

Astronomy and Architecture a Study of the Cultural and Symbolic Dimension

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ABSTRACT: Architecture and astronomy have been deeply related since ancient times. Astronomy is a natural science that manages the investigation of divine items, (for example, the moon, planet, stars, universes) the material science, science, and advancement of such articles; and marvels that begin outside the air of Earth. Astronomy is one of the oldest sciences. Architecture has become an important part of the study of astronomy through old times. Since old occasions, overall observatories have been built up by the ruler and individuals. You find out through different kinds of Architecture use possible as an astronomy study Example like Egypt pyramid, The Jantar Mantar, Stonehenge, etc. Architectural space made for astronomy enhances the experience of the study of Astronomy. Since ancient times people have known about the importance of astrology. They use astrology even in their daily life as a calendar, rituals, etc. Today government is trying to establish advanced forms of observatories. The core idea of the present study was to understand cultural and symbolic dimensions existing due to the relationship between Astronomy and Architecture. The present paper discusses the ideas of the builders of the observatories through various case studies and also the importance of the building typology along with understanding the study of cultural relationships on symbolism is been discussed.

KEYWORDS: Architecture, Astronomy, Ancient observatories, Cultural, symbolic dimension.

I. INTRODUCTION

The field of Astronomy is studying the science of Stars and Stone. Architecture facilitates these studies through a specific type of built environment. To understand the architectural space making an interdisciplinary study of Astronomy, Archeology and Architecture can throw new light. Many ancient monuments showcase a great spatial order to relate Architecture to Astronomical studies. The study of Such Architectural monuments can help to understand the ideology and conceptual transformation of the spaces for Astronomical studies [1]. Before identifying the new means and ideas for observatories, it is essential to understand the ancient observatories through establishing a relation on the tangible monuments to the philosophy, religious background, society of the time, and

understanding of geometry and cosmology [2]. Even

though there are many associated avenues to look at . ancient observatories, for the purpose of this study it is essential to establish limitations through the identification of a specific subject area that needs to be focused on. Astronomical artefacts from ancient cultures such as Egyptian landmarks and Nubian landmarks have been left behind, and early civilizations such as the Babylonians and Greeks as well as early civilizations such as the Chinese, Indians, Iran, and the Maya made systematic observations of the night sky [3]. The invention of the telescope, on the other hand, was required before stargazing had the potential to develop into cutting-edge research. Astronomy has historically included a variety of disciplines, including celestial navigation, astronomy, astrometry, observational astronomy, and the creation of calendars, among others [4]. Practically each of the incredible civic establishments of the past assembled marvelous landmarks, which affirm their abilities, information, and strict convictions. Interestingly, be that as it may, basically these landmarks are quiet: there is no composed source letting us know how and why they were built. But there is one thing that connects many, if not all, of these monuments: astronomical study [5]. In fact, their projects are associated with the sky because of galactic arrangements, 'the study of stars and stones. If used with due caution, it can give us much information about the mind of our ancestors and can also give us the emotion of experiencing today's spectacular events, which were planned thousands of years ago. While tracing the philosophy of the Indian way, it is observed that our ancient Indians had learned the secret of life which is a circular path from evolution to existence to residue and regeneration. People of ancient times had clearly understood that humans, their form, and their surrounding nature are all amalgamation of the cosmic/Solar and organic energies on Earth. In short, the human is a part of nature, and the human body is designed to adapt with nature. Astronomy is a natural science that investigates celestial objects, their physics, chemistry, and evolution, as well as events that occur outside of the Earth's atmosphere. It is the study of celestial objects and their physics, chemistry, as well as evolution. Astronomy is one of the oldest scientific fields [6]. Early civilizations such as the Babylonians, Greeks, Chinese, Indians, Iran, and Maya were known to have conducted systematic

observations of the night sky, as shown by astronomical artefacts such as Egyptian and Nubian monuments and astronomy instruments. The invention of the telescope, on the other hand, was required before astronomy could evolve into a modern science [7]. Astronomy has traditionally encompassed sciences such as astrometry, celestial navigation, observational astronomy, and the creation of calendars, among others. A different discipline Astrology, the predictive branch of astronomy that employs the apparent locations of celestial objects as the foundation for psychology and future event prediction, is not a science and is sometimes referred to as a sort of divination. Another branch of astronomy is climatology, which is the study of atmospheric science. In architecture, the fields of astrology and climatology combine to form the Vastu philosophy [8].

