

From the celestial light to architecture: light and shadow as variables of the spiritual experience of architectural astronomical heritage.

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Abstract:

Para além de um fenómeno físico, a luz assume-se como elemento simbólico e espiritual fundamental da arquitectura, sendo capaz de moldar atmosferas, estimular experiências sensoriais e estabelecer uma ligação entre o ambiente construído e o *cosmos*. Este ensaio explora a interacção entre arquitectura, luz e espiritualidade no contexto do património astronómico, evidenciando como as sociedades antigas recorriam à luz na arquitectura como um elemento mediador entre o ser humano e o *cosmos*. Através da exploração de diversos casos do património astronómico arquitectónico, procura-se compreender como o uso da luz na arquitectura se revela num instrumento essencial de interpretação cosmológica, promovendo uma continuidade entre a ciência, a espiritualidade, o Sagrado e a experiência sensível do tempo, onde a luz celeste opera como um elemento de ligação tangível entre a Terra e o céu.

Palavras-chave:

Arquitectura, Património Astronómico, Espiritualidade, Céu, Luz.

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Abstract:

In addition to being a tangible phenomenon, light is a fundamental symbolic and spiritual element of architecture, capable of shaping atmospheres, stimulating sensory experiences and establishing a link between the built environment and the *cosmos*. The present essay explores the interaction between architecture, light and spirituality in the context of astronomical heritage, highlighting how ancient societies used light in architecture as a mediating element between human beings and the *cosmos*. Through the exploration of various cases of architectural astronomical heritage, this essay aims to understand how the use of light in architecture reveals itself as an essential instrument of cosmological interpretation, promoting a continuity between science, spirituality, the Sacred and the sensitive experience of time, where celestial light operates as a tangible link between the Earth and the sky.

Keywords:

Architecture, Astronomical Heritage, Spirituality, Sky, Light.

1. Introduction.

When we talk about a sense of spirituality in architecture – the possibility of creating places capable of evoking a sense of transcendence and connection with our being, with a higher power or purpose – we understand that there are several design variables that directly influence this experience. As such, regarding astronomical heritage – «the material evidence relating to astronomy and to social uses and representations of astronomy»¹ – and the design variables that are essential for producing the spiritual experience of architectural astronomical heritage, let's look at light and shadow, an architectural characteristic that has been extremely important throughout history. Light offers visibility to our world, and since the creation of the first examples of architecture, the control of light and shadow has been a common practice for the manipulation of the built environment and as a means of transcending its materiality in favour of defining a symbolic link between human beings, the *cosmos* and the Sacred; because the Universe, like everything in it, presents itself as «a vast light show, a vast show of light showing the mysterious divine light»².

In this context, this essay seeks to explore how light and shadow reveal themselves to be one of the fundamental variables in the spiritual experience of architectural astronomical heritage. These structures demonstrate

¹ M. Cotte, C. Ruggles, *Introduction*, in *Heritage Sites of Astronomy and Archaeoastronomy in the Context of the UNESCO World Heritage Convention: A Thematic Study*, International Council on Monuments and Sites, International Astronomical Union, Paris 2010, p. 2.

² J. Turrel, *Works with Light: Seeing the Light That Does Not Illuminate*, in *Arts of Wonder: Enchanting Secularity*, University of Chicago Press, Chicago 2013, p. 103.

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humanity's desire to understand its presence and position in the vast and unknown Universe, and since time immemorial human beings have used light and shadow as a strategy for dialogue between architecture and the *cosmos*, creating places that promote a deep connection with the world and with the cycles of the Earth and the sky. Therefore, by resorting to a multidisciplinary approach based on methods such as theoretical analysis, literature review and the interpretation of historical evidence, we offer a hermeneutic potential that helps us to understand how light and shadow reveal themselves as a variable capable of transmitting a sense of spirituality to human beings through various cases of architectural astronomical heritage; since we believe that these monuments, their motivations and especially their presence in the territory and in the terrestrial and celestial landscape have always supported an essential spiritual function for the human understanding of the *cosmos*.

2. Light, shadow and architecture.

It is through vision that we feel light most intensely, our eyes evolved because there was light; through it we «touch the Sun and the stars», truly revealing itself as a manifestation of «the cosmic breathing of space and the Universe» that connects human beings to the cosmic dimension of life and architecture³. This is not surprising if we consider that the Sun – together with the Moon and the other celestial bodies – is the source of natural light, acquiring a cosmic, Sacred and spiritual symbolism. Since the Sun is responsible for the fertility of the Earth, the passage of time

³ J. Pallasmaa, *Light, Silence, and Spirituality in Architecture and Art*, in *Transcending Architecture. Contemporary Views on Sacred Space*, Catholic University of America Press, Washington D.C. 2015, p. 23.

