

Archaeoastronomy and Calendar Cities

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Abstract. The use of astronomy for collective purposes, both religious and political, is apparent in the earliest astronomical records, from the evidence for Palaeolithic lunar calendars to megalithic monuments and Mesopotamian celestial-omen reports. This paper will consider the application of the heavens to the organisation of the ‘Cosmic State’, the human polity modelled on the assumption of a close relationship between society on the one hand and planetary and stellar patterns on the other. I will also examine the foundation of Baghdad within the tradition of celestial town planning and argue that the city may be seen as a ‘talisman’, designed to connect heaven to Earth and ensure peace, stability and political success by harmonising time and space.

1. Introduction

In a previous paper I explored the notion of the modern ‘Calendar Building’ [1]. I am considering the ‘Calendar House’ as a genre of astronomical architecture to be a modern form of archaeoastronomy. As defined by Matthew Beckett,

The principle of the calendar house is that the number of external doors, windows or panes of glass, chimneys, or staircases or other elements should total either 4 (the number of seasons), 7 (days in a week), 12 (months in a year), or 365 (days in a year) [3].

In that such architecture (and its elements) is often aligned with the precise or general location of the setting or the rising of the Sun at key points in the solar year, or the solar calendar, I propose the designation ‘Calendar City’ to describe whole cities, rather than single buildings, designed to incorporate astronomical symbolism. Further, I consider the origins of the western tradition of ‘Calendar Architecture’ in the Near East.

2. Description of a calendar house

My key study was of the nineteenth-century family house, Avon Tyrrell House, which was designed and built in 1891-3 [2] as a large family residence in the New Forest, a little way north of Southampton in southern England. The house was the first building designed by William Richard Lethaby (1857-1931). My study of Avon Tyrrell House was prompted by the description of the building in a notice board in one of the main public rooms as a calendar house. The notice explained that the house includes 365 windows, one for each day of the year, fifty-two rooms, one for each week of the year, twelve chimneys, one for each month, and seven ground floor doors, one for each day of



the week. We are also told that 'the sun shines through every room'. The main bedrooms, including the original master bedroom, and the gardens therefore receive the maximum amount of Sun and light. Avon Tyrrell House may therefore be considered a modern 'solar' house.

2.1. *Theory of harmony*

The construction of the built environment in order to harmonise with, reflect, or embody the cosmos and/or sky appears to date to the earliest known architecture. For example, in the British Isles, where Avon Tyrrell House is situated, these design traditions date back to the Neolithic [4]. By creating spaces which were connected to the celestial bodies, it is believed that it was possible for ancient builders to create human communities which were linked to celestial referends, encouraging social stability and harmony. The evidence suggests that traditions of cosmic building appear to be as old as settled human life and, as Colin Renfrew said of Stonehenge, seem to represent a 'deliberate attempt to align the human society in question with the cosmos' [5].

Such ideas underpinned traditions of the foundation of cities from China, through India, the Middle East and Mesoamerica. The rationale can often be seen as reflective. Xiaochun Sun argued that in China, 'the universe was conceived not as an object independent of man, but as a counterpart of and mirror of human society' [6], while Trudy Griffin Pierce, talked of a 'patterned mirroring between sky and earth' [7] in native North American cosmology. And in Plato's *Republic* [8], Socrates argues that the city and the soul are structurally isomorphic so that individual, city and cosmos are all connected. The city then becomes what we might call a cosmogram, or cosmopolis, in which the inhabitants – and society as a whole – benefit because its institutions and behaviour are harmonised with the heavens in a reciprocal and harmonious relationship.

2.2. *Theory of power*

The relationship between astronomy and power is often treated as one in which those people in positions of authority apply their astronomical knowledge in order to control and manipulate those whom they control. As Steve McCluskey pointed out in relation to Mesoamerica, 'astronomical observation and knowledge were ... signs of sacred power and status' [9]. Clive Ruggles argued that 'from ancient Babylon to China, Mexico and Peru, from empire and city state to tribe, astronomical information was gathered and recorded and use by those interests lay as much in the spheres of status enforcement and political ideology as in predicting rainy seasons or planning agricultural schedules' [4].