People know of a few constructions from ancient times that may have served as astronomical observatories, although they very certainly had religious purposes [9]. Priests possessed astronomical expertise at the period, and their fascination with the movements of celestial bodies in the sky was applied to societal concerns. The earliest known astronomically oriented structure is the New Grange megalithic passage burial (3200 B.C.). Stonehenge is the most well-known ancient structure with its dual purpose. This monument in Wiltshire, England, is made up of stones placed in a circle around a central one. Its construction spanned over 1600 years and was divided into three parts. It is a famous stone monument that has been utilized as a burial ground for cremated human remains since its inception approximately 3100 BC. The cosmic observation of nature relates to a long-standing human need to comprehend space and time, which manifests itself in architecture. It is a deep and fundamental yearning in the human psyche that we may locate comparable ideas and symbols in faraway peoples even when there are no direct cultural or commerce contacts [10]. Geometrical conceptions and harmonic correlations common to people of many backgrounds, such as the concept of orthogonality and the identification of pure geometric shapes, such as the cube or the sphere, connected with distinct symbolic meanings, were developed through cosmic observation of nature [11]. Architecture was utilized to validate these facts while also serving as a medium for communication and social celebration of the first major discoveries based on natural observation [12].

This is especially visible in architectural settings that use light and orientation to measure time. Their creation required an understanding of astronomical, drawing, geometric, and mathematical laws. As a result, comprehending the theoretical and technological knowledge at the time requires a grasp of the geometry and orientation utilized in building to channel light in the appropriate manner. The architectural ceremonies and beliefs associated to cosmic observations exhibit the symbolic qualities of geometry. In the Mediterranean, astronomical knowledge was employed in structures designed to be "mirrors" of the cosmos, as they incorporated astronomical connotations, cosmic miniaturizations, and allusions to Earth, Heaven, and the motions of the main celestial bodies in their construction. The study of projective geometry, optics, and the invention of equipment for time measurement all began with the observation of the sun and its projected shadows. One of

the earliest recognized strategies for architectural survey is the use of shadows. Thales of Miletus (640-546 B. C.) shocked Egyptians by estimating the height of the Great Pyramid using shadows and the characteristics of comparable triangles at a period when the sun's rays formed a 45° angle with the pyramid base, according to historical records. A second horseshoe-shaped arrangement of standing stones is encircled by a circle of towering stones. The horseshoe's open side points to an exterior avenue, where the "heel stone" is located. The Sun rises above the heel stone at dawn on the June solstice, as seen from the center of the monument. Giza Necropolis is another Egyptian example. Egyptologists believe that the little pyramids near to the big pyramid of Khufu functioned as burial sites for the Pharaoh's kin. Certain factors that have not previously been explored suggest that the pyramids might be used as both burial sites and components of an annual calendar owing to their ground plan design. Architecture has been utilized to adapt knowledge from numerous other fields with various symbols as three-dimensional design. Through the transformation of these symbols into information visualization a new design can be created in a parallel way. The examples presented in this paper should open up further possibilities to investigate inside the field of architecture. Analyzing such Astronomical content of ancient Architecture provides a deep understanding of the varied aspects of our past. Architectural design and astronomy may work together to accomplish mutual aims, as shown in this research, which also provides an insight of how astronomical factors have influenced architectural design. Also, understand how to oldest buildings and places are involved in astronomic space design. It also includes the study of the earliest surviving astronomical architecture However it is limited to the overview of such observations rather than exploring them in detail. In this study, a search for specific elements and contributing factors responsible for the originality resulting in the unique universal value of Astronomical sites is been carried out. It is necessary to define the boundaries between different sorts of evidence in order to properly recognise them. The scope of this study is limited to the study of heritage sites related to Architectural spaces for Astronomical studies within the region of Asia.