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and the illumination of the world, natural light is closely linked to the flourishing of life and has therefore been used as a symbolic representation of «being, order, justice, authority, truth» and the Sacred⁴.

It is in this sense that light, as a substance perceived by vision, is interpreted as a manifestation of a superior or divine presence; it is a pure symbol of life and subsistence, as well as an element of purification and exaltation capable of transforming a physical space into a place properly evocative of the *cosmos* and of a sense of transcendence. In this way, we can see that light reveals itself as a mediator of the Sacred and of a spiritual experience of architecture; light is, according to Lobell, «the giver of presence» of architecture, is «this prevailing luminous source» that «can be visualized as becoming a wild dance of flame that settles and spends itself into material»⁵.

On the other hand, light establishes various relationships with the built elements on which it falls, and together with shadow – which appears as the opposite of light – plays an essential role in the visual composition of architecture. In this context, light and shadow are entirely responsible for revealing the geometries, volumes, textures, depth and other characteristics of the built environment. Therefore, as elements that give the third dimension to spaces and objects in the world, light and shadow stand out as fundamental elements for revealing the forms of architecture and places created by human beings. In this way, we can see how light can only exist as long as it creates shadow, which is responsible for generating a fundamental contrast for defining

⁴ M. Steane, *The Architecture of Light: Recent Approaches to Designing with Natural Light*, Routledge, New York 2011, p. 2.

⁵ J. Lobell, *Between Silence and Light: Spirit in the Architecture of Louis I. Kahn*, Shambhala Publications, Boston 1979, p. 20.

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the spatiality of architecture, providing – in parallel with light – a dynamic experience of architectural space. We are faced with an active and meaningful duality, as the «interplay of light and shadow» is capable of subtly connecting architectural space to «the dynamics of the physical and natural world, the seasons, and the hours of the day»⁶. Symbolically, shadow emerges as a representation of the unknown, mystery, silence, and emptiness; however, it also embodies a sense of protection and introspection, being used to create spaces of refuge, contemplation, and rest, where the absence of light allows human beings to take a pause from their surroundings, immersing them in a sense of reflection.

Consequently, as fundamental elements for vision and for the perception of space delimited between the Earth and the sky, light and shadow are not merely physical elements, but powerful symbolic tools that shape the human perception of space, contributing significantly to the definition of architectural atmosphere. Every «landscape and setting, space and place, has its characteristic light» that defines it, and this is often interpreted as the characteristic that most directly conditions the atmosphere of the architecture and the human state of mind in relation to a particular place⁷. In this way, we understand how light plays an elementary role in defining the atmosphere of architecture, and as such, it is generally regarded as one of the most comprehensive elements in determining its emotional character, being capable of profoundly influencing the temperament of the human being. In other words, by interacting with the physical

⁶ J. Pallasmaa, *Light, Silence, and Spirituality in Architecture and Art*, cit., p. 23.

⁷ *Ibidem*.

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and material elements that make up a particular place, light transforms the human perception of it, inevitably giving it a unique and singular emotional meaning. Through architecture, light «can also produce feelings of comfort or discomfort, depending on its intensity, and whether one gradually approaches the luminous or is abruptly plunged into darkness»⁸. In this context, we can see how light can provoke the most varied sensations in human beings: the soft, faint, diffused light of a winter's morning evokes a sense of serenity and introspection, while the intense, powerful light of a summer's day induces a feeling of vitality and energy; the rays of the Sun attract attention and provoke a sense of revitalization, while the beams of starlight in the night sky incite a sense of mystery, fascination and wonder. Therefore, as Pallasmaa states, light is «surely the most subtle and emotive of the means of architectural expression» and «can express equally delicate and deep emotions, ranging from joy to melancholy, ecstasy to grief, bliss to sorrow»⁹.

In turn, in the context of archaeoastronomy, light plays an important role as a symbolic, functional and ritual element rooted in the very interpretations of the *cosmos* by ancient and traditional societies. This symbolism is based on the main sources of natural light: the Sun, the Moon and the stars; and in this context, the *cosmos*, in all its multiplicity, is totally conceived as an overflow of light from the celestial bodies, a divine emanation that proceeds from itself. But natural light doesn't just create things, it does so for the purpose of enabling them, in their existential journey, to

⁸ T. Barrie, *The Sacred In-Between: The Mediating Roles of Architecture*, Routledge, London 2010, p. 45.

⁹ J. Pallasmaa, *Light, Silence, and Spirituality in Architecture and Art*, in *Transcending Architecture. Contemporary Views on Sacred Space*, Catholic University of America Press, Washington D.C. 2015, p. 23.

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return to the transcendent source from which they came, a return that happens through a process of unification with divine light, since «everything is indeed illuminated – and, even more, illuminating: both shining like light and enlightening us»¹⁰.

