

GEOMETRY IN PLACES OF WORSHIP IN URBAN LANDSCAPE - A STUDY ON ST. PAUL'S CATHEDRAL

Jayita Roy (Ghoshal)¹, Amallesh Kanrar²

1. Department of Anthropology, Narasinha Dutt College, 129, Belilious Road, Howrah, WB - 711101, India (Corresponding Author) E-mail – jayitagroy@gmail.com, contact no - +91 9830413942

2. Department of Anthropology, Narasinha Dutt College, 129, Belilious Road, Howrah, WB - 711101, India Email - amaleshkanrar@gmail.com, contact no-+91 8961131152

Abstract

In this Archaeological anthropological study sacred geometry and its relevance in St. Paul's Cathedral was studied. Sacred geometry as a part of geometric symbols denoting sacred grounds and events is used all over the world. This study focuses on identifying the symbols found in cathedral's structure and interior decorations with relevance of this particular religion and culture.

Key words: Sacred geometry, Neolithic monoliths, Architecture, symbolism.

1. Introduction

In archaeological anthropological studies interpretation of symbols is done from both literal and allegorical purposes to understand significance of a symbol or a shape. Throughout prehistoric, proto-historic and historic periods humans use different shapes for determining either the structure of a building or earmark a part of land as sacred or consecrate some field is a common practice. Cave arts and home arts bear testimony to the fact that humans have always been influenced by geometric and non geometric shapes as observed by them in nature which in turn influenced construction of human settlement structures. Few of these geometric shapes were considered to be sacred by some cultures like square, round, rectangle, pentagon, hexagon etc. Even some shapes became the structure of the roof of a holy ground. Sacred Geometry is not considered to be a normal geometric shape. It is a shape devoted to a particular specific purpose, to a particular service and role. The architects of Christian and Islamic domes drew shapes from a common prehistorically and proto-historically cesspool of information. Culture specific symbolic sacred geometry served as both a melting point of aesthetic sensibilities as well as a mark of distinction. The analytical study of architecture and building designs reveal that presence of dome, use of altars, centrally positioned designs, position of praying areas and engraved geometric symbols can be quite similar but the actual structure of dome and position of altars can be

very different (Trisano 2022). These similarities bear their antecedents to the Neolithic age. The evidence of prehistoric architecture comprises structures like Monoliths, Dolmens, Tumuli and Lake dwellings cover etc. These structures were built over a span ranging from Upper Palaeolithic to Neolithic periods pan world with cultural and temporal varieties. Most of these structures are made out of stones and clay chunks in a circular manner or vertical stones as slabs. Houses are very uncommon structures during the Neolithic period. The seeds of Gothic architecture were planted within the first prehistoric development of words. The most basic counting system was originally based on counting objects but later it became complex. Because of this the attachment of symbols and shapes with numbers were needed. The Pythagorean number theory linked mathematical calculations with a particular shape which eased the understanding of function of structure in a building. Plato suggested three basic shapes which are Pythagorean triangle, equilateral triangle and square as the building blocks for polyhedrons. Use of geometric shapes in succeeding years influenced almost every civilization in every possible manner. Later the real essence of Gothic architecture diffused across Europe and ultimately influenced Christian religious structures including monuments to cathedrals (Clark 2006), which in turn bears the testimony of these geometric shapes dating back to prehistoric times assimilated through Greco-roman influence. The common features of a sacred building are generally use of more interior height, brighter illumination and lesser obstacles between segments of structures (Trisano 2018). Sacred geometry as a number system also finds its applications like warding off evil, invoking some cosmic or divine forces and ushering in prosperity to a particular region or community (Singh 1994). Use of Cross, Triquetra, and terms like *ad quadratum* and *ad triangulum*, use of pyramidal and rhombus structure in domes not only represents the influence of ancient cultures but also finds similarity across all religions. The term fractal coined by Benoît B. Mandelbrot (1924 – 2010) was a Polish-born, French and American mathematician, who first compiled all the research and ideas of hundreds of years about self-similarity and defined as – “A fractal is a never ending pattern. Fractals are infinitely complex patterns that are self-similar across different scales. They are created by repeating a simple process repeatedly in an ongoing feedback loop. Driven by recursion, fractals are images of dynamic systems – the pictures of Chaos. Geometrically, they exist in between our familiar dimensions. Fractal patterns are extremely familiar, since nature is full of fractals. For instance: trees, rivers, coastlines, mountains, clouds, seashells, hurricanes, etc.”

