In addition, the reports of Spanish conquistadors and missionaries provide crucial information on many topics, as we mentioned earlier, but they have to be evaluated critically in their original cultural-historical and colonial-ideological context. Particularly interesting are the religious, historical and literary documents written after the *conquista* by indigenous authors in Spanish or in the Mesoamerican languages (using the Spanish alphabet). The *Historia Tolteca Chichimeca*, the *Anales de Cuauhtitlan*, the *Leyenda de los Soles*, and the works of native historians such as Tezozomoc, Chimalpahin or Ixtlilxochitl, are relevant examples from the Nahuatl speaking world.

A key text for the study of Mesoamerican symbolism is the *Popol Vuh*, a sacred text of the K'iche' Maya of Guatemala, largely conceived in the precolonial period but written down in the colonial period.[12] This impressive work in the K'iche' language starts with the creation of the world in a time of darkness (mystery). The gods try out different successive creations that must lead to that of human beings. The life cycle, however, depends on the victory of the twin heroes Hunahpú and Ixbalanqué (Sun and Moon) over the powers of the realm of death (Xibalbá). The narrative demonstrates how in Mesoamerican thought there is an intimate connection between light (sunrise), the growth of corn, and the human community.

3 The Main Cycles of the Calendar

The calendar is an ancient hallmark of Mesoamerican civilisation and an important component of the precolonial writing systems. It was intimately connected with priesthood, healing and divination. Inscriptions show that this calendar was already in use more than two thousand years ago. It was an intellectual achievement of the Preclassic era, present in the foundational phase of Monte Albán and possibly dating back to the Olmec horizon. Different versions were characteristic of the Classic cultures (Teotihuacan, Monte Albán, the Classic Maya sites, etc.). The system used in Postclassic central and southern Mexico differed in several formal aspects from that of the Classic era (and also from the Postclassic Maya system), but the fundamental mathematical

1997, which also discusses the composition of the hieroglyphs). Similarly, the *Matrícula de Huexotzingo* (Prem 1974) contains lists of signs for personal names with glosses in Nahuatl.

12 See the facsimile edition (1973) as well as the translations by Tedlock (1985) and Christensen (2003/4). Compare the volume on Maya literature edited by Hull and Carrasco (2012) and its review by Jansen (2015b).

structure was the same. We are relatively well informed about certain (but not all) aspects of the calendar because of the early colonial descriptions and its continuous use among several indigenous peoples (such as the K'iche' and Ayuuk).[13]

The basic characteristic of the Mesoamerican calendar is the combination of a series of numbers from 1 to 13 with a fixed sequence of twenty day-signs. In the Nahua and Ñuu Dzaui calendar the twenty days are the following (their position within the sequence is generally indicated with Roman numerals):

I. Alligator (Nahuatl: *cipactli* / Dzaha Dzaui: *quevui*)
II. Wind (Nahuatl: *ehecatl* / Dzaha Dzaui: *chi*)
III. House (Nahuatl: *calli* / Dzaha Dzaui: *cuau* or *maa*)
IV. Lizard (Nahuatl: *cuetzpallin* / Dzaha Dzaui: *que*)
V. Serpent (Nahuatl: *coatl* / Dzaha Dzaui: *yo*)
VI. Death (Nahuatl: *miquiztli* / Dzaha Dzaui: *maha* or *mahu*)
VII. Deer (Nahuatl: *mazatl* / Dzaha Dzaui: *cuaa*)
VIII. Rabbit (Nahuatl: *tochtli* / Dzaha Dzaui: *sayu*)
IX. Water (Nahuatl: *atl* / Dzaha Dzaui: *tuta*)
X. Dog (Nahuatl: *itzcuintli* / Dzaha Dzaui: *hua*)
XI. Monkey (Nahuatl: *ozomatli* / Dzaha Dzaui: *ñuu*)
XII. Grass (Nahuatl: *malinalli* / Dzaha Dzaui: *cuañe*)
XIII. Reed (Nahuatl: *acatl* / Dzaha Dzaui: *huiyo*)
XIV. Jaguar (Nahuatl: *ocelotl* / Dzaha Dzaui: *huidzo*)
XV. Eagle (Nahuatl: *cuauhtli* / Dzaha Dzaui: *sa*)
XVI. Vulture (Nahuatl: *cozcacuauhtli* / Dzaha Dzaui: *cuii*)
XVII. Movement (Nahuatl: *ollin* / Dzaha Dzaui: *qhi*)
XVIII. Flint (Nahuatl: *tecpatl* / Dzaha Dzaui: *cusi*)
XIX. Rain (Nahuatl: *quiahuitl* / Dzaha Dzaui: *co*)
XX. Flower (Nahuatl: *xochitl* / Dzaha Dzaui: *huaco*)