Elaborating on this argument, and using the Precolumbian Mesoamerican application of the movements of Venus to regulate warfare, Clive Ruggles described the manner in which astronomical knowledge can function as 'a resource that can be brought to bear in support of the dominant ideology to reaffirm and reinforce the structures of a particular society' [10]. No doubt there is some truth in this perspective, and it resonates with the Gramscian theory of hegemony in which ideology rather than physical force serves as a tool of repression in the Gramscian sense. In terms of the theory of space, Deyan Sudjic encompasses this model of the world in his analysis of the phenomenon whereby powerful people construct monumental structures, including, of relevance to this paper, Saddam Hussein's reconstruction of Babylonian sites [11]. In this sense, monumental architecture is used as an instrument of state power, to reinforce a cosmology in which the leader is interposed between the mass of the population and their ability to control their destinies.

2.3. *The origins for Renaissance England*

Beckett argued that,

The genesis of the [modern] calendar house appears to have been in the intellectually fertile Elizabethan period when the elite of society revelled in the advances of science, mathematics and astronomy. They also had a great love of the "device" which in the 16th-century meant any ingenious or original shape or concept [12].

Elizabethan scholars were familiar with Platonic concepts that the world was constructed according to number and that number contained meaning and revealed time [13, 14]. One of the most famous astronomically and symbolically potent buildings of the late Elizabethan period was Tresham Lodge, built in 1594-5. This was a triangular construction designed according to the principles of the number three, probably, according to Girouard [14], with assistance from the Cambridge mathematician and astronomer John Fletcher. It is plausible that such a symbolically-aware milieu gave rise to the idea of the calendar house. The earliest known example of a calendar house is Knole House, in Kent in southeast England, dating from 1604, just a decade after Tresham Lodge; the calendar is represented through the building's 365 rooms, fifty-two staircases and seven courtyards. Renaissance Platonism was inspired by the translations of Platonic and Hermetic texts dating from the fifth century BCE to the fifth century CE, which brought Near Eastern and classical magical cosmology to fifteenth and sixteenth century Europe [15].

3. The ancient world

The earliest surviving accounts of the foundation of cities at astronomically auspicious moments date to the Near East of the first millennium BCE. The Assyrian emperor Sargon II (722-705 BCE) founded his new capital at Dur-Sharrukin on the auspicious day of the auspicious month. His successor Esarhaddon (681-669 BCE) reputedly re-founded Babylon at an astronomically auspicious moment. In the following century, Persepolis, the ceremonial capital of the Persian Achaemenid Empire of approximately 550-330 BCE, was conceived of as a calendar city. Paul Wheatley described it as follows:

With its acres of buildings, with a reception hall open on all sides to symbolize the diffusion of divine authority to the four quarters, and its triple wall, itself symbolic but further strengthened by symbolic defensive signs and enormous supernatural figures standing guard before its gates, with its sacred groves in stone, its man-headed and lion-slaying bulls, sphinxes and paws uplifted in adoration before the Tree-of Life, throne room scenes, and all-pervading symbolic emblems, Persepolis constituted a magnificent demonstration of abundance, the contribution of the Persian people to the maintenance of harmony between the heavens and the earth [16].

Such traditions were extended into the Hellenistic and Classical world. According to Appian, the foundation date of Seleucia, the capital of the Seleucid empire, was chosen by the emperor's *magi* [17]. Roman scholars were then deeply concerned with establishing the correct astronomical alignments at the foundation of Rome [18]. Recently studied examples of architecture in the Roman world which incorporate solar symbolism in design and structure include Nero's 'Golden House' [19] and the Pantheon [20]. There is also a widespread tradition, surviving only from the sixth-seventh century CE that the emperor Constantine founded Constantinople, his new capital, on the presumed astronomically significant date of 11 May 330 CE [21].

4. The Islamic world

Astronomy was intensively used in the Golden Age of Islam. Saliba enumerated many examples of the use of astronomy, including (1) the founding of the cities such as Baghdad in Iraq (762 CE) and al-Mahdiyya in Tunisia (921 CE); (2) the extensive use of astronomy by the vizier ibn Muqla (d. 935 CE) in building his house and meeting with the Caliphs al-Muktafi (r. 902-908 CE) and al-Qāhir (r. 932-934 CE); and (3); the timing of wars, an example being Abū Ma'shar advice to the caliph al-Mu'tamid (r. 870-892 CE) in his war against the Zang; and arranging proper times to declare heirs to the Abbasid throne [22].

