

Astrology and Cosmology in the World's Religions

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Chapter 5

South and Central America: Salvation and Sacrifice

*And since until noon the sun was rising, they heightened their voices, and after noon they slowly softened them, always in step with the movement of the sun.*¹

Of all the human cultural zones which have written their lives, hopes and fears into the sky, there have been just three which have taken the step into formulating highly complex technical systems. One was the Chinese/East Asian. The second was the Mediterranean/Near Eastern/South Asian. The third was the Mesoamerican/Andean. Quite why some societies should develop such complex systems is not clear; as Anthony Aveni pointed out, 'Why the Maya became such ardent astrophiles is a problem not yet resolved'². One obvious answer is that societies with complex socio-economic and political systems develop technically complex cosmologies as an aid to management of society and the state. But, of course, we also have to ask whether the Maya, Aztecs or Inca were actually any more astrophiliac than any other culture? The answer is probably no. What they did have, in common with the Chinese, Babylonians and Egyptians, was a sense of precision, that the merest details of life could be timed to correspond to the flow of celestial time, rather than, as with the Native Americans or sub-Saharan Africans, for example, the general ebb and flow of events. Most of the surviving evidence concerning the astrology of the Andean and Mesoamerican cultures relates to its official functions in relation to political matters, historical periodisation and dynastic power, war, peace and ritual observance of the religious-agricultural calendar. The possible style and quality of unofficial vernacular or 'folk' astrology may be understood from recent ethnographic work in central and south America. The literature on Andean and Mesoamerican cosmology is not extensive, but there are sufficient studies to present a rich picture of societies which paid intense attention to the sky as a guide for ritual, social and agricultural affairs, and engagement with the divine.

The leading works include Anthony Aveni's, *Native American Astronomy, Skywatchers of Ancient Mexico* and *The Sky in Mayan Literature*, both of which are valuable collections, while *Empires of Time, Calendars, Clocks and Cultures*, contains up-to-date and useful summaries of Maya, Aztec and Inca calendar systems. Anthony Aveni and Gary Urton's *Ethnoastronomy and Archaeoastronomy in the American Tropics*, is an early and useful collection of papers in the field. David Friedel, Linda Schele and Joy Parker's *Maya Cosmos: Three Thousand Years on the Shaman's Path*, is an excellent and comprehensive account of Maya cosmology, complimented by

¹ Description of an Inca sun-ceremony in Sabine MacCormack, *Religion in the Andes: vision and imagination in early Colonial Peru*, (Princeton: Princeton University Press, 1991), pp. 75-6.

² Anthony Aveni, 'Introduction: Making Time', in *The Sky in Mayan Literature*, (Oxford: Oxford University Press, 1992), p.5.

the astronomical details in Susan Milbrath's *Star Gods of the Maya*. Don McCaskill, *Amerindian Cosmology*, contains papers on north, south and central America. The literature on the Inca is sparse but Brian Bauer and David Dearbon, *Astronomy and Empire in the Ancient Andes* is a fine summary and Gary Urton's *At the Crossroads of the Earth and the Sky: An Andean Cosmology* is also recommended. Gerardo Reichel-Dolmatoff, *Amazonian Cosmos: the Sexual and Religious Symbolism of the Tukano Indians*, Chicago: University of Chicago Press, 1971, is a rare study of non-Andean, south American cosmology.³

Our understanding of the history of pre-Columbian south and central America is constantly shifting as archaeologists make new discoveries and palaeographers work with (Mesoamerican) textual sources. The recent discovery of monumental remains in the Amazon, on the Brazilian-Bolivian border, dating to around 200-1283 CE and capable of supporting 60,000 people, has cast serious doubt on fond notions of the Amazonian forest as 'virgin'.⁴ In addition, recent work at a site at Monte Verde in southern Chile has produced an apparent dating of 20,000 BCE, 10,000 years earlier than the date which was once given for the migration from Siberia to Alaska across the Bering Strait land bridge. Carbon 14 dates of about 20,000 BC were also obtained decades ago at Tlapacoya, Mexico, and in Pikimacahy Cave near Ayacucho, Peru, but were not universally accepted.

Whatever is stated about American prehistory – that, for example, agriculture may have appeared in central America by 5000 BCE but in the north around 2000 BCE – must come with the major qualification, 'according to current archaeological evidence'. The same caveat applies to our understanding of American religious practices, cosmology and astronomy.

The source problems are also considerable. It is a small consolation that, although the peoples of south and central America were systematically brutalised by their conquerors, and their culture devalued and destroyed, we do have the advantage of some written sources in the form of

³ Aveni, Anthony, *Skywatchers of Ancient Mexico*, (Austin, Texas: University of Texas Press, 1980), *The Sky in Mayan Literature*, (Oxford: Oxford University Press, 1992) and *Empires of Time, Calendars, Clocks and Cultures*; Friedel, David, Linda Schele, Joy Parker, *Maya Cosmos: Three Thousand Years on the Shaman's Path*, (New York: William Morrow and Company, 1993); Milbrath, Susan, *Star Gods of the Maya: Astronomy in Art, Folklore, and Calendars* (Austin: University of Texas Press, 1994); Don McCaskill (ed.), *Amerindian Cosmology*, (Brandon and Edinburgh: Canadian Journal of Native Studies and the Traditional Cosmology Society, 1988) Bauer, Brian S. and David S.P. Dearbon, *Astronomy and Empire in the Ancient Andes*, (Austin: University of Texas Press, 1995); Urton, Gary, *At the Crossroads of the Earth and the Sky: An Andean Cosmology*, Latin American Monographs, no. 55, (Austin: University of Texas Press, 1981); Reichel-Dolmatoff, Gerardo, *Amazonian Cosmos: the Sexual and Religious Symbolism of the Tukano Indians*, (Chicago: University of Chicago Press, 1971).