Furthermore, in the various examples of architectural astronomical heritage, natural light was constantly manipulated by human beings to mark specific moments of the year, such as the solstices and equinoxes, symbolizing the passage of time and the connection of the cycles of the celestial plane with the terrestrial plane. This is exactly why light has always linked architecture to the dynamics of the physical and natural world, marking «the passage of time from the changes of seasons to the daylight hours of the day»¹¹. The changes in the intensity and orientation of light throughout the day and year symbolized the natural cycles and rhythms of the Earth and the *cosmos*, linking architecture to a wider, universal and cosmic context. As such, given its connection to the cycle of the seasons, we can see how the symbolism of light is also related to fertility and the regeneration of nature, being an essential source of heat and energy for agriculture. This factor reinforces its symbolic association with the continuity and revitalization of life and the prosperity of human societies and communities, since light reveals itself as a symbol of eternal life, in contrast to the shadow that represents the domain of darkness and death. Therefore, we can now see how light is interpreted as the ultimate expression of the universal order of the world, of the cycles of the *cosmos* and of the passage of time.

¹⁰ J. Turrel, *Works with Light*, cit., p. 102.

¹¹ P. Tabb, *Thin Place Design: Architecture of the Numinous*, Routledge, New York 2023, p. 74.

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Having said that, it will now be important to realize that light and shadow are revealed as mediating elements between the physical world and the spiritual realm – between the Earth and the sky –, playing an elementary role in the production of places that stimulate both a sensory and ontological experience of architecture and the definition of an atmosphere that facilitates a sense of introspection, meditation and connection with the Sacred. However, it is relevant to note that the interaction of light and shadow in architectural space also leads to the creation of powerful and suggestive *hierophanies* capable of evoking a sense of transcendence, which can often be found in many cases of architectural astronomical heritage.

3. The worship of the Sun and the *hierophanies* of light.

Regarding light and shadow as a transformative element in architecture and as a variable of the spiritual experience of the various examples of architectural astronomical heritage, let's now look at the *hierophanies* of light. In fact, *hierophanies* of light play a fundamental role in countless cases of architectural astronomical heritage, reflecting a link between architecture, astronomy and the symbolic and cultural dimensions of ancient and traditional societies. According to Eliade, the concept of *hierophany* means the manifestation of the Sacred¹²; and as such, these phenomena, which consist of a process of manifestation of the Sacred through the interaction of natural light with architecture at specific moments of the cycle of the celestial vault, are a tangible testimony of the astronomical knowledge, spirituality and the cultural and symbolic

¹² M. Eliade, *O Sagrado e o Profano: A Essência Das Religiões*, Livros do Brasil, Lisboa 1983, p. 36.

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practices of human civilizations. From a cultural and symbolic point of view, *hierophanies* of light give architecture a sense of sacredness and collective identity, and are often associated with founding myths, religious or spiritual narratives and cultural traditions, which can transport human consciousness to a sense of the Sacred. When light is manipulated to create moments of visual and emotional impact, it reinforces the link between architecture, the celestial plane and the transcendent realm of our reality, turning this interaction into a unifying symbolism capable of externalizing both cultural values and spiritual principles throughout space and time.

In this context, we can see how *hierophanies* of light have a unique importance for the spiritual experience of architectural astronomical heritage, and throughout history, many monuments have been designed to capture the light of specific astronomical events, such as the solstices and equinoxes. Of these cases from antiquity, more specifically in the context of megalithic monuments, no example has proved as remarkable – and even «magical» – in the creation of *hierophanies* of light as Newgrange. In Newgrange, as identifies by O'Kelly, the rays of the rising Sun pierce the entrance of this monument during the winter solstice until they rest on a megalith carefully decorated with the engraving of a triple spiral – or triskelion – in its central inner chamber. During the winter solstice, the Sun's rays align with the entrance to the corridor of this monument, projecting a beam of light through the *roofbox* that crosses the 19 metres of the narrow Newgrange passageway and illuminates the clover-shaped inner chamber for around 17 minutes – which is believed to have functioned as a sanctuary, having been used to perform rituals related to the passing of the seasons,

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the cult of the dead and of the celestial bodies. In fact, this majestic *hierophany* of light occurs due to the monument's careful orientation towards the sunrise during the winter solstice and due to an opening – the *roofbox* – at the top of the Newgrange entrance: «a stone conduit or duct, designed to enable entry of the Sun's light from the exterior of the monument to its interior»¹³; and as such, for a moment, half of Newgrange's inner chamber «would have glowed in stunning sunlight while the other half remained dramatically dark».¹⁴

Professor O'Kelly reports that he stood alone in the dark chamber on December 21, 1967, waiting to see if anything would occur. He was amazed to watch as minute by minute, the long chamber grew lighter; then a bright ray of light entered the roof box and traveled down the passage "lighting up everything as it came until the whole chamber – side recesses, floor and roof six meters above the floor – were all brightly illuminated."¹⁵

In recent years, numerous suggestions have been put forward regarding the meaning of this Newgrange phenomenon, which not only demonstrates an understanding of celestial movements on the part of the communities that built it, but a clear concern to incorporate the cycles of the celestial plane into architecture; transcending the mere astronomical event in favour of exalting a human connection with the *cosmos* and with the cycles of the Earth and the sky.