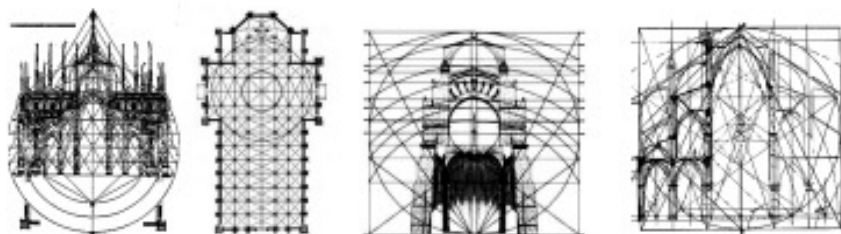


Fig 1: The concept of ad quadratum (quadrangles) and ad triangulum (triangles) in the construction of churches and cathedrals

2. Relevance of sacred geometry in Archaeological Anthropology

In the beginning of the twentieth century it was general practice in archaeological studies to interpret an object of interest with cultural significance by using simplistic application of linguistic knowledge. Most of those objects had symbols depicting materialistic or spiritualistic worlds that tend to be interpreted as general phenomena of daily life like use of the sun as a symbol in many cultures to be interpreted as the sun itself. But later it was observed that many symbols are present with more cognitive intricate meaning than literal. But later it was found that these symbols sometimes can be as simplistic as basic geometric shapes. Like during the Neolithic, pots were decorated with simple square, sphere, triangle or wavy lines. These symbols were in vogue for denoting natural forces or events like tide, sea, sun, moon, animals etc. but later religious and cultural adaptations assimilated various cultural perspectives (Shackel and Barbara 1992). Fractal geometry finds applications in different sectors. Fractal geometry substantiates as a medium of expression to unveil the beauty of complexity in architecture. It serves as a platform for the nascent mind imagery of an architect and acts as a medium for the transmission of energy flow emanating continuously from the universe and routed through buildings and monuments. Hindu temples are one of the best examples of application of fractal geometry (Sardar and Kulkarni 2015). Across passage of time few basic geometric shapes infused with religious doctrine and became a benchmark like cross with Christianity. Main objective of the present study is to identify a few geometric shapes in St. Paul's Cathedral and find its relevance with sacred geometry from an archaeological anthropology perspective.

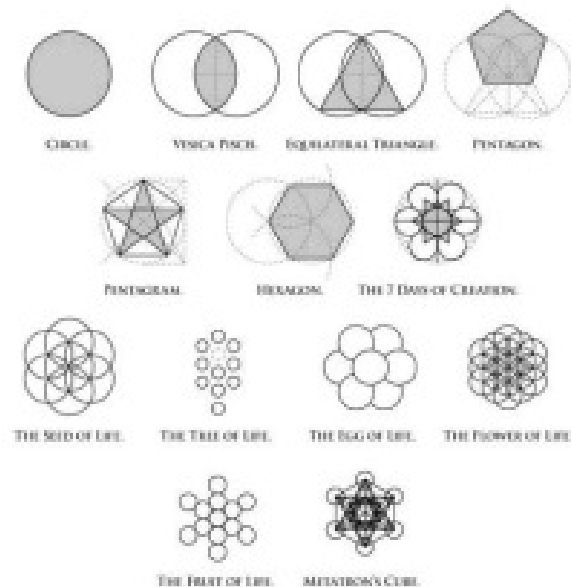


Fig 2: Principle elements of sacred geometry (Ramzy 2015)