⁴ Martti Pärssinen, Denise Schaan and Alceu Ranzi, 'Pre-Columbian geometric earthworks in the upper Purús: a complex society in western Amazonia', *Antiquity*, vol. 83, no. 322, (Dec. 2009), pp.1084-1096.

monumental inscriptions, surviving texts known respectively as the Dresden, Madrid, Paris and the (possibly inauthentic) Grolier Codices, named after the location of the archives which now house them, as well as scores of other post-colonial texts, many post-colonial, which provided accounts of earlier cosmology. Such work has contributed much of value to our understanding of Mesoamerican culture since the major breakthrough in the translation of the Maya script took place in the 1970s, as a result of a concerted effort building on earlier successes and, by 1989, about 800 hieroglyphs were identified.⁵ Possibly around 70-80% of the Maya script has now been deciphered. This has allowed a valuable reconstruction of the major features of pre-Columbian cosmic religion, given that there is still considerable work to be done. Everything else, along with the notebooks which we know that the astrologers carried, have been lost. When we move to Peru, the situation is worse, due to the Inca habit of keeping records on thin, golden sheets which melted by the conquistadores, for whom cash was of far greater importance than knowledge. This leaves us with little more than visual clues: we have just one precious drawing of a wall in the Coricancha, the main temple in the capital, Cuzco, dedicated, amongst other deities, to the sun, moon and stars. But, as to the meaning of the Coricancha's portrayal of the Inca cosmos, there is little certainty. However, to our list of 'texts' we can add two important sources. One is monumental building and sculpture, of which the richest examples survive from the Mesoamerican cultures, which either contain celestial iconography, or are aligned with significant celestial patterns. The other, which has proved fruitful in our understanding of Maya cosmology, is the testimony of modern Indians and the anthropologists who have lived with them. Even so, all our understanding of pre-Columbian cosmology is therefore provisional and dependent on fragmentary sources, archaeological interpretation, colonial-era texts which may be filtered through Christian eyes, and anthropological accounts that are, inevitably to some extent, corrupted by their assumptions and preconceptions.

The Maya cosmos itself came into being as a gradual emergence of order, of something from nothing. The opening lines of the great creation epic, the *Popul Vuh*, expresses the still beauty of a calm morning, the dawn of everything:

Now it ripples, now it still murmurs, ripples, still it sighs, still hums and it is empty under the sky.

Here follows the first words, the first eloquence:

There is not one person, on animal, bird, fish, crab, tree, rock, hollow, canyon, meadow, forest. Only the sky alone is there; the face of the earth is not clear. Only the sea alone is pooled under all the sky; there is nothing whatever gathered together. It is at rest; not a single thing stirs. It is held back, kept at rest under the sky.

Whatever there is that might be is simply not there: only the pooled water, only the same sea.⁶

And then, the text continue, deep within the dark, the Plumed Serpent, the Aztec Quetzalcoatl, the Maker and Modeller of all, stirs and speaks with the Heart of Sky, also known as Hurricane,

⁵ D. Stuart and S. Houston, 'Maya Writing', *Scientific American*, (Aug. 1989), pp. 82-9.

⁶ Dennis Tedlock (trans.), *Popul Vuh*, (London: Simon and Schuster, 1996), p. 64.

and the creation begins. The cosmos of the great Mesoamerican and Andean civilisations was alive. Its structure was that of a living body. In this sense it is not necessary to ask what something is made of, or how it moves, but what one's relationship with it is.

In terms of physical structure, we encounter concepts such as the Aztec 'nine heavens' inhabited by Tonatiuh, the sun, Meztli, the moon, and Tlahuizcal-pantecuhli, the dawn. The Mesoamerican universe was envisaged as revolving around a world tree, also common motif in Europe and Asia and, like the Native Americans to their north, and the Europeans to the east, the Mesoamericans venerated the number four as a means of dividing time and space. The tree stood at the centre of the four cardinal directions, although in some versions, there might be a tree for each direction. Fourness, though, is not necessarily defined spatially by north, south, east and west, but may, at least in the *Popul Vuh*, be marked by the four points at which the sun rises and sets at dawn and dusk on the winter and summer solstices.⁷ In a sense, the four quarters were themselves divine, as the locations of four of the chief deities: Tezcatlipoca, who inhabited the north, Huitzilopchtli, who dwelt in the south, Tonatiuh, the sun, who occupied the east and Quetzalcoatl, who presided over the west. This belief in fourness as the basic structure of time and space extended to the Andes, where the Inca envisaged four heavens, with the greatest god in the highest heaven. Fourness as a fundamental property is also evident in the *Popul Vuh*, which records the 'lighting of the sky-earth' in which by 'halving the cord (and) stretching the cord', the maker of the world undertook 'the fourfold siding, fourfold cornering, measuring, fourfold staking...in the sky, on the earth (of) the four sides (and) the four corners'.⁸ Although the world is laid out in a fourfold pattern, fourness is not created in the process of construction, but construction proceeds in a fourfold manner because fourness is written into the fabric of existence.