¹³ R. Hensey, *Rediscovering the Winter Solstice Alignment at Newgrange, Ireland*, in *The Oxford Handbook of Light in Archaeology*, Oxford University Press, Oxford 2022, p. 144.

¹⁴ E. Krupp, *Skywatchers, Shamans & Kings: Astronomy and the Archaeology of Power*, John Wiley & Sons, New York 1997, p. 139.

¹⁵ M. Dolan, *Decoding Astronomy in Art and Architecture*, Springer, Cham 2021, p. 55.

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Additionally, in Newgrange, the connection between sunlight and architecture seems to have had something to do with the revitalisation of the world. As Krupp suggests: «The sunlight and the tomb may have had something to do with revivifying the world, or perhaps the light just put life into the spirits of the dead and made them available for consultation»¹⁶. However, whatever the special significance of this *hierophany* of light may have been, it seems obvious to us that it would have been of enormous importance to the Neolithic peoples, especially in terms of exalting the symbolic link between life, death and the cycles of the celestial vault; acting as a tangible expression of man's cosmological and spiritual conceptions, consolidating this monument as a place of convergence with the Sacred. Furthermore, we understand how in the imagination of Neolithic communities, the Sun played an essential role directly related to fertility, renewal and the cycle of life, death and rebirth, and as such, the subtle entry of sunlight into this burial tomb can be properly interpreted as a powerful and suggestive metaphor symbolising the continuity of life after death, as well as the fertility of the Earth. In a certain way, we are dealing with a metaphorical process of fertilisation of the earth's plane, because when we enter the interior of this funerary tomb, the sunlight symbolically acts as the seed that causes Mother Earth to germinate, guaranteeing the prosperity and vitality of the lives of our fellow human beings and nature. Therefore, in Newgrange, the momentary presence of this *hierophany* of light during sunrise on the winter solstice speaks directly to us about the cycle of renewal of the Earth and of the veneration of the Sun; it is «the story told by Mother Earth», who, «with a little help from the sky», gives us a clear

¹⁶ E. Krupp, *Skywatchers, Shamans & Kings*, cit., p.140.

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message about the revitalisation of the world, about the rebirth of the solar year, of life, and about the renewal of the cycles of the *cosmos*¹⁷.

In this way, we can understand how the presence of *hierophanies* of light in megalithic monuments illustrates a deep integration between astronomical knowledge, symbolic expressions, cosmological and spiritual practices that reflect the cultural complexity of prehistoric societies and their ability to conceive space and time as inseparable dimensions of the experience of the Sacred. These *hierophanies* can be found in countless cases of megalithic monuments beyond Newgrange, namely the funerary tombs and in the prehistoric temples of Malta, as in the case of the Temple of Mnajdar, which, similarly to Newgrange, uses the light of sunrise – but during the spring and autumn equinoxes – as a strategy for creating an atmosphere that carries an immense symbolic charge, reinforcing the sacredness of this place while, at the same time, giving it an exceptional character as a threshold point between the world of the living and the dead, thus acting as a place of connection between human beings, their ancestors and the *cosmos*; a factor that reinforces the symbolism of light as the most powerful of all forces, because in its presence all darkness fades away.

In turn, given the importance of light, especially as an element capable of giving architecture a spiritual atmosphere, we can also see how these *hierophanies* have been developed over space and time in countless cases of architectural astronomical heritage. Another case where we can find the presence of this light phenomenon is the Temple of Ramses II at Abu Simbel in Egypt, built during the reign of the pharaoh Ramses II. According to Krupp – and taking into

¹⁷ *Ivi*, p. 141.

