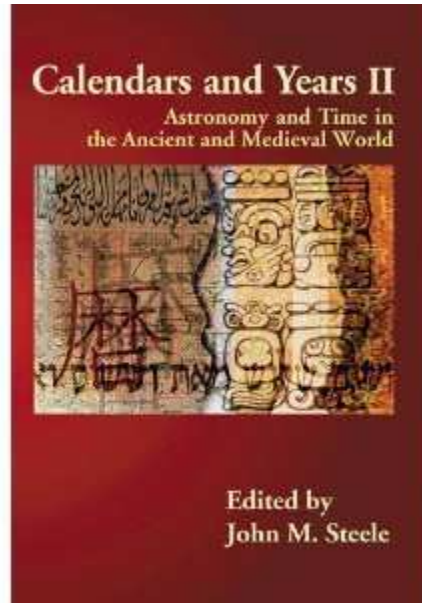


“The Chinese Sexagenary Cycle and the Ritual Origins of the Calendar,” in *Calendars and Years II: Astronomy and Time in the Ancient and Medieval World*, edited by John M. Steele. Oxford: Oxbow Books, 2010. ISBN: [9781842179871](https://doi.org/10.1017/9781842179871).



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## The Chinese Sexagenary Cycle and the Ritual Foundations of the Calendar

Adam Smith

From the earliest appearance of literacy in East Asia, around 1250 BC, there is evidence of the routine use of a system for recording dates using cycles of named days. The more fundamental of these consists of ten terms and will be referred to here as the '10-cycle' (table 1). By running the 10-cycle concurrently with a second cycle twelve days in length, the '12-cycle' (table 2), a longer cycle of sixty days is generated, sixty being the lowest common multiple of ten and twelve. We will refer to this compound cycle as the '60-cycle'.<sup>1</sup> At the time of their first attestation, the day was the only unit of time that the three cycles were used to record.<sup>2</sup> Days within these cycles will be referred to in this chapter with the formulae  $n/60$ ,  $n/10$  and  $n/12$ . So, for example,  $3/10$  refers to the third day of the 10-cycle.

There are many ways of visualizing the compound 60-cycle.<sup>3</sup> A comparativist might think of it as a pair of toothed wheels engaged with one another (figure 1), by analogy with the representations of the Mesoamerican Tzolk'in cycle, with which the Chinese 60-cycle has certain similarities. However, in the centuries after its first appearance it was conceived by its users in terms of a simple tabular format, with the sixty compound terms arranged in six vertical columns of ten terms each, one for each round of the 10-cycle. The first (rightmost) column began with the pair of terms for day  $1/60$  ( $1/10$  paired with  $1/12$ ), below which followed  $2/60$  ( $2/10$  and  $2/12$ ),  $3/60$  ( $3/10$  and  $3/12$ ), and so on down to  $10/60$  ( $10/10$  and  $10/12$ ) at the bottom. The beginning of a new column, as at  $11/60$  ( $1/10$  and  $11/12$ ), coincided with the recommencement of the 10-cycle. The first repeat in the 12-cycle occurred on day  $13/60$  ( $3/10$  and  $1/12$ ), at the third position in the second column. Many examples of this tabular format survive among the earliest remains of scribal training.<sup>4</sup>

The mathematical principles of the compound 60-cycle, and its timekeeping function, have obvious parallels in the calendars of other cultures. In addition to the 260-day Mesamerican Tzolk'in, a compound cycle of  $13 \times 20$  days, there is a similarly direct parallel with the form and function of the 42-day round of the Akan calendar, a compound cycle of  $6 \times 7$  days.<sup>5</sup>