These signs are combined with numbers from 1 to 13 in the following manner: 1 Alligator, 2 Wind, 3 House, 4 Lizard, 5 Serpent, etc. After 13 Reed, the next day is 1 Jaguar, beginning of the second 13-day period (Spanish: *trecena*). This creates a special rhythm determined by cycles of twenty (the day signs) and

13 See the programmatic article by Jansen (2012b). Fundamental studies of the Mesoamerican calendar are, for example, those by Kubler and Gibson (1951), Caso (1967), Tena (1987/2008) and Pharo (2014). On the contemporary uses of the calendar see the studies by Tedlock (1982) and Rojas Martínez Gracida (2012), as well as the dissertations prepared by Reyes Gómez and Van den Akker, members of our research team.

ILLUSTRATION 0.03 *The twenty day-signs*

thirteen (the numbers). After the cycle of twenty day signs is completed for the first time, the day sign Alligator returns but now combined with the number 8. Indeed, each time the day sign is repeated in this sequence its number goes up with 7. As 2 × 7 = 14, this means that after 40 days the number will be one digit higher: 2 Alligator is 40 days after 1 Alligator. This made it relatively easy to calculate when a specific day in the future would fall. The total of sign-number combinations, i.e. of different day names, is 260 (=13 × 20); the last combination being 13 Flower. This set of 260 days is the primary 'day count', known as *tonalpoalli* in Nahuatl.

The day on which an individual was born accompanied him or her during life as a calendar name, particularly in the Postclassic Ñuu Dzaui codices, and in the pictography of the Oaxaca region in general. The calendar name could be complemented with a more poetic given name, resulting in patterns such as Lord 8 Deer 'Jaguar Claw' or Lady 10 Flower 'Rain Spiderweb'.

The day of birth also establishes the connection of the newborn human being with his or her *nahual*, or *alter ego*. The concept of the *nahual* (from Nahuatl: *nahualli*) is crucial in Mesoamerican religion and represents the embodiment of humans' bond with nature. Essentially it is the experience

of becoming an animal or other being during states of dreaming or trance (particularly associated with darkness and night).[14] This category of animals includes certain natural phenomena such as whirlwinds, clouds, lightning, etc. From the moment of birth, a child is spiritually (and to some extent also physically) connected to one or more such animal companions, with which he or she will share character and destiny.

The *nahual* experience is mostly not understood as a physical transformation or shape-shifting, but as a liminal state of trance or altered, expanded consciousness, in which humans transcend their human bodies and can 'walk with the gods'. This bond creates a parallel existence: human beings lead a civil life (under sunlight) as well as a life in nature in the form of animals and/or natural phenomena (*nahuales*), a life of reason and one of vision. This is still the key to the Mesoamerican living religious experience today.

Typically, the Spanish missionaries condemned nahualism, i.e. the idea of transformation into an animal or natural phenomenon, as synonymous with witchcraft (*brujería*) and the trance as indicative of a pact with the devil. In fact, Sahagún used the word *nahuallotl* ('cosa de nigromancia') for the precolonial calendar (introduction to Book IV). In Mesoamerican terms, however, the calendar was the very device to create social and symbolic order: it was indeed *nahuallotl*, i.e. an element of *nahual* power, sacred and mysterious.

The basic cycle of 260 days is obviously not related to the solar-agricultural year and its seasons, but had another origin. According to traditional calendar knowledge, the symbolic meaning of this unit is related to the time that elapses in human pregnancy, which explains its use for divination and related rituals.[15] The calendar is very much about human experience and about the relationships between humans and the divine forces of the universe. On this first level, the combination of thirteen numbers with the twenty day-signs creates a sequence of twenty periods of thirteen days each (Spanish: *trecenas*). Each number, each day sign, each day, each night and each 13-day period would also have its specific patron deity, who would receive worship and offerings. All this would have been generally shared knowledge in the community.