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account that the political and religious power of Ancient Egypt was deeply linked to the cycles of the celestial vault –, the main axis of the Temple of Ramses II at Abu Simbel was carefully planned by the ancient Egyptian architects so that on 22 October and 22 February, the rays of sunlight could enter the temple and illuminate a chamber that housed the statues of Amun-Ra, Re-Horahkty and Ramses II, leaving only the figure of Ptah, a chthonic god directly linked to the realm of the dead, in the shadow.¹⁸ In other words, during dawn on these days of the year – dates that are believed to coincide with the birth and coronation of Pharaoh Ramses II, along with the heliacal rising of the star Sirius in the sky –, the Sun's rays penetrated the entrance to this sanctuary and progressively illuminated the temple corridor until they reached, for approximately 20 minutes, its inner chamber located around 60 metres from the temple's main entrance and where you can find the statues of the gods mentioned and the statue of Pharaoh Ramses II¹⁹. In fact, the illumination of these statues with sunlight is not just a remarkable architectural feat, but a tangible manifestation of the connection between the pharaoh and the divinities, reaffirming his divine legitimacy as an intermediary between the earthly plane and the domain of the gods. In this context, we now understand how this phenomenon of light in the Temple of Ramses II at Abu Simbel symbolises the relationship between the Earth and the sky; being this relationship emphasised through this *hierophany* of light,

¹⁸ E. Krupp, *Light in the Temples*, in *Records in Stone: Papers in Memory of Alexander Thom*, Cambridge University Press, Cambridge, Mass. 1988, p. 483.

¹⁹ G. Magli, *The Beautiful Face of Ra: The Role of Sunlight in the Architecture of Ancient Egypt Giulio*, in *The Oxford Handbook of Light in Archaeology*, Oxford University Press, Oxford 2022, p. 274.

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which duly promotes the pharaoh's connection to the solar deities – a factor that reinforces his legitimacy and divine power down here on Earth.

An astonishing ambience is generated in the temple of Abu Simbel in late February and late October, on the dates when the Sun penetrates into the deep sanctuary of the temple to illuminate the figures of the king and the solar divinities, Amun and Re-Horahkty, leaving in darkness the image of Ptah, god of the underworld.²⁰

This luminous phenomenon in the Temple of Ramses II at Abu Simbel is a unique example of the creation of *hierophanies* of light through the mastery of the cycles of the Sun and architecture, which plays a central role in expressing the sacredness of the place and in the communication of its spiritual significance. Therefore, as Magli states, this *hierophany* of light can be interpreted as the determining factor that governed the planning of the temple's entire architecture²¹. This phenomenon can be observed in other examples of ancient Egyptian architecture, such as the Temple of Amon-Rah in Karnak, where the alignment of the temple towards the sunrise in the winter solstice allows the sunlight to be appreciated over the main axis that organises the temple's architecture, while at the same time making it possible to create a *hierophany* of light when the rising Sun aligns itself with this axis before beginning its progressive ascent into the sky. Furthermore, we should note that the symbolism of the *hierophany* of light in the Temple of Ramses

²⁰ J. Belmonte, *Ancient Egypt*, in *Heritage Sites of Astronomy and Archeoastronomy in the Context of the UNESCO World Heritage Convention: A Thematic Study*, International Council on Monuments and Sites, International Astronomical Union, Paris 2010, p. 124.

²¹ G. Magli, *The Beautiful Face of Ra*, cit., p.275.

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II at Abu Simbel – just like in the Temple of Amon-Rah at Karnak – is still intrinsically linked to the cosmology, worldview and calendars of Egyptian civilisation, since the Sun, the celestial cycles and the cycles of the seasons – and of nature – played essential roles in defining the spirituality of the people of Ancient Egypt and in the legitimisation of the political and divine power of the pharaoh himself – which were ultimately manifested through architecture.

In addition to these examples, it is also worth mentioning the case of the El Castillo in Chichén Itzá, in particular its *hierophany* of equinoctial light and shadow which is suggestively called «the descent of Kukulcan»; an astronomical phenomenon that occurs during the spring equinox. In truth, the architecture of the El Castillo was designed to create an effect of light and shadow that simulates the descent of the god Kukulcan to Earth. This *hierophany* occurs when the sunlight falls on the north staircase of the temple at dusk, projecting seven triangles of light and shadow that align with the sides of the balustrade, thus creating the shape of a serpent that descends from the top of the temple to its base²². In other words, as the sun descends from the sky and approaches the horizon, the luminous triangles create an illusion of movement, conveying the impression that the figure of the serpent is descending from the top of the pyramid, from the sky, towards the earth, where we can find the sculpture of a serpent's head embedded in the temple itself. As such, it is important to realise that this phenomenon is not just a simple architectural

²² I. Montero García, *La Astronomía En Mesoamérica*, iTiO Ediciones, Naucalpan 2022, p. 123.

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and astronomical spectacle, but an event deeply charged with symbolic, spiritual and cosmological significance.