3. Description of St. Paul's Cathedral

St. Paul's Cathedral is an important landmark in Kolkata resplendent in its history, culture and religious relevance. For the enthusiasts of colonial architecture, the cathedral is a fine example of The Gothic revival style of architecture bearing strong resemblance to Norwich Cathedral of England, and the largest and first overseas cathedral constructed by the East India Company which had its headquarters in Kolkata. The cathedral was constructed over a period of 8 years from 1839 to 1847. The cathedral suffered severe damages after an earthquake and was redesigned in Indo-Gothic style with a 201 ft long central spine and auspicious designs both geometric and non geometric on the floors and also with intricate detailing done by tinted glasses and art forms (Basu et al 2021).

Figure SEQ Figure * ARABIC 1 St. Paul's Cathedral of Kolkata



Fig 3. The sprawling structure of St.Paul's cathedral

4. Relevance of Sacred Geometry in St. Paul's Cathedral

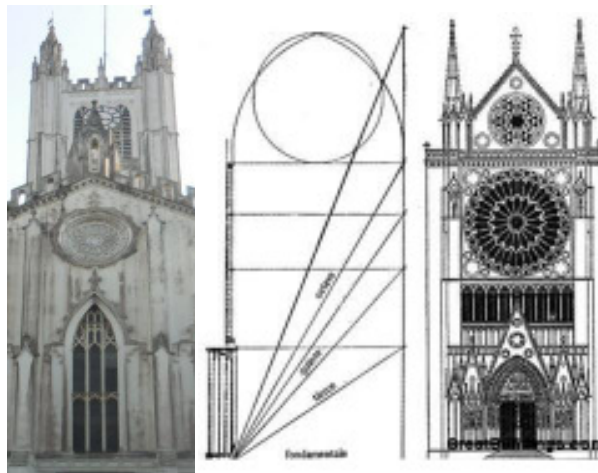


Fig 4. Arabic squares and various geometric shapes with cross. The layout and the cathedral from the front view.

Sacred geometry is the applied aspect of number symbolism and finds its use in construction of sacred structures. Basic tools like a triangle and a secant help architects and masons to maintain the proportionality of a structure while constructing along with a compass, a measuring stick and preliminary calculations. The three regular essentially geometric tools were preferred for setting a proportional size for various elements within a structure and enlarging the measurements of a model to full scale at the same time conserving the proportions. This protocol was used for centuries and also helped in introducing the concepts of polyhedrons and pentagons in building. Even after restructuring after the devastating earthquake in 1934, its renovation was done on the lines of Bell Harry Tower in Canterbury and is strongly influenced by medieval and Gothic church designs like dome and arches and elliptical arch window frames on top. Being a European structure in Indian soil, its seclusion of other cultural influences pertaining to the Christian sacred geometry is most relevant and interesting to study.

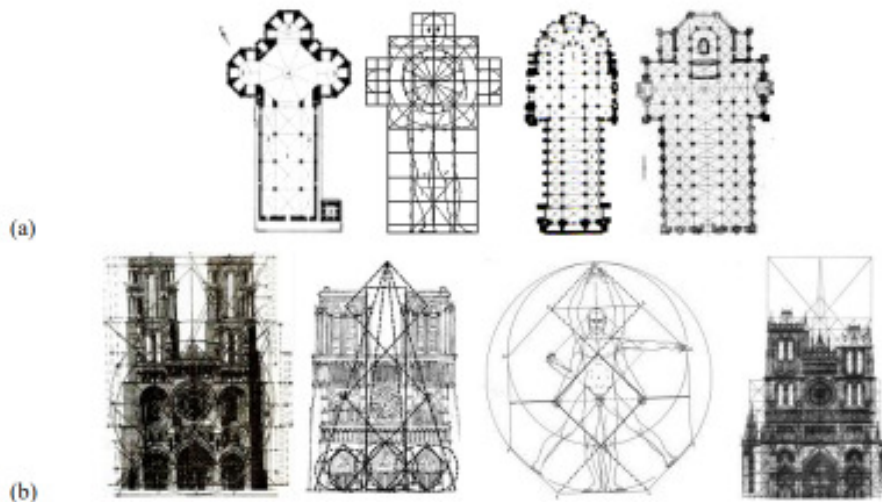


Fig 5: Representation of human proportions in cathedral layout and structure (Ramzy 2015)