The inauguration of the city of Baghdad in July 762 (145 AH) marked a seminal moment in the legitimisation of Abbasid power. The move of the capital city of the Islamic Empire from Damascus was a huge undertaking, initiated in 758 CE and involving around 100,000 labourers and

artisans [23]. It signified a break with the past and a new beginning which was conducted in conformity with astronomical alignments and the rules of astrological interpretation. It therefore provides a case study in the relationship between astronomy and political authority.

5. The astronomical foundation of Baghdad

Ibrahim Allawi's *Some Evolutionary and Cosmological Aspects to Early Islamic Town Planning*, published in 1988 [24] is the seminal study of the foundation of Baghdad as a calendar city, or cosmopolis. Allawi's thesis was based on the following assumptions: First, town-planning in the Islamic world was, in important instances, cosmological and, in this respect, based on pre-Islamic examples of which the most notable is Mecca (the Ka'aba being aligned with the spring equinox). Such planning has antecedents which may be traced back to Sumerian culture in the third millennium BCE. Second, there were two principal models of the Islamic cosmopolis: one was the city of Kufa, which had replaced Medina as the Islamic capital under Caliph Ali in 656 CE, and the other was Baghdad, founded as a replacement for Damascus in 762 CE under Caliph al-Mansur. When Al Mansur decided to create his new capital he intended it to be, as Allawi put it, 'the centre of a world empire of power and commerce, and the naval of the whole cosmos' [24]. Allawi identified various cosmological-numerological templates for urban planning, such as a quadruple system analogous to the cardinal points, and a hexagonal system identified with the many septenary systems in the ancient world, including the seven planets. He argued that the design of Kufa was essentially open and aligned, like Mecca, with the spring equinox. Baghdad, meanwhile, was essentially closed and, unusually, round, and envisaged as 'a grand cosmic astrolabe' [24]. Again, according to Allawi,

More relevant to our theme is the team of astronomers, astrologers and *muhandisun* to whom was entrusted the design of the city and the execution of the work. Translations of Ptolemy's *Almagest*, Indian astronomical treatises and Persian manuals were ordered by al Mansur [24].

Allawi concluded that the design of Baghdad 'cannot be separated from astronomy' [24]. He argued that the round city was divided into twelve sections and related to the great circles of the Universe, such as the tropics and the equator, as well as to the Sun's apogee and perigee [24]. The key to understanding Baghdad, then, is its solar nature.

However, for a full picture of the astronomical considerations behind Baghdad's foundation, the horoscope needs to be analysed. In order to ensure the best possible moment for his new capital's inauguration, al Mansur employed a committee of astrologers which, according to the chroniclers al-Yaqubi (d.897 CE) and al-Biruni (973-1048 CE), included Nawbacht the Persian, of whom little is known, Masha'allah whose work was to be influential both throughout the Islamic world and in medieval and Renaissance Europe, Umar ibn al-Farrukhan al-Tabari (known in Latin Europe as Omar of Tiberius), and al-Fazari, reputedly the first Arabic astronomers in the Islamic world [25].

Traditions of astronomical architecture became central to Islamic power and the construction of the 'Cosmic State', a polity in which astronomy is central to the functioning of the state. The most important city in Islamic Egypt after Alexandria was Fustat, on the site of modern Cairo. However, repeated rulers funded their own capitals. In 751 CE the Abassid prefect Abu'Aun decided to find his own base outside Fustat under the name al-Askar (the 'Cantonment'). Al-Askar flourished, and was noted for the beauty of its architecture. Al-Askar was succeeded followed by al-Qata'i (the 'Wards'), constructed by Ahmad ibn Tulun, who established de facto independence – autonomy under nominal Abassid suzerainty – for the first time since the Roman conquest. Ibn Tulun's son, Khumarawayh, installed in one of the city's parks 'an enormous pool filled with mercury: "The light of the sun, the moon, and the stars reflected on this amazing lake to produce an extraordinary effect" [26].