In a parallel with schemes found in Greece, Mesopotamia and India, the fourfold division of space was also generally extended into notions of time. The Maya envisaged four successive worlds, named respectively in order, Jaguar Quitze, Jaguar Night, Mahucutah and True Jaguar. The Aztecs, coming later in time than the Maya, added a fifth world; their own. The four Aztec worlds, or Suns, all lasted for multiples of 52 years and were destroyed by catastrophes related to the Sun's name. The first Sun, 4 Jaguar, was destroyed by wild animals, the second, 4 Wind, by wind, the third, 4 Rain, by a rain of fire and the fourth, 4 Water, by a deluge. The Aztecs believed that they were living in the fifth age, 4 Movement. There is quite clearly an apocalyptic theme in the sequence of four – or five – Suns, but one which seems to be a projection into the grand historical narrative of the importance attached to the observation of the sunrise which is a feature of north American astronomy as well as central American.

Like other apocalyptic schemes, such repetitive cosmogonies incorporate a dialectical relationship between chaos and order, with attendant hopes and fears – hope for order and fear of chaos. The Aztec version includes the creation of the fifth Sun - and the moon – created by the deliberate

⁷ Barbara Tedlock, *Time and Highland Maya*, (Albuquerque: University of New Mexico Press, 1992), pp. 173-8.

⁸ Dennis Tedlock (trans.), *Popul Vuh*, (London: Simon and Schuster, 1996), p. 63-4..

self-immolation of the gods Nanahuatzin (or Nanahuatl), and Tecuciztecatl. The tale contains a combination of features from the profound to the mundane. The latter is represented in a simple explanation for a typical item of observational astronomy: after Tecuciztecatl initially refuses to jump into the great fire prepared by the other gods, one of them hits him in the face with a rabbit explaining through an event of almost slapstick triviality the resemblance of the blemishes on the moon's surface to a rabbit. The story, though, also contains motifs of messianic resurrection and salvation; it is through Nanahuatzin's noble sacrifice that humanity survives: the god dies and human beings are saved. In recognition of his willingness to offer his own life that others may live, Nanahuatzin is transformed into the sun, Tonatiuh. When, then, solar rituals were enacted, and solar alignments written into sacred monuments, the Aztecs were engaged in a deeply respectful acknowledgment of the great sacrifice made on their behalf. In observing the ebb and flow of the sun's life as he moved this way and that along the horizon, between the solstices, they were observing a drama which, through its repetitive nature, held echoes of the great calamity and renaissance to which they owed their existence.

Like many polytheistic systems, in which the relationship with monotheism is fluid and uncertain, the Mesoamerican may be portrayed as a scheme in which many deities emerge out of the one. The Maya, for example, clearly envisaged a Great Spirit, not unlike the Native American model. In the sacred text, the *Popul Vuh*, this being is described as the

Maker Modeler,
mother-father of life, of humankind,
giver of breath, giver of heart,
bearer, upbringer in the light that lasts
of those born in the light, begotten in the light;
worrier, knower of everything, whatever there is:
sky-earth, lake-sea.⁹

The Great Spirit, if we can apply that North American term to the Maya deity, is, then, the world and whatever is in it, the creator and the creation, life and the source of life. He was also known as Hunab Ku (the one god) and as elsewhere, solar and universal deities are often coincident, the universal being expressed through the particular. In some stories Itzamna, the legendary founder of Maya culture and the supreme deity and creator, often manifestly incorporating minor gods (including the Sun god) was a saviour and a civilising hero who, among his other skills, was able to bring the dead to life. The colonial sources, though are far from precise, and may be misleading but Itzamna himself can also be associated or expressed through with Hunab Ku or the sun; celestial and divine identities may both be poly-symbolic.

The gods and goddesses of the Mesoamerican pantheon were personifications of everything considered important in the phenomenological world, and included a range of celestial deities. The Aztec Sun god was known under various names depending on how he was best invoked in different rituals. In his main form he was Tonatiuh, the leader of heaven. As Tezcatlipoca (or Smoking Mirror – a reference to the use of obsidian mirrors for divination), he ripened the harvest, but who might also inflict drought and threaten starvation. It is difficult to unravel myths

⁹ Dennis Tedlock (trans.), *Popul Vuh*, (London: Simon and Schuster, 1996), pp. 63-4.

after centuries of syncretism and cross-cultural transmission but, in an early form, Tezcatlipoca was the Heart of the Sky who initiated the creation with Quetzalcoatl in the *Popul Vuh*. The two creators, though, were also sworn enemies, expressing the motif of struggle between two gods familiar from Persia, Egypt and Christian mythology.

The worship of the snake-bird, the Plumed Serpent, is attested under a variety of names is attested across the region since the Preclassic period, probably in the late first millennium BCE, and was clearly associated with the planet Venus, which achieved the same profound significance for the Maya and Aztecs as it did for other pre-modern cultures, by the Classic period, from around 300 CE.¹⁰ There is no astronomical logic which dictates why Venus should be at war with the sun, so the enmity between the two gods may be a legacy of the Aztec conquest of the Toltecs, who had revered Quetzalcoatl as the creator, lord of the winds and master of life. He was a civiliser, a creator and inventor, responsible for art, crafts, knowledge and technology and was connected with merchants, was related to the dawn, gods of the wind, and was a patron of the priesthood. Like many other conquerors (the Romans and Assyrians come to mind) the Aztecs were syncretisers, who adopted the gods and goddesses of the people they conquered, along with their land and wealth, and deities could be added to the pantheon with no concern for precise consistency. The Aztecs also had a goddess, Tlazolteotl, who had a relationship, albeit a marginal one, with Venus, and was connected with, amongst other things, of love and sex (she was the patroness of adulterers).