II. LITERATURE REVIEW

I. Sprajc et al. proposed new intensive examination of building arrangements in Maya Lowlands has shown the presence of broad and durable arrangement designs that must be made sense of utilizing galactic skyline references. The investigation of a huge information test drove us to the end that significant city and stylized structures were arranged prevalently to dawns and dusks on explicit dates isolated by calendrically critical spans, suggesting utilization of effectively reachable observational systems planned to screen the slippage of the calendrical year comparative with the extended period of the seasons, probably to guarantee appropriate farming movement booking. The discoveries of this study give new understanding on the cosmic and calendrical significance of the chief designs of Chichén Itzá, quite possibly the main site examined, and consider a reexamination of past translations [13].

Ivan Sprajc in his article the author summarizes current systematic research into the use and significance of astronomical configurations in ancient Maya architecture, and shows how authors were possible to perceive alignment patterns that shed light on the validity of previous hypotheses and provide a basis for novel interpretations by utilizing a more rigorous methodology to a large number of orientations. Our observations and analysis show that the most common orientations to the Sun's position on the horizon permitted the use of observational calendars with multiples of 13 and 20 days, which were also meant to help in agricultural scheduling. Additionally, although some structures recorded Venus extremes, a newly undiscovered orientation group was discovered to relate to key lunar standstill points. Besides displaying cosmic directions, a few huge structures are adjusted to unmistakable regular or social scene highlights, inferring an intentional determination of these areas for their development. The creator accept that Maya metropolitan and compositional arranging was administered by a modern arrangement of standards, where galactic worries and their commonsense applications were consolidated in a more noteworthy system of cosmological ideas [14].

A. Martinazzo et al. states the issue of processing and analyzing a huge quantity of picture data arose with the advent of photometric surveys in astronomy. To evaluate which design works best for each task, people analyze the performance of five prominent Convent architectures when applied to three distinct picture categorization challenges in astronomy. Even when compared to designs that do substantially better on the Image net competition, people demonstrate that a VGG-style architectural pre-trained on ImageNet delivers the top performance on all analyzed tasks [15].

III. DISCUSSION

A. Inception Study

The Jantar Mantar at Jaipur, India (Asia):

The Jantar Mantar of Jaipur is an observatory fundamental the principle part of the 18th century. Worked by Maharaja Sawai Jai Singh II, the Jantar Mantar Observatory went about as a point of convergence of his new capital, Jaipur, the first and the earliest mathematically arranged city in India. Presently there are 19 main astronomical instruments for the study. They were by and large built of block rubble and mortar, yet a couple of them were made of bronze as shown in Figure 1.



Figure 1: Shows the picture of Jantar Mantar of Jaipur.

They were built to observe the celestial bodies through the necked eye and precision of the observation was achieved through the scale of the monuments built. These monuments show the replica of the earlier instruments and some of them stand as the largest in the world. These instruments are important as they show architectural and instrumental innovation in terms of their size and scale. In every one of the three primary old style coordinate frameworks there are instruments working: the skyline peak neighborhood framework, the central framework, and the ecliptic framework. One instrument which is the Kapala Yantra works in two frameworks and it changes arrangements straightforwardly from one framework to the next. This features an illustration of the instruments of the pre-adaptive workmanship world remaining in a functioning condition till today. Likewise, Jantar Mantar is a famous UNESCO world heritage site.

a. The symbolic as well as cultural dimension

The basic marks of Jai Singh II's sensible program were to refine the old Islamic Zij tables, to measure the particular hour at Jaipur reliably, and to describe the timetable conclusively. One additional was to apply the cosmological vision getting from the Ptolemaic one, considering cosmic real factors, to visionary estimate both social (for instance anticipating tempest and yields) and individual (for instance printing ordered libraries). This was a critical period for the well-known gathering into the old-fashioned Hindu act of cosmic data coming from Islamic and Persian civilizations. The entwining of science, cosmology, religion, and social condition has had an unbelievable importance in Rajasthan culture since the eighteenth century and continues into current circumstances.

b. Taosi Observatory, China (Asia)