Observations of the places of sunrise and sunset through the year from a fixed point (such as a temple) and in relation to landscape features (e.g. mountaintops) will, of course, bring an understanding of the solstices and other phenomena of horizontal astronomy which mark the seasonal year of

14 The treatise of Ruiz de Alarcón is a primary source for this set of ideas and experiences. López Austín includes an analysis of nahualism in his classic monograph *Cuerpo Humano e Ideología* (1980: Ch. 11).

15 Schultze Jena (1933–38, vol. I) reproduces texts of the K'iché day keepers.

365 days.[16] In subterranean chambers of caves with natural or artificial vertical shafts it is possible to observe the passage of the sun through the zenith at midday, which produces a remarkable column of light that enabled the ancient astronomers to anchor the astronomical year (Aveni and Hartung 1981). Throughout Mesoamerica that event takes place in the first half of May, which announces the beginning of the rainy season and the preparation for planting. Nowadays this important ritual moment is preserved as a specific liturgical day in the Christian calendar, often the Day of the Holy Cross (3 May), when the community goes in procession to a specific cave, known as the 'House of Rain', in order to say prayers and bring offerings to ask the rain to come.

On the basis of such horizontal astronomical observations, Mesoamerican *tlamatinime*, 'wise and knowledgeable persons', constructed a second level within the calendar, delimiting solar years consisting of 365 days (*xiuhtli or xihuitl* in Nahuatl) within the continuous sequence of 260-day cycles. This unit of 365 days was used for dating historical events. In central and southern Mexico each solar year was named after a specific day, the year bearer, which occupied a fixed position (often the first day) in the total of 365 days. The year bearer was indicated by a special sign: in Aztec pictography the day was situated in a blue square (because of the homonymy between *xiuhtli / xihuitl*, 'year' and *xiuhtli / xihuitl*, 'turquoise'), while in Ñuu Dzaui codices it was combined with a special sign (called 'A-O sign' by codex researchers), which had developed from a diadem but in its form transmitted the symbolism of a bound ray of sunlight.

A simple mathematical exercise reveals that the solar year of 365 days contains eighteen units of 20 days, plus 5 extra days ($365 = 18 \times 20$ with a remainder of 5). Therefore, the year bearer – that fixed position marking the 365-day period (solar year) – will move forward five positions each year in the list of the twenty day signs. After four years the same sign will return as year bearer ($4 \times 5 = 20$ days), and so the cycle of day signs is completed. Consequently, the year bearer can only fall on four of the twenty day-signs, each of which is five positions after the other. For the Nahua and Ñuu Dzaui peoples these were the signs Reed (XIII), Flint (XVIII), House (III) and Rabbit (VIII). These four

16 A number of archaeo-astronomical studies have focused on the orientation of precolonial Mesoamerican buildings towards astral phenomena. A fascinating classic study is that of Tichy and Broda (1991). See furthermore the survey article by Šprajc (2010). Manuel May Castillo, a member of our ERC team, has reviewed part of the evidence and concludes in his Ph.D. thesis (2014) that one should not exaggerate the astronomical aspect of architecture in itself but rather situate this within the overall context of a sacred landscape. See also the hermeneutic analysis of sacred architecture by Jones (2000) and the similarly oriented studies of landscape by Tilley (1994) and Ingold (2000, 2011).

year-bearer signs were symbolically associated with the four world directions: East, North, West and South respectively.

The same simple mathematics determines that in one solar year the 13 numbers are repeated 28 times, with one extra day (365 = 28 × 13 with a remainder of 1). Therefore, the next year bearer has a number one digit higher than the one before.

The combination of these two mathematical calculations means that the sequence of Aztec-Mixtec year bearers (the days which lend their names to the years) is: 1 Reed – 2 Flint – 3 House – 4 Rabbit – 5 Reed – 6 Flint etc. until the last combination, 13 Rabbit. This gives a total of (13 × 4 =) 52 different year names, a cycle known in Nahuatl as the *xiuhmolpilli*, 'year-binding', in scholarly literature referred to as the 'Calendar Round'. Such calendar rounds are subdivided into periods of thirteen years, named after the year in which they begin: 1 Reed, 1 Flint, 1 House and 1 Rabbit. The beauty of this mathematical organisation is that the sign of the leading year bearer during such a thirteen-year period will fall on the positions 1, 5, 9 and 13, which are symbolically associated with the centre and the four directions of the earth's surface (1, 5), the underworld where the dead ancestors are (9), and heaven (13).