The Fatimid dynasty emerged in Syria in the tenth century. Claiming descent from Fatima, Mohammed's daughter and the wife of Ali, from whom Shia Islam derives its authority, the Fatimids were followers of Ismailism, a form of revolutionary millenarianism which was founded in the ninth century and prophesied the coming of the Mahdi. Ismaili propaganda was particularly effective in

Tunisia, where Ubayd Allah- al-Mahdi was recognised as the Imam, the Commander of the Believers, in Qayrawan, in 910 CE [26]. In 915 CE Ubayd Allah founded the city of Mahdiyya on the Tunisian coast in order to escape Sunni opposition in Qayrawan. Qayrawan had two palaces, 'one for the caliph with entrance facing west, and one for the heir to the throne, facing east' [26]. Later, in 969 CE, the foundation of Qahira (Cairo) was set for an astronomically significant moment [26].

6. Discussion regarding power and harmony

However, I wish to highlight a different perspective, in which those who occupy powerful positions in terrestrial society are themselves, along with the politically powerless, inhabitants of a wider cosmic state in which power is only achieved by harmonising with the wider cosmic environment. This is a perspective we can describe as astrological and it occurs in most societies.

In classical Greek cosmology this perspective is pronounced amongst the Platonists and Stoics, particularly in the requirement for 'virtue' on the part of rulers: the successful ruler was as bound by requirements of harmonisation with the cosmos as were his subjects and the oppressive ruler would ultimately be overthrown. The exercise of political power then lay in submission to a higher cosmic force. Virtue was simply defined as 'the state of mind which tends to make the whole of life harmonious' [27]. Diogenes Laertius summarised a fuller explanation from the Stoic philosopher Chrysippus (approximately 279-206 BCE):

As Chrysippus says in the first book of his *De finibus*; for our individual natures are parts of the nature of the whole universe. And this is why the end may be defined as life in accordance with nature, or, in other words, in accordance with our own human nature as well as that of the universe, a life in which we refrain from every action forbidden by the law common to all things, that is to say, the right reason which pervades all things, and is identical with this Zeus, lord and ruler of all that is. And this very thing constitutes the virtue of the happy man and the smooth current of life, when all actions promote the harmony of the spirit dwelling in the individual man with the will of him who orders the universe [28].

Diogenes added, 'for if a man be possessed of virtue, he is at once able to discover and to put into practice what he ought to do. Now such rules of conduct comprise rules for choosing, enduring, staying and distributing' [29].

The ideal ruler in the Stoic cosmos was good and wise precisely because goodness and wisdom were absolute requirements. This notion of virtue as central to the exercise of political power was adopted by the rulers of the Islamic caliphate and transmitted to medieval Europe. The builders of calendar cities of the Classical and Islamic civilisations did not use astronomy as an external agent to manipulate the people. They were *inside* the system and their cosmic cities were designed to create a physical link between heaven and Earth, to synchronise human actions with God's will as expressed in the unfolding of planetary patterns. As Berdoulay wrote, 'a place comes explicitly into being in the discourse of its inhabitants, and particularly in the rhetoric it promotes' [30].

7. Conclusion

While the modern calendar building is a sub-genre of astronomical architecture, the tradition it belongs to is evident in the ancient world. In the study of cultural astronomy (astronomy as applied to culture) and archaeoastronomy (the study of astronomy in relation to the built environment), astronomical architecture may be considered in relation to ideology. There is, then, a clear case to be made that impressive, monumental and astronomical architecture may have been designed to intimidate the masses or to keep them obedient, an alternative argument holds that astronomical architecture may also be designed to harmonise heaven with Earth for the common good. In this sense, the politically powerful and powerless, the rulers and the ruled, exist within a common system. If we consider a modern astronomical building such as Avon Tyrrell House, its size displays the occupant's

wealth, its style denotes their taste, and its symbolism denotes not their power, but their ease within a harmonious, cosmic system.