Taosi observatory (c.3000 – 2000 BC) located at the Taosi archeological site is one of the known observatories of Longshan culture in north China. It is surrounded by the rammed earth enclosure. The observatory was constructed and utilized during the Middle Taosi Period (21st century BC) and was intentionally crushed during the Late Taosi Period (20th century BC). A semi-round stage around 1,000m² in the locale, assessing 40m inverse east to west and around 29m from north to south, seems to have comprised of three patios in a concentric way. The internal residential and ceremonial area is separated by a rammed earth wall which also separates the areas of the elites and the commoners. The space formation of the place indicates the stratification of the society [16]. It has also a rammed-earth retaining wall as shown in Figure 2. Archeologists as of late found an enormous semi-round stepped earth stage, which has an unmistakable and clear beat earth focal center along with a bent divider punctured by twelve holes. The stage is supposed to be an old observatory used to decide the seasons by watching the dawn.



Figure 3: Shows the Taosi Observatory, China.

c. Cultural and symbolic dimension

According to Chinese old-style composing, the act of 'seeing the eccentricities to introduce the seasons' profits to old-fashioned events. The most reliable by and large recorded method for concluding the seasons is by assessing the lengths of the sun's shadow around early evening. Little was recorded concerning the system for seeing the heading of first light to choose the seasons, in any case, the Taosi observatory recommends that the act of referencing such genuine realities had at this point been set up for a surprisingly long time. The Taosi site is acknowledged to be the capital of King Yao, who regulated before the Xia Dynasty, the principle Dynasty in Chinese history. About 33% of the Yao Dian, a traditional Chinese text accepted to be King Yao's record, is focused on portraying the Great King's system and achievements in stargazing. In particular, he told cosmic authorities to "make a timetable to frame the textures of the sun, moon, stars, and sublime bodies and to give intentionally to people the seasons for acknowledgment. The Taosi observatory could have been used to recognize these four uncommon days, in this way showing that the old Chinese did astronomical discernments warily as long as 4100 years earlier.

d. Napata, Sudan (Asia)

Merowe Northern province of Sudan having Dongola as its capital consists of the site for the observatory of Napata. The region is overwhelmed by the pile of Jebel Barkal, otherwise called the 'Unadulterated Mountain' situated on the western bank of the Nile. This is circled by safe-havens and pyramid fields as displayed in Figure 3. The necropolis of Nuri, of course, is arranged on the east bank. The feet of the old mountain have around seven sanctuaries and a few royal residences based on the bank of the Nile. Found close by are two little fields of pyramids, while the more established necropolis of El Kurru is discovered a few kilometers downstream. There are around 20 sanctuaries inside the balance of Nuri. At the hour of the eighteenth Dynasty, prior places of worship of Napata were constructed and Kings of the 25th tradition named it as their capital and stayed the capital of the Kingdom of Kush for some ages subsequently. Indeed, even following

six centuries the sanctuary of Amun stayed an imperial traveler community and the burial ground of Nuri stayed steady at the spot even after the moving of the funding to Meroe by Aspelta (i.e., until 300BC).



Figure 3: Illustrates the Napata Observatory, Sudan.

e. Cultural and Symbolic Dimensions

Based on a hypothesis of God Amun known as the God of the pure mountain at Karnak, Napata was a cultural center of Amun. The sanctuary was based on the lower regions of the mountain and across the stream Nile. Going against the norm bank, at Sanam, Taharqa created another asylum for Amun, orientated to nightfall. Taharqa is known for initiating the burial ground at Nuri. The location was chosen due to its potential association to the pure mountain. The Nuri pyramids themselves were orientated so that the diagonals of their bases changed intimately with the cardinal headings. One of the later assembled pyramids at the Barkal field contains a grand framework with Egyptian typology.

f. The pyramid of Giza, Egypt (Asia)

The pyramid of Giza is arranged at the highest point of River Nile's delta in the space of Giza, Egypt. The Giza level is a necropolis containing the entombment offices of a couple of rulers and leaders of the fourth Dynasty and their families. It was also considered to be a hallowed site where strict practices were performed for some ages, particularly in the Sphinx region and in the sanctuary of Isis as displayed in Figure 4. This World Heritage Site contain the colossal pyramids of three rulers of the fourth Dynasty; their associated valley sanctuaries, upper sanctuary, and thoroughfares; the Sphinx and its sanctuary; and the necropolis of the grand family and the blue-bloods. These burial chambers incorporate texts with celebration records. Another example from Egypt is Giza Necropolis. In the normal assessment of Egyptologists, the little pyramids close to the extraordinary pyramid of Khufu filled in as internment places for the family members of the Pharaoh. Presently found certain facts related to the ground plans indicate that it might be possible that these pyramids were not only the burial places but they were the components of a year calendar.