In the system used by the Nahua and Ñuu Dzaui peoples, a full date consists of a day and a year bearer. This combination fixes a day within a period of 52 years, with the only exception that a day may be repeated within the same year (within the unit of 365 days, 105 days of the *tonalpoalli* occur twice).

The calendar is ubiquitously present in archaeological context. In Tomb 7 at Monte Albán one of the carved jaguar bones (Bone 37a), for example, is inscribed with the first thirteen years of the 52-year cycle: year 1 Reed to year 13 Reed.

For historical analysis it is important that ancient Mexican dates can be correlated with dates in the Christian calendar. The day of the Spanish conquest of Mexico Tenochtitlan (on which the last Aztec emperor Cuauhtemoc was captured) was the day 1 Serpent of the year 3 House in the Aztec calendar, which corresponded to 13 August of the year 1521 in the Julian calendar of the Spaniards at the time. On the base of this fact the correlation of other dates can also be calculated. Other Aztec sources confirm this synchronology. Furthermore, colonial documents clarify that the Ñuu Dzaui (Mixtec) people had the same day count, but started the year on another moment, 40 days earlier to be precise, with the effect that the Aztec year 2 Reed would correspond roughly to a Mixtec year 1 Reed and so on: the Mixtec year bearer is consistently one digit less than the Aztec year bearer.[17]

17 The difference between the Aztec and Mixtec year count was discovered by the Mexican historian Wigberto Jiménez Moreno, who explains it in his commentary on the Codex of Yanhuitlan (Jiménez Moreno and Mateos Higuera 1940).

The solar years are subdivided into eighteen 'months' of twenty days each (Spanish: *veintena*), with 5 remaining 'superfluous days', called *nemontemi* in Nahuatl.

The Nahuatl names for these months are the following:

- Cuahuitlehua ('Rising Trees') or Xilomanaliztli ('Offering of tender corncobs')
- Tlacaxipehualiztli ('Flaying')
- Tozoztontli ('Small Bloodletting')
- Huey Tozoztli ('Big Bloodletting')
- Toxcatl ('Popcorn' or 'Drought')
- Etzalcualiztli ('Eating Corn and Beans')
- Tecuilhuitontli ('Small Feast of the Lords')
- Huey Tecuilhuitl ('Big Feast of the Lords')
- Miccailhuitontli ('Small Feast of the Dead') or Tlaxochimaco, ('Offering of Flowers'),
- Huey Miccailhuitl ('Big Feast of the Dead') or Xocotl Huetzi ('Falling Fruit')
- Ochpaniztli ('Sweeping the Roads')
- Teotleco ('Arrival of the Gods') or Pachtontli ('Small Festival of *Pachtli*')
- Tepeilhuitl ('Festival of the Mountains') or Huey Pachtli ('Big Festival of *Pachtli*')
- Quecholli ('Dart' or 'Roseate Spoonbill')
- Panquetzaliztli ('Raising the Banners')
- Atemoztli ('Water Descending')
- Tititl ('Shrinking' or 'Stretching')
- Izcalli ('Growing' or 'Revival')

The rituals of these 20-day months were the hallmarks of community life and often celebrated agricultural or seasonal events (clearing the fields for planting in Tlacaxipehualiztli, harvesting corn in Ochpaniztli etc.). Colonial sources propose different correlations of these months with periods within the Julian year. The most fundamental one is the correlation of the entrance of the conquistadors in the Aztec capital Tenochtitlan on November 8, 1519, which would correspond to the day 8 Wind as the 9th day of the month Quecholli.[18] A good overall reconstruction, however, is difficult due to the intrinsic problem of understanding the Mesoamerican concepts, subdivisions and sequences of

18 See Castillo (1971) and Tena (2008: 45–47). Kubler and Gibson (1951: 42–54) discuss the basic aspects of the correlation problem. This complex subject matter will return in the Chapters 6 and 7 of this book.

time in terms of the European calendar. On the one hand the fixed rhythm of year bearers, marking periods of 365 days, does not allow for intercalary days and leap years. On the other hand, the connection of the month feasts with seasonal events must have obliged the calendar experts (priests) to take such measures in order to avoid loosing contact with natural reality.[19]

