intersection of the diagonals and the circle drawn in step 1.
3. Repeat step 1 and step 2 two times to get circle equal to the size of the lingam.
4. Extend points P and O to P1 and O1. The distance between P1 and O1 marks the width of the mandapa.



**Fig.B.3a** Plan : Vijayalya-Colisvara Temple, Narttamalai  
 (Adapted from Encyclopedia of Indian Temple Architecture, 1983  
 pg.134).

**A. Method of locating the garbhagriha**

1. The width of the temple base (platform) is taken as the width of chessboard.
2. Draw exterior square ABCD as shown in figure.
3. Insert diagonal AC and BD. The point of intersection, X,

determines the ritual center of the sanctuary. The point above which Shiva's symbol, the lingam is erected.

4. Draw a square by connecting points E,F,G and H (refer to the diagram constructed by the Castle movement).
5. Insert circle tangent of square EFGH. (the Queen movement).
6. Inscribe a square by connecting points I,J,K and L. (the Bishop movement).
7. Insert circle tangent of square IJKL (the Golden circle). This circle determines the outer width of the garbhagriha.
8. Inscribe a square by connecting points M,N,O, and P.
9. Insert circle tangent of square MNOP.
10. Inscribe a square by connecting points Q,R,S and T
11. Insert circle to determine the inner width of the garbhagriha.

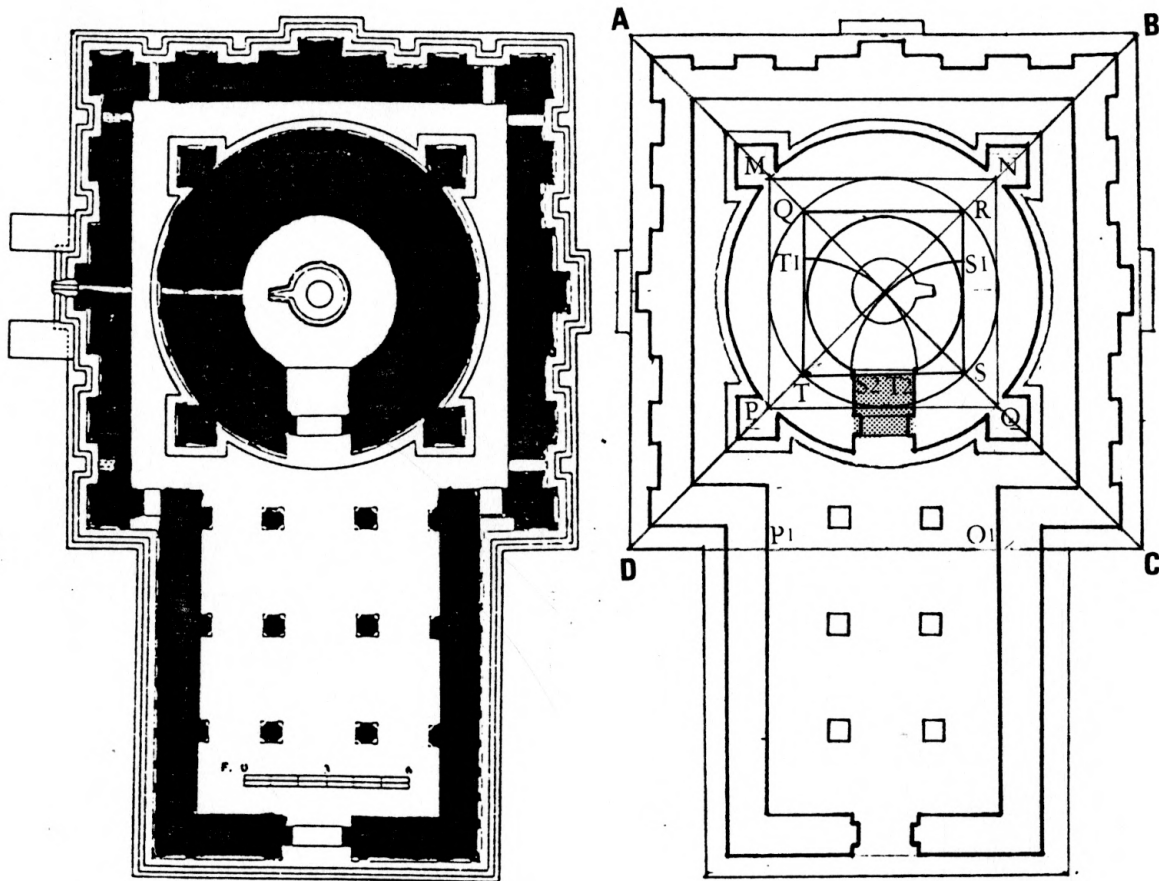
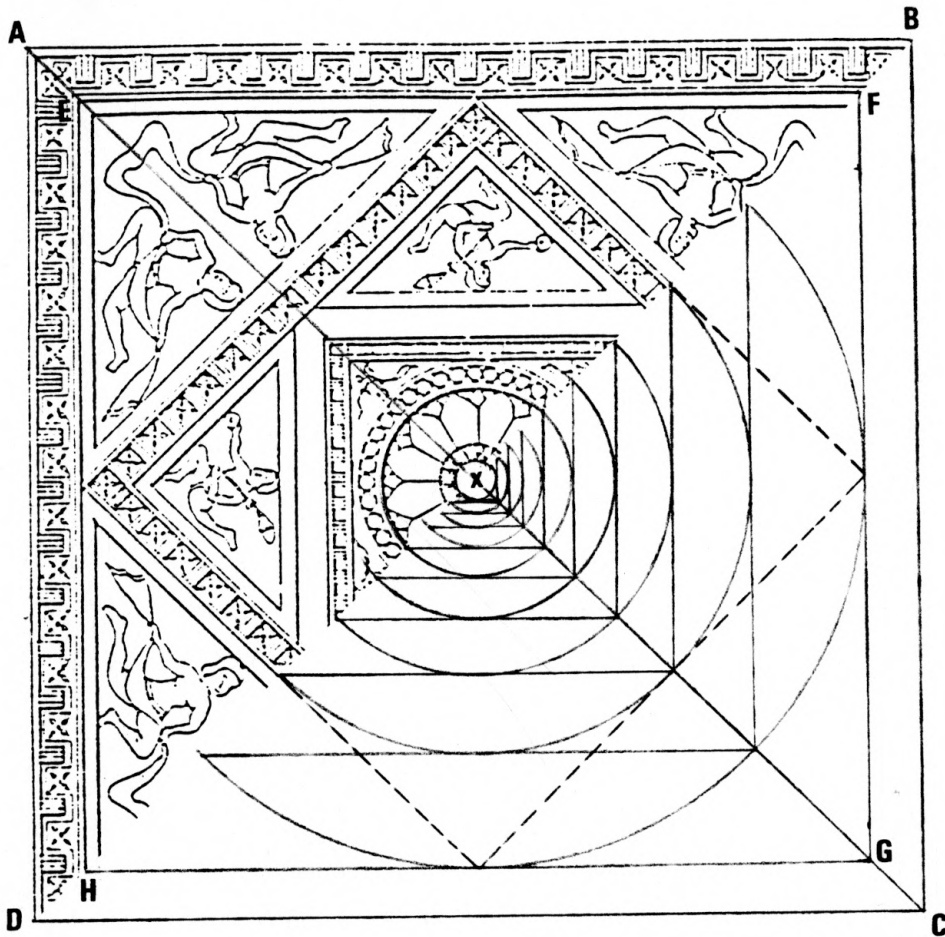