Quetzalcoatl may have been a creator but his affairs were, above all, tied to the cycles of the planet Venus, and to its regular periods of invisibility; when it moved too close to the sun to be seen, it was personified, as in Mesopotamian stories of Inanna's descent to the underworld, to a classic motif of death and resurrection. Anthony Aveni takes up the story:

at the time when the planet was visible in the sky (as evening star) Quetzalcoatl died. And when Quetzalcoatl was dead he was not seen for 4 days; they say that he dwelt in the underworld, and for 4 more days he was bone (that is, he was emaciated, he was weak); not until 8 days had passed did the great star appear; that is, as the morning star. They said that then Quetzalcoatl ascended the throne as god.¹¹

Such resurrection themes also occurred in Inca religious iconography, for solar mythology generally features the imaginative accounts of the sun's daily disappearance into the darkness and rebirth into the light. The Inca celestial trinity were Inti, the sun, Mama Quilla, the moon, who were husband and wife, and brother and sister, and Chasca, the god of Venus and the dawn, and page to Inti.

¹⁰ David Carrasco, *Quetzalcoatl and the Irony of Empire: Myths and Prophecies in the Aztec Tradition*, (Chicago, IL: University of Chicago Press, 1982).

¹¹ Anthony Aveni, *Skywatchers of Ancient Mexico*, (Austin, Texas: University of Texas Press, 1980), p. 187, citing Seler, *Anales de Quauhtitlan*, 1904), pp. 364-5.

The meanings of the Inca constellations appear to have no central patterning, and so may be based on the gradual accretion of regional ideas over centuries, rather than a single invention. Their correspondences with terrestrial phenomena appear to be primarily animal and botanical. The Pleiades, one of the most familiar of all seasonal markers, were related to maize production, as they still are by the Inca's modern descendants.¹² In Mesoamerica, the Pleiades were also venerated for their protection of cereals which may be coincidence, but could equally be the result of a shared, ancient tradition. However, most of the Inca astronomical referents are still uncertain, especially the constellation of the Llama, one of the most important of celestial animals on account of its terrestrial equivalent's critical importance: its body may actually be a dark cloud in the Milky Way, its eyes the stars Alpha and Beta Centauri.¹³ Similar uncertainties afflict our understanding of the constellation of the Snake (where was it, and was it a dark space instead of a star group?), as well as Inca observations of Venus: we know they watched the planet closely, but we have little or no idea how they attributed significance to it. Neither do we have any idea of notions of time amongst the Inca comparable to the complexity of calendrical counting amongst the Mesoamericans. However, modern ethnography may give a better picture of popular astrology in the lands ruled by the Inca, or adjoining them, of which Gerardo Reichel-Dolmatoff's work amongst the Desana Indians of the Columbian-Brazilian border remains the principal exemplar. There are moral tales (the sun repents his unwitting act of incest with his daughter, Venus), warnings of chaos as a result of moral collapse (solar eclipses) and relationships of biology (the nights of the full moon are bad for fishing) and sympathy (the constellation of the shrimp heralds the rainy season). Reichel-Dolmatoff was particularly alert to the notion of astrological theory as a celestial projection of social codes. Describing Desana cosmology, he explained how;

A relationship also exists between the moon and the conditions of health and sickness. When there is a full moon, people observe in which zone the spots are most outstanding, east, west, south or north and from their position the direction from which the sickness come is deduced. Because these spots, according to myth, represent the menstrual blood of the Daughter of the Sun [Venus?], we observe again an association between sexual physiology and the concept of imminent danger.¹⁴

The details may not be exactly those of Andean popular astrology under the Inca, but the spirit, most likely is. Elizabeth Reichel extended this research into other Columbian people's demonstrating an astrology very similar to that familiar in North America, including very careful attention to the sun, moon and calendars, a ritual approach to daily life expressed for example in

¹² Gary Urton, *At the Crossroads of the Earth and the Sky: An Andean Cosmology*, Latin American Monographs, no. 55, (Austin: University of Texas Press, 1981), p. 119.

¹³ Brian Bauer and David Dearbon, *Astronomy and Empire in the Ancient Andes*, (Austin: University of Texas Press, 1995), p. 138-9.

¹⁴ Gerardo Reichel-Dolmatoff, *Amazonian Cosmos: the Sexual and Religious Symbolism of the Tukano Indians*, (Chicago: University of Chicago Press, 1971), p. 73.

the incorporation of cosmic principles (such as the universal division of space into gender – male and female – or by the number four) and a participatory attitude to the cosmos as a whole, recognising that human action is required to ensure its continued harmonious functioning.¹⁵ Following the example of the structuralists, it is often easier to identify native star stories as containing an underlying social message rather than a prognostic function. For example, when the Barasana, who live on the Columbian-Brazilian border, tell of the conception of the solitary hero as a result of the moon's impregnation of his younger sister they are accounting both for blemishes on the moon's surface and warning against incest.¹⁶

The accuracy of Mesoamerican astronomy points to the concept of the world as precisely regulated by mathematically definable patterns – the cosmic, ticking clock. The Maya of the classical period could forecast the dawn appearance of Venus, or a total eclipse, to within a day, a century in advance. The details of the Maya constellations are better understood now than they were a few decades ago, but the identification of Maya stars with their western equivalents are less important than the use of the sky as a huge stage-set for imaginal engagement between humanity and the cosmos, a means to engage not just with the creation, but with the act of creation.¹⁷