It is logical to suppose that the dates of the agricultural and seasonal rituals were determined by the observation of the natural phenomena (such as the coming of rain and the growth of the maize plant) in relation to the cosmic order of the recurrent solstices and the passages of the sun across the zenith. The synchronisation of the (agricultural) rituals with (astronomical) reality would imply adapting the temporal distances between those rituals in ways that in practice must have come close to the use of intercalary days. If the months of central Mexico had a consistent relationship with the agricultural and seasonal rituals, their cycle could not consist of invariable blocks of twenty days as purely quantitative units (which would have run rapidly out of step with the seasons), but must have been more flexible ritual periods that were anchored in astronomical observations but would allow for incidental adaptations to the reality of the rural world.[20]

The structure of the data from the sixteenth century suggests that the spring equinox (corresponding to March 21 in our Gregorian calendar) fell in Tlacaxipehualiztli, the zenith passage of the sun (Gregorian: in the first half of May) would occur towards the end of Huey Tozoztli or beginning of Toxcatl, the summer solstice (Gregorian: June 21) had to be at the end of Etzalcualiztli or beginning of Tecuilhuitontli, the autumn equinox (Gregorian: 21 September) was part of Ochpaniztli, and that the winter solstice (Gregorian: 21 December) would coincide with the end of Panquetzaliztli.

To keep these correspondences and to keep this structure functioning, the set of the month rituals must have included occasional (slight) variation in the length of the year in accordance with the experiences and needs of the

19 See the discussion of the calendar in the commentaries on Codex Cospi (Anders, Jansen and Van der Loo 1994) and Codex Ixtlilxochitl (Van Doesburg and Carrera González 1996).

20 In the Maya calendar there is indeed a fixed interlocking of the 260-day cycle with the 365-day cycle so that each day's position is given in a regular system of eighteen 20-day months and 5 remaining days, without leap years or any other use of intercalary days. Classic Maya dates even counted the precise number of years and days that had elapsed since a virtual zero point in 3114 BC. This fixed frame of reference enabled Maya experts to study the changes in the cosmos and keep track of seasonal and astronomical events. The Classic inscriptions as well as the Postclassic books often contain astronomical references, such as lunar positions, heliacal risings of Venus, solar eclipses, etc. (Freidel, Schele and Parker 1993).

farming population. The colonial sources mention a variety of solutions to this problem: adding one intercalary day every four years or one intercalary period of thirteen days every fifty-two years etc. This suggests that different practices were followed.

On the other hand, these adaptations seem not to have affected the day-count proper (the continuous sequences of 260 days). The calendar position of the year bearer also remained fixed within cycles of 365 days each. This was confusing to the colonial chroniclers (and still is confusing to us today) as it leads to the co-existence of (1) unvariable sequences of days with fixed year bearers (days giving names to years), which do not allow the introduction of leap-years, and (2) the adaptation of the month rituals to the astronomical year, which implies that the duration of the set of months (forming the ritual year) would occasionally have to be lengthened.

If this reconstruction is correct, the set of eighteen months and five extra days must have behaved more or less like the Julian/Gregorian calendar, with the position of the year bearer shifting vis-à-vis this ritual year (presenting itself with an average of one day earlier every four years, just as it does in the correlations with the Julian/Gregorian year). Unfortunately, this complex process has not been adequately documented, so our explanation remains hypothetical.

The days themselves were subdivided into shorter periods, which the priests marked by blowing conchs on the temple pyramids.[21] This blowing of the conchs also implies that the whole community was aware of the passage of such 'hours', very much as subdivisions of the day in the colonial era were indicated by the church bell and nowadays by watches. Similarly, the knowledge of what day it was in the Mesoamerican calendar must have been generally shared in the precolonial community. Many markets were organised in cycles of five days.[22] As a result, the market days would follow the same rhythm as the year bearers. Similarly, the agricultural rituals and community feasts would make everyone aware of the passage of the 20-day periods or 'months' and – with that – also of the cycle of years. This 'being in the same time' made it possible for the community to maintain its memory and to implement social, economic and religious planning, which implies a sense of cohesion and cultural identity.

4 The First Day-Keepers

Needless to say, the calendar was much more than a chronometric mechanism. In the Nahuatl language a day is *tonalli*, but this word also refers to a spiritual

21 Muñoz Camargo, *Historia de Tlaxcala*: Ch. 22.

22 See for example Rosquillas Quiles (2010: 150).