In the equinox season, an undulating, luminous profile forms from seven triangles of sunlight on the north side of the Pyramid of Kukulcan as the sun approaches the western horizon. The head of a feathered serpent, sculpted into stone at the bottom of the stairs, turns the display into a descending snake [...].²³

We can certainly see how this *hierophany* of light and shadow at El Castillo reflects the cosmology and worldview of the Mayan civilisation, thus underpinning the notion that the cycles of the celestial vault and the phenomena of the Earth were intimately interconnected and subordinate to the divine and transcendent realm of the gods – transforming this event into an instrument of revelation of the Sacred. Therefore, the *hierophany* of light and shadow of the «the descent of Kukulcan» can be interpreted as the subtle union between the earth and the sky, between human beings and the gods, and between the mundane reality of our earthly life and the transcendent and sacred domain of the sky. In this way, this phenomenon of light and shadow underlines the Mayan belief in the harmony of the *cosmos* and the need to synchronise human activities with the forces of the world. Furthermore, this *hierophany* of light and shadow can be understood as a divine blessing that guarantees the fertility of the Earth and the prosperity of the community – as at Newgrange – and as a reaffirmation and confirmation of the political and religious power of the elites of the Mayan civilisation – as in the Temple of Ramses II at Abu Simbel –, who possibly used this manifestation of the Sacred to

²³ E. Krupp, *Skywatchers, Shamans & Kings*, cit., p.268.

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legitimise their authority, which, through these phenomena, was allegedly mediated by a privileged connection with the gods.

4. Light and the passage of time.

Regarding the relevance of light and shadow in the spiritual experience of architectural astronomical heritage, it is also important to address a factor directly linked to the conception of the *cosmos* by ancient and traditional societies, the keeping of time and the respective calendaring and marking of the cycles of the Earth and the sky. Many of the cases of architectural astronomical heritage that we have mentioned are related to the dimension of time, a factor that is not at all surprising if we take into account, as Pereira states: «*that most of the time, archaeoastronomy has to do with systems of knowledge, which were aimed at establishing calendars, interpreting the cosmos, maintaining “order” in terms of sacred power or sacralised “temporal” power (pre-monarchies or sacred monarchies)*»²⁴. As such, let's note that time can be mapped through the control of light in architecture, and this element has often been used in countless monuments and sacred spaces throughout history to properly express the presence and flow of time.

So, let's now see that in the context of architectural astronomical heritage, *hierophanies* of light also function as temporal markers, playing an essential role in defining and organising human activities in the world. It is through light that we perceive time, which can be described and understood through the changes in natural light, as we can see through the alternation between day and night or through the

²⁴ P. Pereira, *Lugares Mágicos de Portugal: Espírito Da Terra*, Temas e Debates, Lisboa 2010, p. 67. T.d.A.

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changing positions of the Sun according to the seasons. Therefore, the control of light through architectural space, particularly for ancient and traditional societies, served as an element that properly indicated the seasonal cycles of the Earth and the sky, guaranteeing, by linking the scientific and spiritual aspects of light, the definition of a constant continuity between human beings, architecture and time – especially with the conception of cyclical time.

As such, we can see how many of the orientations and alignments of the examples of architectural astronomical heritage are directly related to the concept of the cyclical time – a conception or interpretation of time as a continuous process marked by a series of cycles that repeat themselves as part of a pattern without a concretely defined beginning or end. As Dolan points out, this feature provides us with concrete evidence that these architectures could have served as «calendar markers» and as places for performing seasonal rituals directly linked to the world's cyclical events and «their cosmic connections»²⁵. In fact, most human beings are naturally familiar with some basic examples of cyclical time, such as the passing of the seasons, the cycle of the Sun's movement, the phases of the Moon, the 24 hours of the day, the 12 months of the year, the female reproductive cycle, the cycles of agriculture and nature, *et al.*. In this sense, we realise how the activities of observing and contemplating the sky were a fundamental factor in defining the individual and collective identity of ancient and traditional societies. However, these activities were also related with the measurement and control of the passage of time and with the phenomena of the sky, serving as a fundamental element for:

²⁵ M. Dolan, *Decoding Astronomy in Art and Architecture*, Springer, Cham 2021, p. 4.

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the delimitation of calendars that were linked to a variety of religious, spiritual and agricultural rituals and celebrations; the definition of beliefs about the human vision of the world; the structuring of historical and mythological narratives; and the creation of strategies for organising space and the cultural and social activities of human communities.

This link between Time and architectural astronomical heritage can be seen from the earliest days of civilisation, especially in the case of megalithic monuments. Stone circles such as Stonehenge or Avebury were remarkably orientated around the light of the Sun, with light serving as a symbolic element that acted as the source of the fundamental energy of life and subsistence for the Earth and human beings. As Ruggles states, Stonehenge's connection with the winter and summer solstices, and in turn with sunlight, should be clearly understood in symbolic terms²⁶; because such symbolism supports the idea of this monument's connection to the annual cycles of the Earth and the sky, portraying a series of seasonal activities related to fertility, the success of harvests and the connection of our fellow human beings to the dead and their ancestors – activities that are deeply related to the passage of time. In this regard, Stonehenge can be understood as a mediation device between human perception and the cosmic rhythms of light and time – as an attempt to understand and control time. Furthermore, its construction reflects a conception of time that transcends mere chronological counting, incorporating ritual and symbolic elements to the extent that this monument involves – through its architecture – a clear understanding of the

²⁶ C. Ruggles, *Later Prehistoric Europe*, in *Heritage Sites of Astronomy and Archaeoastronomy in the Context of the UNESCO World Heritage Convention: A Thematic Study*, International Council on Monuments and Sites, International Astronomical Union, Paris 2010, p. 34.