The function of astronomy was to forecast the future and manage the present, two functions which are symbiotic. As Stephen McCluskey put it, the content of the astronomical texts was 'purely astrological'; he continued, 'To the extent that in the high cultures of Mesoamerica cosmologies are tied to a predictive astronomy, these astronomies are arithmetical rather than geometrical and they are concerned with the prediction of the dates of astronomically and astrologically significant events...'.¹⁸ For Anthony Aveni, who was equally strong in his opinion, the Mayan astronomical texts were 'purely astrological' in their function and intent.¹⁹

The surviving evidence points to the private, sacred nature of the astrological documents and their use primarily by a wealthy, literate elite. The name for a Maya priest was Ah Kin, or Ah Kin Mai, which means 'He of the Sun', suggesting, as Michael Coe put it, 'a close connection with the calendar and astronomy' in the fulfilling of sacred functions.²⁰ These officials were

¹⁵ Elizabeth Reichel, 'The Eco-politics of Yakuna and Tanimuka Cosmology (Northwest Amazon, Columbia)', (PhD Thesis, Cornell University, 1997)/

¹⁶ John Bierhorst, *The Mythology of South America*, (New York: William Morrow and Co., 1988), pp. 32-3.

¹⁷ For Maya astronomy see David Friedel, Linda Schele, Joy Parker, *Maya Cosmos: Three Thousand Years on the Shaman's Path*, (New York: William Morrow and Company, 1993), pp. 75-112.

¹⁸ Stephen McCluskey, 'Native American Cosmologies' in Norris Hetherington (ed.), *Encyclopaedia of Cosmology*, (New York and London: Garland Publishing, 1993), p. 427.

¹⁹ Anthony Aveni, 'Introduction: Making Time', in *The Sky in Mayan Literature*, (Oxford: Oxford University Press, 1992), p. 4.

²⁰ Michael Coe, *The Maya*, 3rd edition, (London: Thames and Hudson, 1984), p. 154.

actually the equivalent of similar state functionaries across the world – of whom we might cite the hour-watchers in Egypt and the temple-scribes in Babylon. They were highly educated and responsible for maintaining the calendar, arranging and conducting official rituals and providing advice to the political elite, and answers to their questions, activities which required mathematical and astronomical skill and a sophisticated awareness of the intricate meaning of each phase of the unfolding patterns of time and space.²¹ However, Anthony Aveni also writes of the Maya ‘calendrical shamans...(who) travelled from village to village with their books of prognostications tucked under their arms’.²² In the Inca realm such people were the *yanca*, or *yanac*, a term translated by the Spanish as astrologer, and they might be found advising the urban elite as much as rural villagers. Even if the Maya ‘calendrical shamans’ – or astrologers’ – preferred customer was the wealthy landowner, there is a clear inference that astrologers could be accessible to anyone. The surviving almanacs from the post-conquest period give a flavour of the reasons for precise prediction, Aveni cites an example: ‘Woe to the turtle (drought?): woe to the warrior and pregnant female; his sacrifice, his divine punishment is set; evil excessive sun; the misery of the maize seed’.²³ The threat is clear: drought leads to a poor harvest, and a poor harvest to possible starvation. Again, a multitude of examples from the Old World suggest the means which might be taken to stave off such a disaster, from the natural (reinforce the water storage and irrigation systems) to the supernatural (appeal to the gods via prophylactic rituals) and a mixture of the two (manage the environment by manipulating magical sympathies). At any rate, we see in operation here one of astrology’s prime functions; to maintain the ecological harmony between humanity and the environment.

We can also identify three other major characteristics of Mesoamerican astrology. First, it was concerned with the individual’s duty to engage with the cosmos; to quote Aveni, it was preoccupied with ‘the appropriate course of human action to keep the civilized world running on sacred time’.²⁴ Secondly, functionally, the primary, collective activity in which most people would have been engaged was participation in rituals designed to maintain the annual cycle of planting and harvesting. Thirdly, such manipulation of time on a daily, human scale should be seen as a microcosmic drama which took place within the macrocosmic concern with the long term cycles of the creation and destruction of the world, the birth of the gods and origins of humanity. As Aveni put it, ‘the main business of the Maya codices was to keep track of cycle

²¹ See Anthony Aveni, *Empires of Time, Calendars, Clocks and Cultures*, (London: Tauris Parkes Paperbacks, 2000), p. 219.

²² Anthony Aveni, 'Introduction: Making Time', in *The Sky in Mayan Literature*, (Oxford: Oxford University Press, 1992), p. 5.

²³ Anthony Aveni, 'Introduction: Making Time', in *The Sky in Mayan Literature*, (Oxford: Oxford University Press, 1992), p. 4.

²⁴ Anthony Aveni, 'Introduction: Making Time', in *The Sky in Mayan Literature*, (Oxford: Oxford University Press, 1992), pp. 4-5.

upon cycle of time'.²⁵ We can say exactly the same of Inca astronomy where the notion the cosmic state was acted through time via, at different time, sequences of lunar and solar months, with their attendant rituals.²⁶

The unique feature of the Mesoamerican calendar was the Tzolkin (Tonalpohualli to the Aztecs), the 'day-count' of 260 days, composed of 20 named days and thirteen numbers, which occurs in the *Dresden Codex*.²⁷ The scheme is constructed from 20 named days and 13 numbers, which 260 permutations, one day at a time. The Tzolkin's origin is uncertain, although Michael Coe thinks it was developed in the Late Formative or early Classic periods, perhaps between 300 BCE and 300 CE., although it spread to all Mesoamerican cultures and is still in use.²⁸ Each day has a range of iconic symbols which varied between different cultures and can be interpreted symbolically. For example, the first of the 20 day signs, Imix, was a waterlily to the Maya, and a caiman (cipactli) to the Aztecs, represented the surface of the earth and was bad for leaders.²⁹ This calendar has a clear divinatory function, for every day has a predetermined quality, which then indicates the possible prospects for success of any venture. In this case Imix is therefore a day on which every leader knows that risk should be avoided and caution exercised. This prognostic system still survives in unchanged form among some isolated folk in southern Mexico and the Maya highlands, under the care of calendar priests, and has also performed an easy and popular leap into western New Age culture.³⁰ There is a theory that the origins of the 260-day calendar are inexplicable, and that the best we can say is that elements of it might have been borrowed, along with other ideas about time, from the Zapotecs, who flourished around 600 BCE, but who survived until the Conquest, or the Olmecs, whose civilisation reached its peak in