References

- [1] Campion N 2015 Religion, archaeology and modern calendar buildings: A study Avon Tyrrell house in England *J. for the Academic Study of Religion* Special Issue Religion, Archaeology and Folklore **28.2** (submitted)
- [2] Lethaby W R 1984 *W.R. Lethaby 1857-1931: Architecture, Design and Education* ed S Backemeyer and T Gronberg (London: Lund Humphries) p 70
- [3] Beckett M 2013 The Calendar House: A History *Country Life* (2 January) <http://www.countrylife.co.uk/property/article/530609/The-Calendar-House-A-history.html#hZIyrUgCCmZFpVw4.99> (accessed July 3, 2013)
- [4] Ruggles C 1999 *Astronomy in Prehistoric Britain and Ireland* (New Haven and London: Yale University Press) p 23
- [5] Renfrew C 2009 *Prehistory: the Making of the Human Mind* (London: Weidenfeld & Nicolson) p 183
- [6] Xiaochun S 2000 Crossing the boundaries between heaven and man: astronomy in ancient China *Astronomy Across Cultures: the History of Non-Western Astronomy* ed H Selin (Dordrecht: Kluwer Academic Publishers) pp 423-54
- [7] Griffin-Pierce T 1995 *Earth Is My Mother, Sky Is My Father: Space, Time and Astronomy in Navajo Sandpainting* (Albuquerque: University of New Mexico Press)
- [8] Plato *Republic* trans Paul Shorey 1935 (Cambridge MA and London: Harvard University Press) IV.I.C, III.A, VIII.A
- [9] McCluskey S 1993 Native American cosmologies *Encyclopaedia of Cosmology* ed N Hetherington (New York and London: Garland Publishing) p 429
- [10] Ruggles C and Saunders N 1993 The study of cultural astronomy *Astronomies and Cultures* ed C Ruggles and N Saunders (Niwt CA: University of Colorado Press) p 4
- [11] Sudjic D 2005 *The Edifice Complex: How the Rich and Powerful Shape the World* (London: Allen Lane)
- [12] Beckett M 2011 Make a date: the strange world of the calendar house *The Country Seat* (16 February) <http://thecountryseat.org.uk/2011/02/16/make-a-date-the-strange-world-of-the-calendar-house/>
- [13] Tillyard E M W 1943 *The Elizabethan World Picture* (London: Random House)
- [14] Girouard M 2009 *Elizabethan Architecture: its Rise and Fall, 1540-1640* (New Haven and London: Yale University Press) pp xvii, 236
- [15] Campion N 2009 The medieval and modern worlds *A History of Western Astrology* vol 2 (London: Continuum)
- [16] Wheatley P 1971 *The Pivot of the Four Quarters: A Preliminary Enquiry into the Origin and Character of the Ancient Chinese City* (Edinburgh: Edinburgh University Press) p 439
- [17] Appian II: 9.58 in Cramer F H 1996 [1954] *Astronomy in Roman Law and Politics* (Chicago: Ares Publishers) p 11
- [18] Heilen S 2007 Ancient scholars on the horoscope of Rome in *The winding courses of the stars: essays in ancient astrology* ed Greenbaum D G and Burnett C *Culture and Cosmos* **11.1,2** pp 43-68
- [19] Hannah R, Magli G and Palmieri A 2013 Nero's 'solar' kingship and the architecture of Domus Aurea (*Preprint* [arXiv:1312.7583v2](https://arxiv.org/abs/1312.7583v2))
- [20] Hannah R and Magli G 2011 The role of the sun in the Pantheon's design and Meaning *Numen* **58.4** pp 486-513
- [21] Pingree D 1977 The horoscope of Constantinople *Prismata, Festschrift fur Willy Hartner* (Wiesbaden: Franz Steiner Verlag) pp 305-315

- [22] Saliba G 1992 The role of the astrologer in medieval Islamic society *Bulletin d'études orientales* pp 45-67
- [23] Wiet, G 1971 *Baghdad; metropolis of the Abbasid caliphate* trans S Feiler (Norman: University of Oklahoma Press)
- [24] Allawi I 1998 Some evolutionary and cosmological aspects to early Islamic town planning *Theories and Principles of Design in the Architecture of Islamic Societies* ed M B Sevckenko (Cambridge, MA: Aga Khan Program for Islamic Architecture) pp 58, 62, 66-69
http://archnet.org/library/documents/one-document.jsp?document_id=3776
- [25] Pingree D 1970 The fragments of the works of al-Fazari *Journal of Near Eastern Studies* **29.2** p 104
- [26] Raymond A 2000 *Cairo* (Cambridge MA: Harvard University Press) pp 27, 35, 37
- [27] Diogenes Laertius *Zenon* in *Lives of Eminent Philosophers*, trans R.D. Hicks 1925 (London: William Heinemann) pp 110-263
- [28] Diogenes Laertius VII.88
- [29] Diogenes Laertius VII.126
- [30] Berdoulay V 1989 Place, meaning and discourse in French language geography *The Power of Place* ed J A Agnew and J S Duncan (London: Unwin Hyman) p 135