4.1. Sacred Geometric symbols and Structures

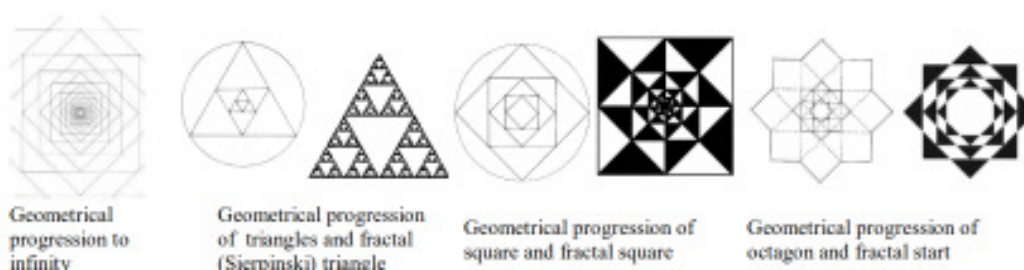


Fig 6: Examples of geometric progression used in structural layout

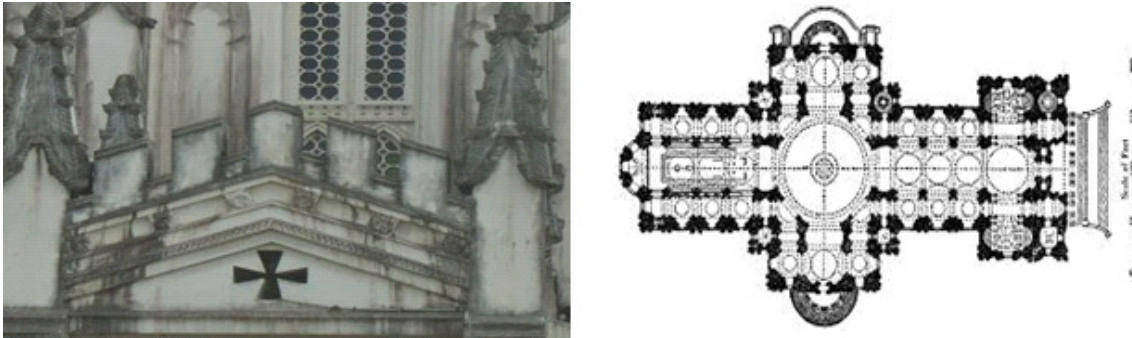


Fig 7. The Maltese Cross between two spires

Symbols like cross, chalice, candle, rosary are considered sacred in Christianity. The construction or building also bears many different symbols or symbolic patterns in its ground plan and construction. Like a medieval angelic church's ground plan has two extensions from altars protruding on both sides symbolising a cross from a vertical view (Clark 2006). St. Paul's Cathedral has the same type of ground plan. At the same time considering natural lighting patterns (Trisano 2018), the altar is higher and the roof of the altar is dome shaped. The altar is rectangular and also has a square shaped podium. Windows and few doors and archways have cross symbols over them. Few of them have four triangles converging at a resembling a cross rather than conventional two rectangles that look like a cross in a conjoined form. This cross is known as the Maltese cross. This particular cross is associated with knighthood, protection and bravery. Interpreting this cross as the opposite of a four headed star also symbolizes divine protection (Pasztor 2008). The dome at the centre has a Latin cross on top of its roof. The dome is also square shaped with four peaks, each having a Latin cross. Few Greek crosses were also visible. The sanctum sanctorum of the cathedral has a long spine which also crosses a beam and forms a cross. These types of various geometric shapes were visible; few were round shaped windows and dome openings covered with tinted glass segmented in square but the top portion had an elliptical glass structure.