²⁵ Anthony Aveni, 'Introduction: Making Time', in *The Sky in Mayan Literature*, (Oxford: Oxford University Press, 1992), p. 7.

²⁶ Brian S. Bauer and David S.P. Dearbon, *Astronomy and Empire in the Ancient Andes*, (Austin: University of Texas Press, 1995), pp. 54-56.

²⁷ Eric Thompson, *A Commentary on the Dresden Codex*, (Philadelphia: American Philosophical Society, 1972), pp. 62-71.

²⁸ Michael D. Coe, *The Maya*, (London: Thames and Hudson, 1984), p. 43; Vincent H. Malmstrom, 'Origin of the Mesoamerican 260-Day Calendar', *Science*, vol. 181, (1973), pp. 939-941.

²⁹ See Mary Miller and Karl Taube, *The Gods and Symbols of Ancient Mexico and the Maya: An Illustrated Dictionary of the Mesoamerican Religion*, (London: Thames and Hudson, 1993), for a list of the Aztec and Maya names. See also Anthony Aveni, *Empires of Time, Calendars, Clocks and Cultures*, (London: Tauris Parkes Paperbacks, 2000), pp. 191-203; Sharon L. Gibbs, 'Mesoamerican Calendrics as Evidence of Astronomical Activity', in Anthony Aveni (ed.), *Native American Astronomy*, (Austin and London: University of Texas Press, 1975), pp. 21-35; Sylvanus Morley, *An Introduction to the Study of Maya Hieroglyphics*, (New York: Dover Publications, 1975), pp. 37-51; and Dennis Tedlock (trans.), *Popul Vuh*, (London: Simon and Schuster, 1996), pp. 205-206.

³⁰ Michael D. Coe, *The Maya*, (London: Thames and Hudson, 1984), pp. 43-4; for a western adaptation see Ariel Spilisbury and Michael Bryner, *The Mayan Oracle: Return Path to the Stars*, (Rochester, Vermont: Bear and Company, 1992).

1200 BCE: the earliest known 260-day count glyph is from around 600 BCE, and was found in San Jose Mogote, Oaxaca, but the Zapotec culture lived until the Conquest. However, it has been noticed that at $14\frac{1}{2}$ degrees north, the latitude of the great Maya city of Copan and the earlier, pre-classic city of Izapa, the sun spends 105 days north of the overhead position, and 260 days south of it. The argument, is then that the Tzolkin was constructed as a local divinatory medium relevant to this location. A more complicated assumption, is that the cities were constructed at $14\frac{1}{2}$ degrees north, in order to give physical form to the calendar, an alternative which still, unfortunately, leaves the origins of the calendar itself as mysterious.

The 260 year count ran simultaneously with the 365 day Vague Year, extending the total number of combinations to a 'Calendar Round' of 18,980 days, or 52 years. The current 'Long Count', which began on 11 August 3114 BCE, is measured in a series of units, a *uinal* of 20 kins (days) a tun of 360 days, a katun of 20 tuns and a baktun of 20 *katuns*, or 144,000 days. The 13th baktun comes to an end on 21 December 2012 (the Maya date 13.0.0.0.0) and has become the focus of a great deal of New Age apocalyptic excitement as well as '2012', a classic Hollywood 'disaster' movie, largely thanks to Jose Arguelles' imaginative reconstruction of the Mayan original.³¹ The sequence can be extended into multiples of baktuns, potentially, as in Indian chronology, adding up to billions of years.

The Maya and Aztec calendars paid attention to a series of factors, including the planets' relationships with the sun – the so-called synodic years which separate the points at which each planet forms a conjunction with the sun. Mars, for example, has a synodic year of 780 days. The moon's synodic (the time between successive new moons) and sidereal (the time which separates its conjunctions with any particular star) months, 29.5 days and 27.3 days respectively, were also critical. For the solar year, two counts were used, and a 365 day *haab*, which modern scholars know as a 'vague year', which consisted of 18 months of 20 days each and 5 unlucky additional days and, occasionally, a computing year of 364 days, convenient because the number is easily divisible by a variety of factors. Of crucial significance, though, was Venus' average 584 day synodic period. The real gap between Venus' conjunctions with the sun varies from 580 to 587 days, but the average, over five complete conjunctions, is 584 days. Without getting too involved in numbers, the significance is that every eight years, almost to the day, the sun, moon and Venus all returned to the same place in the sky, in a clear indication that three great cycles of cosmic time had come to an end and were beginning again in a dramatic indication of the infinite possibilities of creation. The mere description of this event does not do justice to its potentially awe-inspiring appearance when, for example, the first appearance when a new crescent moon in a clear evening sky, coincides with Venus' brightest phase and the two celestial bodies would occupy the sky in a vivid display of numinous power. Special attention was also paid to the 52-year periodicities in which the 260 year Tzolkin and the 365 day Haab came together, again in a dramatic reminder that creation is continuous and the laws of the cosmos, cyclical. Any cycle

³¹ Arguelles José, *The Mayan Factor: Path Beyond Technology*, (Santa Fe: Bear and Company, 1987).

involving Venus was reminiscent of Quetzalcoatl, and so concerned with war and violence.³² Yet bloodletting in Mesoamerican culture was a necessary means of repaying the debt owed to the gods for the blood they shed during the creation and for securing fertility and maintaining the cosmic order: prisoners of war were sacrificed in this cause, although the figure of up to 20,000 which has fuelled popular mages of the Aztecs is demonstrably an exaggeration based on tendentious, early Spanish reports.