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cyclical passage of time, which is based on the natural patterns of the *cosmos*; symbolically acting as a «cosmic clock» that, through the light of the Sun, unites the human being with the cycles of the Earth and the sky.

Furthermore, we should note that at Stonehenge, light and time interact with human beings in a deeper and more meaningful way; an interaction that is closely linked to the cycle of life and death. In fact, archaeological research has revealed that this monument was used, in part – like funerary tombs such as Newgrange or even megalithic temples such as Mnajdra – as a place for the burial of the dead from its earliest stages, thus assuming, according to Ruggles, as «“houses” for the dead»²⁷. In this context, the association between light and Time suggests that Stonehenge functioned as a liminal space where the living honoured the dead and strengthened ties with their ancestors – a common practice in the more everyday activities of ancient prehistoric peoples. Therefore, the union between the cycle of light and time in this monument also symbolises the perpetual cycle of life and death, ensuring that the dead were not forgotten, but integrated into the very cosmologies of ancient and traditional peoples, where time was inevitably interpreted as a continuous flow marked by birth, death and rebirth. In addition, the purposeful alignments of this monument at the time of the winter and summer solstices may have acted as a strategy to honour the ancestors and ritualistically mark time through light and, in turn, the shadow cast by it. During the solstices, sunlight «bathes» the stones in a particularly dramatic way, creating a spectacle that reinforces the sacredness of this place and the symbolic presence of the

²⁷ *Ivi*, p.35.

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dead – giving them an eternal resting place that was synchronised with the rhythms of the *cosmos*.

In a certain way, we are dealing with an experience of the *terror of time*, which, according to Harries, presents itself as a universal and eminent fear of human mortality – of the eventual end of life, of oblivion and, in fact, of the end of everything that has been done by human beings – and architecture is seen as one of the most concrete ways in which mankind can deal with this constant fear²⁸. As such, in the specific context of Stonehenge, this connection between light and time not only celebrates the union between the living and the ancestors, but also expresses a sense of pacification and comfort for human beings with the idea of death through the continuity of life and their harmonisation with the cycles of the *cosmos* – it is, in a certain way, a *sublime* experience of time.

[...] as long as we remain unable to make our peace with the fact that we grow older and sooner or later must die, remain unable to make our peace with the passage of time, we also will be unable to make our peace with all that bind us to time – with our bodies, for example, with our sexuality, and with the setting of the sun, with the coming of winter, and with the earth, which so often withholds its gifts.²⁹

However, we should also note that the link between light and time is not limited to megalithic monuments, especially if we take into account that the very link between the various cases of architectural astronomical heritage and the

²⁸ K. Harries, *Building and the Terror of Time, Perspecta* (19). 1982, pp. 58-60.

²⁹ K. Harries, *The Ethical Function of Architecture*, MIT Press, Cambridge, Mass. 1998, p. 160.

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phenomena of the celestial vault – namely their alignment with the cycles of the sky – already represents an attempt to understand and control time through architecture; as we can see in examples such as the Pantheon in Rome, El Castillo, El caracol, Angkor Wat and the Jantar Mantar in Jaipur. In fact, this link between light and time can be achieved through the simplest of built elements, such as *sundials*, *gnomons*, *obelisks* and other objects that help human beings assimilate time and its passage. However, there are other examples of architectural astronomical heritage that deal with the relationship between light, shadow and time in a more direct and obvious way, these are the specific cases of the churches with meridian lines.

The link between light, time and the churches with meridian lines is directly related to calendar reasons and the spring equinox, which arose from the need to regularise the moving day of Easter. As Pereira points out, Easter – which is related to the resurrection of Christ and takes place «a couple of days after Pesach (the Hebrew Passover)» – falls on the first Sunday after the first full Moon following the spring equinox, and this calendar and astronomical event is «fundamental to the Christian Church», having been defined in 1325 that the spring equinox occurred on march 21, and this date was «locked in», even if that wasn't the reality, since the date of the equinox changed as time went on, thus revealing itself as an «astronomical fiction», as a mere reference date ³⁰– at the very least, it is the «equinox» as the middle day between solstices, and not the true «astronomical equinox». In this context, we understand that the implementation of meridian lines in Christian churches –

³⁰ P. Pereira, *Arte e Ciência: A Descrição Do Cosmo*, Círculo de Leitores, Lisboa 2019, p. 154.