The origins of the Chinese cycles are largely obscure.<sup>6</sup> No compelling etymology for the names of the terms in the 10- and 12-cycles has ever been constructed, in Chinese, or any other language. They show no connection to the system of decimal numbers that also appears with the first evidence of the script. The 10-cycle is, fundamentally, the early Chinese week. The 12-cycle may have had a similar status among certain groups or in particular contexts but they have left no evidence of their existence. The well-known correlation of the 12-cycle with a list of animals is not attested within the first one thousand

|                              | 1   | 2  | 3    | 4    | 5  | 6  | 7    | 8   | 9   | 10  |
|------------------------------|-----|----|------|------|----|----|------|-----|-----|-----|
| Modern Graph                 | 甲   | 乙  | 丙    | 丁    | 戊  | 己  | 庚    | 辛   | 壬   | 癸   |
| Pinyin                       | jia | yi | bing | ding | wu | ji | geng | xin | ren | gui |
| Shang Graph<br>(ca. 1200 BC) | 𠄎   | 𠄎  | 𠄎    | 𠄎    | 𠄎  | 𠄎  | 𠄎    | 𠄎   | 𠄎   | 𠄎   |

TABLE 1. The 10-cycle.

|                              | 1  | 2    | 3   | 4   | 5    | 6  | 7  | 8   | 9    | 10  | 11 | 12  |
|------------------------------|----|------|-----|-----|------|----|----|-----|------|-----|----|-----|
| Modern Graph                 | 子  | 丑    | 寅   | 卯   | 辰    | 巳  | 午  | 未   | 申    | 酉   | 戌  | 亥   |
| Pinyin                       | zi | chou | yin | mao | chen | si | wu | wei | shen | you | xu | hai |
| Shang Graph<br>(ca. 1200 BC) | 𠄎  | 𠄎    | 𠄎   | 𠄎   | 𠄎    | 𠄎  | 𠄎  | 𠄎   | 𠄎    | 𠄎   | 𠄎  | 𠄎   |

TABLE 2. The 12-cycle.

years of the cycle's use.

The graphs used to write the terms of the 10-cycle may have been created for that purpose. That is, they are not obviously borrowings of graphs used to write other words. This is not the case for some terms in the 12-cycle. The writings for the sixth and tenth terms, for example, are phonologically motivated secondary uses of pictograms created to write 'child' (*zi* 子)<sup>7</sup> and 'beer' (*jiu* 酒), employed as approximate phonetic spellers. This suggests that certain fundamental properties of the script were already established before they were applied to writing the 12-cycle.

In addition to their role in the calendar, terms in the 10-cycle, at the time of their first appearance and for several centuries after, were employed in names referring to dead kin. The 10-cycle and 60-cycle also underlay the calendrical apparatus that was used to schedule sacrificial performances directed towards these same dead kin, a central religious preoccupation of elites and probably the early Chinese population more broadly during the late second millennium.

The use of the 60-cycle to record dates was retained after the practice of naming dead kin with cyclical terms came to be abandoned, and the legacy of its role in scheduling ritual events continued to be felt, in elite funeral arrangements for example, into the mid first millennium BC. However, this break with the earlier ritual significance of the cyclical terms, as a means of referring to and commemorating dead family members, allowed them to be reinterpreted as a more abstract system of ordinals, one that could be creatively redeployed to label sequential or cyclical phenomena of many kinds in addition to days. Many of these new uses in their turn attracted a religious or magical focus.