The Maya, Aztecs and Inca all managed time through an elaborate series of rituals whose timing was defined by astronomical patterns, chiefly the phases of the sun and moon, throughout the year, and were intended to maintain the equilibrium of the seasonal cycle, preventing extremes of drought or flood, a purpose achieved through the careful propitiation of the relevant deities.³³ The ceremonies, though, were conducted with elaborate attention to detail, including the wholesale sacrifice of prisoners of war. Every year, for example, just one prisoner, whose looks were suitably powerful, was chosen to impersonate Tezcatlipoca, one of the creators. For most of the following year he was treated with deep reverence and lived in great luxury, waited on by eight devoted servants. He was a living god in human form. Twenty days before he was sacrificed, the intended victim took four wives, representing goddesses who embodied the female aspect of the division of space-time, initiating a series of festivals. On the day of his blood sacrifice the solar man-god was led to the top of the temple, where his beating heart was ripped out and offered to the sun god.

The great Inca calendar rituals were as magnificent as anything in Mesoamerica. We have a colourful description of a solar, harvest-festival ritual which took place in Cuzco in 1535, witnessed by the Spaniard Bartolomé de Segovia, presided over by the Inca – the emperor - and attended by six hundred magnificently dressed nobles:

They stood in two rows, each of which was made up of over three hundred lords. It was like a procession, some on one side and the others on the other, and they stood very silent, waiting for sunrise. When the sun had not yet fully risen, they began slowly and in great order and harmony to intone a chant; and as they sang they each moved forward...and as the sun went in rising, so their song intensified...and so they sang from the time when the sun rose until it had completely set. And since until noon the sun was rising, they heightened their voices, and after noon they slowly softened them, always in step with the movement of the sun.³⁴

³² John B. Carlson, 'Venus-Regulated Warfare and Ritual Sacrifice in Mesoamerica', in Clive L.N. Ruggles and Nicholas J. Saunders (ed.), *Astronomies and Cultures*, (Niwtot, Col.: University of Colorado Press, 1993), pp. 202-252.

³³ For the Aztec ritual year see Anthony Aveni, *Empires of Time, Calendars, Clocks and Cultures*, (London: Tauris Parkes Paperbacks, 2000), pp. 255-273; and Richard Townsend, *The Aztecs*, (London: Thames and Hudson, 1992), pp. 212-5.

³⁴ Sabine MacCormack, *Religion in the Andes: vision and imagination in early Colonial Peru*, (Princeton: Princeton University Press, 1991), pp. 75-6.

As in many solar states, the Inca, in his person, embodied the sun on earth. He stood at the fulcrum of the system of ritual action, architecture and astronomy which preserved harmony on earth. It is often said the cosmic political systems of Mesoamerica and the Andes were designed to maintain the power of the elites. This is misleading. The Mesoamerican and Andean rulers were quite capable of abusing their position, but were also expected to express the general quality whose equivalent was known in Medieval Europe as 'virtue', according to which they were as much servants of their people as masters, obliged to care for their subjects rather than exploit them. The emperor was an embodiment of the sun, and could be associated with other celestial bodies, including Venus, and was a link with the divine and a magician, a living talisman, channelling the power of the heavens for the benefit of his people.

Time, in the form of Venus' motions, as well as those of the other cosmic cycles, was embodied in a series of sacred buildings in the Mesoamerican realms. Typical was the so-called Palace of the Governor, a richly decorated structure in Uxmal, the capital of a Mayan state which appears to have flourished between around 500 and 1200 CE. The building itself was probably completed in the early tenth century and is a long, low structure built over a platform with a long facade containing a series of openings, and covered in around 350 Venus-related glyphs. These images suggest that the entire building has a celestial function, perhaps to maintain harmony between Venus' earthly responsibilities, and its heavenly motions. The first evidence was published by Anthony Aveni and Horst Hartung in 1975 but, as an example, of difficulties of understanding original sources, has been questioned. Aveni and Hartung found that the building's central doorway, they found, was aligned with the centre of a double-headed jaguar throne in the courtyard, and from there to a pyramid-like structure on the south-eastern horizon which approximated to Venus' southernmost rise, a point which it reaches every eight years and marks the culmination of a phase of Venusian time. Ivan Šprajc, though disagrees on the grounds that the difference between the alignment and the southernmost rising point of Venus as morning star is almost three degrees, or five diameters of sun. The palace's orientation, however, agrees perfectly with the northerly extremes of the evening star, which always occur from April to May and thus announce the beginning of the rainy season; the Venus glyphs on the façade of the building are placed in the cheeks of the rain god Chac.³⁵ The issue, then, is not whether there is a celestial relationship, but of its details.