Fig8 : The structure of St. Paul's Cathedral resembles the Maltese Cross

5. Conclusion

In archaeological interpretations of symbols, various relevance and interpretation of one symbol is very frequent. At one point even temporal context can also play a significant role of understanding and alter one symbol over time. But use of Geometric symbols as sacred denoting symbols, can be said as sacred geometry, is very susceptible to change through culture. This study was conducted to find and understand the use of sacred Geometry in St. Paul's Cathedral of Kolkata. It was also imperative to understand and observe any changes happening to them with repairs and traces of geometric symbols from ancient human settlements from Europe. Use of cross and ground plan as a standard Anglican church were found here which denotes its cultural integrity and relevance of Christian symbols. As a whole it can be said that use and relevance of sacred geometry was found here in the form of executing fractals which implies the sense of completeness as the concept of fractals is that of the “part to whole” and “whole to part” by bringing order into chaos and resulting in ushering beauty into complexity.



Fig 9: Seed of life with emblem on top of the cathedral

6. Acknowledgement

This work is a part of the project work as prescribed in the curriculum of Calcutta University carried out by final year students of B.Sc,Anthropology Honours who passed out in 2019.The authors would like to thank Principal, Dr. Soma Bandyopadhyay for granting permission to carry out the project work. Authors express their sincere gratitude and thanks to St.Diocese Church of North India for granting permission to carry out the work in the premises.



Fig 10: The students of B.Sc (Anthropology)Hons 2019, batch.

7. Reference

1. Basu, C., Bhattacharyya, S., Chaudhuri, A., Akhtar, S., Chatterjee, A., Thakur, B., Guha, H. And Chaudhuri, P.(2021). Assessment of Potential Damage Factor: A Case Study of St. Paul's Cathedral, Kolkata. *Journal of Heritage Management*. 6(1). 53-68.
2. Clark, W.W. (2006). *Medieval Cathedrals*. Greenwood press. Westport. Connecticut. London
3. Pasztor, E. (2008) Celestial symbols on archaeological finds from the Bronze Age in the Carpathian Basin – a case study. *Cognitive Archaeology as Symbolic Archaeology*. 13-21.
4. Ramzy Shafik Nelly (2015) The Dual Language of Geometry in Gothic Architecture: The Symbolic Message of Euclidean Geometry versus the Visual Dialogue of Fractal Geometry; *Peregrinations: Journal of medieval art and architecture*.vol 5(2), pp 135-172
5. Sardar D and Kulkarni YS (2015):Role of Fractal Geometry in Indian Hindu Temple Architecture,*International Journal of Engineering Research & Technology (IJERT)* Vol. 4 Issue 05 ,pp 532-537
6. Shackel, P.A., Barbara, J.L. (1992) Post-Processual Approaches to Meanings and Uses of Material Culture in Historical Archaeology. *Historical Archaeology*. 26(3). 5-11.
7. Singh, R. P. B. (1994). Sacred geometry of India's Holy City, Varanasi: Kashi as Cosmogram. *National Geographical Journal of India (N.G.J.I)*. 40. 189-216
8. Trisano, R. (2018) The Meaning of Natural Lighting on Alter Case study: Cathedral Church and Church of the light. *International Journal of Civil Engineering and Technology (IJCIET)*. 9(12). 209-213.
9. Trisano, R., Lianto, F., Liauw, F., Tangyong, D., Gelgel, I.M.W., Yasuhiro, H. (2022) Sacred Indicators of Jakarta Cathedral Church, Indonesia, Before the second Vatican Council. *Journal of Hunan University(Nature Sciences)*. 49(2). 24-33