fig. B.3b.

**B. Method of determining the width of the antarala**

1. With point T as center and radius = TX draw arc T1, T2.  
(from fig. C.3a).
2. Repeat the step with point S as center and radius = SX Draw arc S1, S2. (The sacred cut). The distance between points S1 and T1 determines the width of the antarala.
3. Extend points O and P to O1 and P1 from figure above. The distance between P1 and O1 marks the width of the mandapa.





**fig. B.4** Plan : Ceiling of Shiva Temple, Pandrethan (Adapted from The Hindu Temple - An Introduction To Its Meaning and Form, 1977 p. 84).

Notes on the analysis of fig. B.4

1. The width of the ceiling plan is taken as the width of chessboard.
2. Draw exterior square ABCD as shown in figure.
3. Insert diagonal AC and BD. The point of intersection, X,

is the point above which Shiva's symbol, the lingam is erected.

4. Draw a square by connecting points E,F,G and H (refer to the diagram constructed by the Castle movement).
5. Insert circle tangent of square EFGH. (the Queen movement).
6. Repetition of the above steps produces the overall design composition.

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**Sacred Geometry in Chess and the Design of the Hindu Temple**

by

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Kansas State University

Manhattan, Kansas

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## A B S T R A C T

The purpose of this research is to investigate the relationship between the game of chess and the design of Hindu temples of South India built in the early Chola period (800 A.D. to 900 A.D.) through a comparative analysis of the implicit geometries and the meanings of their forms.

The origin of the game of chess was in India and it developed within the framework of the Hindu temple culture. Chess and its structure follows a consistent pattern of geometric order and proportion, based on the governing rules (movements) of the game.

The Hindu temple is the most characteristic example of Indian sacred architecture in which there was an extensive use of "sacred geometry". The system of geometry that regulates the size, position, and proportion of the temples can be seen in the study of their formal elements and spatial relationships.

It is demonstrated that the system of geometry which underlies chess has a direct congruence with the geometry which regulates the planning of the Hindu temples. Both chess and the design of the Hindu temple are based on the 8X8 square or mandala, within which the circle, the square and the Pythagorean 3,4,5 triangle are key regulating forms. The center of the 8X8 square is the focus of all the activities

enacted in the play of chess and the rituals of temple worship. The chess player who controls the center (the central four squares) gets an advantage over the opponent. The center is also the point (bindu) at which the Shiva lingam is placed, which is the focus of rituals of devotional worship.

The symbols of Indian art, whether they are as monumental as the Hindu temple or as small as "the chess mandala" or a meditation yantra, echo the same fundamental truth and direct man's spiritual journey towards the goal of transformation and self-transcendence. These symbols stimulate the aspirant to identify and reveal his "inner center" which is identical with and not separate from the heart of every apparently separate thing in the universe.