The construction of sacred space using both natural features, and monumental architecture, was a profoundly important matter for the civilisations of the Andes and Mesoamerica and the latter are especially known for their building of pyramids.³⁶ These, probably more frequently than their Egyptian equivalents, possess precise astronomical identities. Some commentators, such as Michel Smith, have cast doubt on claims that Mesoamerican cities are 'cosmograms' – designed

³⁵ Ivan Šprajc, 'The Venus-Rain-Maize Complex in the Mesoamerican World View', *Journal for the History of Astronomy*, vol. 24, (1993), pp. 17-70.

³⁶ For sacred space in Aztec culture see Richard Townsend, *The Aztecs*, (London: Thames and Hudson, 1992), pp. 129-154.

to embody the cosmos in their layout and structure, but the majority consensus is in favour.³⁷ Such sacred buildings as the Mesoamerican pyramids are talismans, providing a medium for the harmonisation of a potentially disordered society with the permanently ordered patterns of the cosmos, through either their structure, their astronomical orientations and the ceremonies performed on them, or a combination of all three. They also, in that the stellar and calendrical patterns they incorporate are divine, *are* themselves divine.

Some of the best known examples are located in one of the greatest of all astronomical cities in the world – a true cosmopolis, the 'place of the gods', the city of Teotihuacan.³⁸ From perhaps around 200 CE, or a little earlier, until the seventh century, Teotihuacan was the most powerful and sacred city in ancient Mexico, home to around 200,000 inhabitants. Even in the fourteenth century its reputation was such that the Aztecs still buried their rulers there. Teotihuacan's pyramids rivaled those of ancient Egypt, and the greatest, the Pyramid of the Sun, rose 230 feet from a base the same size as the Great Pyramid of Giza. The smaller Pyramid of the Moon was 150 feet high, but built on higher ground so that its summit matched that of the Sun Pyramid. The third pyramid, dedicated to Quetzalcoatl, was located at the southern end of the main boulevard, the Avenue of the Dead, which ran precisely 15 1/2° east of due north. The three pyramids are also aligned with the surrounding mountains suggesting that the entire city was seen as the focus of terrestrial and celestial forces. The key to the astronomical code lies in the 260-day calendar and the regularity of the dry and rainy seasons which regulated maize production. The Pyramid of the Sun, for example is aligned with sunrise on 11th February (start of agricultural season, clearing of the fields), sunset on 30th April (the onset of the rainy season and the time for planting) and 13th August (the ripening of the first corn cobs), and sunrise on 29th October, the end of the rainy season. The Maya then moved through a cosmic web in which the formula star= god=rain=maize varied throughout the year depending on time, and the religious-cosmic structure of the state as expressed through architecture, sacrifice and ritual was designed to keep the *machina mundi* in operation.

The relationship between the sky and the landscape in the Inca realm was less spectacular than that in Mesoamerica, but ingenious and unparalleled in any other culture. One unusual feature was the system of pillars on the horizon outside Cuzco, which could be used to track the daily movement of the sunrise point backwards and forwards across the horizon between the summer and winter solstices.³⁹ The pillars have largely been destroyed, so we have no idea how many

³⁷ For criticism of the astronomical hypothesis, see Michael E. Smith, 'Did the Maya Build Architectural Cosmograms?', *Latin American Antiquity*, vol. 16, no. 2, (Jun. 2005), pp. 217-224. For an alternative point of view see Ivan Šprajc, 'More on Mesoamerican Cosmology and City Plans', *Latin American Antiquity*, vol. 16, no. 2, (Jun. 2005), pp. 209-216.

³⁸ Ivan Šprajc, 'Astronomical Alignments at Teotihuacan, Mexico', *Latin American Antiquity*, vol. 11, no. 4, (Jun. 2005), pp. 403-415; Saburo Sugiyama, 'Teotihuacan city layout as a cosmogram: Preliminary results of the 2007 Measurement Unity Study', in Iain Morley and Colin Renfrew (eds), *The Archaeology of Measurement: Comprehending Heaven, Earth and Time in Ancient Societies*, (Cambridge: Cambridge University Press, 2010), pp. 111-149.

³⁹ Brian S. Bauer and David S.P. Dearbon, *Astronomy and Empire in the Ancient Andes*, (Austin: University of Texas Press, 1995), pp. 67-100.

there were, only that they existed as one of the most extensive public astronomical measuring devices ever conceived on a par, in its own way, with the Great Pyramid. Equally unique were the ceques, lines which radiated out from Cuzco, dividing the region into four, and containing shrines known as huacas.⁴⁰ Their function was calendrical, astronomical and designed, through the manner in which they were constructed in the landscape, to bring sky and earth together in harmony.

Both the Inca and the Aztecs observed dire omens which presaged or coincided with their conquest by the Spanish. The Aztecs witnessed a column of fire which burned dreadfully in the air for a year in 1517, four years before the conquistadores' final victory. The subsequent account reported how 'when this sign and portent was first seen, the natives were overcome with terror', aware a calamity was approaching, but unsure of its nature.⁴¹

The great civilisations of South and Central America offer a picture of societies driven by a profound sense of the intricate and intimate relationship between divinity, earth and stars. There is still much to be done on the surviving literary sources, monumental inscriptions and architectural evidence but, as Gerardo Reichel-Dolmatoff and Dennis and Barbara Tedlock have demonstrated, anthropological evidence can contribute to an understanding of the rich practical cosmology which flourished until the fifteenth century, and its legacy in modern Indian life.

⁴⁰ Brian Bauer, *The Sacred Landscape of the Inca: The Cusco Ceque System*, (Austin: University of Texas Press, 1998).

⁴¹ Léon-Portilla, Miguel (ed.), *The Broken Spears: The Aztec Account of the Conquest of Mexico*, (Boston: Beacon Press, 1992), p. 7.