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which consist precisely of lines demarcated on the church floor to represent the local meridian, i.e. the imaginary line that links the North and South cardinal points passing through the zenith of the observer himself, – is presented as a strategy for marking out space and as a direct link between the phenomena of the sky and the experience of the Sacred, using light and time as concrete elements for defining the most important dates in the ecclesiastical calendar, for marking out religious ceremonies and for delimiting the times of the rituals of Christian worship.

The meridian, as it is modernly understood, essentially serves to measure time. However, it can be considered that the establishment of meridians was a way of *organising space* and determining its cosmic orientation, *guiding it* – that is, indicating North and the North Star – and marking midday – the precise point at which the Sun shines vertically on a given point, crossing the meridian without casting a shadow. This is where the central *gnomon* is erected, which functions simultaneously as the *navel of the world*, the *omphalos*, the “official” place of observation of the Sun and the “centre of the world”. It is probable that the establishment of political “centres”, sacred centres too, was one of the first ways of measuring time and terrestrial space, as elementary forms of geodesy.³¹

From an architectural and symbolic point of view, the use of light in the meridian lines in churches united science, faith and time, transforming these sacred spaces into places of scientific research and spiritual contemplation. Moreover, as Heilbron states, it was this calendar interest, the interest in

³¹ P. Pereira, *Lugares Mágicos de Portugal: Espírito Da Terra*, Temas e Debates, Lisboa 2010, p. 73. T.d.A.

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the passage of time itself and the definition of Easter Day, that led to the installation of meridian lines by astronomers and mathematicians in countless Christian churches³²; from the Renaissance to the Enlightenment – especially in Italy – such as in the Palermo Cathedral, in the Cathedral of Santa Maria del Fiore, in the Cathedral of Milan, in the Basilica of San Petronio, in the Basilica Santa Maria degli Angeli and – in the French context – in the Church of Saint-Sulpice. Indeed, the precision required to build the meridian lines and place the gnomons in these churches reflected a deep astronomical and mathematical knowledge, as well as a careful interaction with the spiritual and practical dimensions of time itself; and as such, the entry of light at the top of these Christian temples and its projection on the meridian lines can be symbolically interpreted as an ultimate connection with the divine, with the passage of time and as a union between the Earth and the sky – as well as a tangible connection between the terrestrial plane and the «Christian Heaven». In this way, the churches with meridian lines stand out as testimonies of the human ingenuity and the quest to understand the *cosmos* within a context of spirituality, celebrating the human capacity to decipher the laws of creation and, at the same time, to recognise the transcendent nature of light and time – elements that transcend human existence and transport it to something eternal, divine and ultimately Sacred.

5. Final considerations.

In the context of architectural astronomical heritage, we can see that light and shadow are essential characteristics

³² J. L. Heilbron, *The Sun in the Church: Cathedrals as Solar Observatories*. Harvard University Press, Cambridge, Mass 1999, pp. 3-5.

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for defining the spiritual experience of architecture. Phenomena such as those we observed in the cases explored throughout this essay illustrate how light, especially sunlight, meticulously integrated into architecture, becomes a powerful means of manifesting the Sacred. In fact, these interactions between light and architecture went beyond their mere utilitarian or aesthetic function in favour of the affirmation of complex cosmological representations that reinforced the sacredness of these architectures and their symbolism as places of connection between the Earth and the sky. Whether as a metaphor for renewal and fertility, as a symbol of the connection between human beings and the divine, or as mechanisms for perpetuating and legitimizing political and religious power, *hierophanies* of light gave architectural astronomical heritage a transcendent and spiritual dimension.

Consequently, as manifestations of the Sacred resulting from the interaction between light and architecture, these *hierophanies* can be seen as structuring phenomena of the spiritual experience of architectural astronomical heritage. These phenomena not only reflect an advanced knowledge of the rhythms of the Earth and the sky, but also the cosmological, spiritual, and cultural conceptions of the civilizations that built them. Additionally, through these cases, we can also see how light and architecture, can establish an intrinsic relationship with time. By marking the movement of the celestial bodies and the succession of the seasons, light acts as a mediating, symbolic and functional element in the organization of these sacred spaces, helping human beings to define rituals and narratives that are essential for structuring their view of the world and their understanding of the *cosmos*. Furthermore, by uniting science, spirituality and

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art, these architectures reveal human ingenuity in exploring the mysteries of the world and the search for a greater meaning of our reality; and in this context, we can understand how the various cases of architectural astronomical heritage reveal themselves as a timeless testimony of the human desire to understand, control, preserve and celebrate the Sacred, the cycle of time, nature, and the *cosmos*, thus defining our experience as beings who dwell on the Earth and under the sky.

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