Figure 4: Shows the pyramid of Giza.

g. The cultural as well as symbolic dimensions

The three essential Giza pyramids are orientated to the cardinal heading with extraordinary precision. The pyramid of Khufu's arrangement additionally incorporates a progression of emblematic arrangements for the ventilation channels emanating from two chambers in within the pyramid. As a result of the general cardinal structure of the necropolis, the Sphinx, a representation of the god Horus at the horizon faces the equinoctial rising sun. The general illustration of the necropolis in like manner exemplifies a movement of extra geographical and cosmic courses of action that make a boundless scene, mirroring the old Egyptian viewpoint.

h. Ulugh Beg's Observatory, Uzbekistan (Asia)

The Ulugh Beg Observatory, Samarkand, Uzbekistan was built somewhere around 824–1422. Considered to be one of the finest by scholars to have been one of the finest, it is known as the most important observatory in bringing new discoveries in astronomy and mathematics as shown in Figure 5. The observatory was an enormous round working with three stories.



Figure 5: Shows the Ulugh Beg's Observatory, Uzbekistan.

i. Cultural as well as symbolic dimensions

The essential point of the observatory was to make a zij. It became one of the most well known zij, duplicated in excess of multiple times, converted into Arabic and Turkish, and bits of it were changed over into Latin. The Sultani Zij's key component was its refreshed qualities for cosmic boundaries and new computational strategies. The Astronomers of Samarkand are known for an endeavor to work out tables of geometry and characterize new upsides

of fundamental parameters.xx as a component of the geometrical tables of the Sultani Zij, Ulugh Beg Ghiyath al-Din Jamshid al-Kashi, a senior stargazer of the observatory, decided an extremely precise estimation of the sine of 1° using new philosophy. His work the Key to Arithmetic is maybe the best piece elucidated calculating in the medieval times. Samarqand turned out as an important and suitable place to study advanced science under the rule of Ulugh Beg.

B. Astronomical Structures

Astronomical heritage like observatories are scientific monuments. In the process of assessing the scientific site, the architectural approach might turn out to be a limitation.xxii Astronomical Structures are fixed and un-moveable instruments. Since an instrument as a fixed 'landmark' could serve the very same explanation as a singular convenient instrument or a semi-portable instrument arranged in explicit spots for perception. This issue isn't capricious to cosmology anyway applies to science and advancement inheritance generally. Substantial portrayals of perceptions, occasions and forecasts addressed in schedules, time estimations, expectations of shrouds, zodiacs, divine portrayals, etc. Cosmological and symbolic representations are represented in iconography and paleography. The three primary parts of the 'galactic framework' related with a given spot and site are as per the following. Material proof of the astronomical places as fixed property objects. The outcome of scientific activities which includes Astronomical observations but is not restricted to it; and Socio-social applications and jobs of stargazing at a given second or over a given period for the site.

IV. CONCLUSION

This research paper states that since the old-time 1000 years ago people are really intelligent and they know about astrology and how to use architecture in astronomy study. When that time technology is not available compared to today's modern time. They know about how important architecture calculation and building are important parts of study. They know the relation between Astrology and Architecture. Use as an old schedule by utilizing space science observatory a schedule to characterize the consistencies of the sun, moon, stars, and heavenly bodies. Utilizing an observatory, they had the option to track down Directions with accuracy, cosmic perception, noticing the peculiarities to the seasons, estimating the lengths of the sun's shadow, noticing the course of dawn to decide the seasons and orientated to dusk and so forth. In this Thematic Study authors look to get what portrays the explicitness and inventiveness, and subsequently adds to the extraordinary all-inclusive worth of galactic destinations.

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