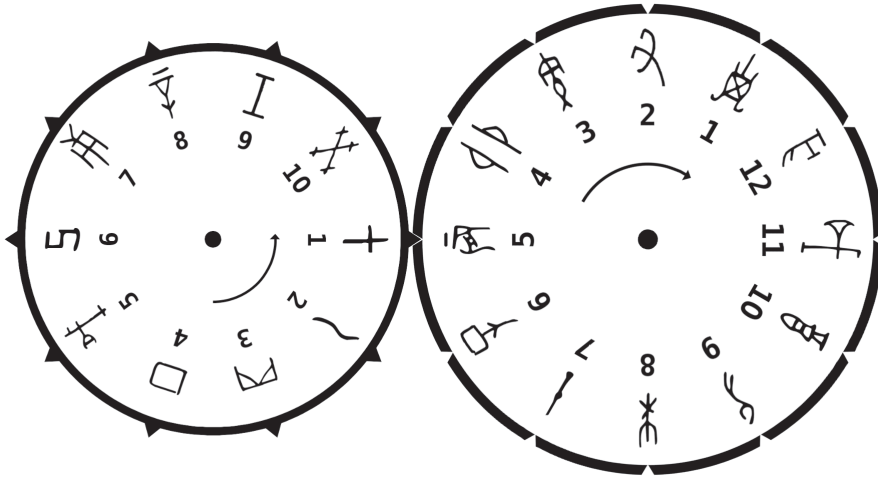


FIGURE 1. The 60-cycle envisaged as a pair of toothed wheels representing the 10-cycle and the 12-cycle. Even-numbered positions never engage with odd-numbered positions. Six turns of the 10-cycle correspond to five turns of the 12-cycle, after which the system has returned to its original state. The arrangement shown corresponds to Day 41/60.

### The Shang king list

The Shang (ca. 1600–1050 BC)<sup>8</sup> king list, a sequence of more than thirty names over approximately twenty generations, is one of the earliest complex documents from East Asia that can be demonstrated to have been reliably preserved through textual transmission. A version of this list was available during the Western Han (206 BC – 25 AD), and is preserved in the *Shi Ji* (史記 Grand Scribe's Records).<sup>9</sup> This received version of the list is a very close match for the list that was reconstructed by twentieth-century scholarship from the sacrificial schedules reflected in divination records excavated at Anyang, location of the seat of the last seven generations of kings to appear in the list (table 3).<sup>10</sup> Besides the bare sequence of royal names, the transmitted list was evidently equipped with further ancillary information. It marked instances of fraternal succession, for example, and may have provided cues to some of the anecdotes that pad out the version of it that appears in the *Shi Ji*.

A remarkable feature of the king list, that the list itself does nothing to explain, is the fact that every king is named after a term in the 10-cycle.<sup>12</sup> No other list of rulers from early China has this property. Clearly, the Shang had an intimate relationship with the cyclical terms, beyond the fact that they were the first to write them down. From the early centuries AD, attempts have been made to explain the relationship between the use of the 10 cycle to write these royal names—the so-called 'temple names' (*miaohao* 廟號) or 'day-names' (riming 日名)—and its use to record dates. Early proposals included suggestions that the names reflect birth days, or that they referred in some way to objects representing the dead kings in the ancestral temple (*miao zhu* 廟主). The archaeological rediscovery of the Shang in the last century prompted a revival of interest in the question.<sup>13</sup>

Since the king list contains more than ten kings, some terms from the 10-cycle will

| Generation                                   | Succession | Name | Pinyin              | Day-name | Son of | Wives' day-names |
|--|------------|------|---------------------|----------|--------|------------------|
| G1   | K1         | 上甲   | Shang (Higher) Jia  | 1        |        |                  |
| G2   | K2         | 報乙   | Bao Yi              | 2        | K1     |                  |
| G3   | K3         | 報丙   | Bao Bing            | 3        | K2     |                  |
| G4   | K4         | 報丁   | Bao Ding            | 4        | K3     |                  |
| G5   | K5         | 示壬   | Shi Ren             | 9        | K4     | 7                |
| G6   | K6         | 示癸   | Shi Gui             | 10       | K5     | 1                |
| G7   | K7         | 大乙   | Da (Greater) Yi     | 2        | K6     | 3                |
| G8   | K8         | 大丁   | Da (Greater) Ding   | 4        | K7     | 5                |
| G9   | K9         | 大甲   | Da (Greater) Jia    | 1        | K8     | 8                |
| G8   | K10        | 外丙   | Wai (Outer) Bing    | 3        | K7     |                  |
| G10  | K11        | 大庚   | Da (Greater) Geng   | 7        | K9     | 9                |
| G11  | K12        | 小甲   | Xiao (Lesser) Jia   | 1        | K11    |                  |
|  | K13        | 大戊   | Da (Greater) Wu     | 5        |        | 9                |
|  | K14        | 雍己   | Yong Ji             | 6        |        |                  |
| G12  | K15        | 中丁   | Zhong (Middle) Ding | 4        | K13    | 6, 10            |
|  | K16        | 外壬   | Wai (Outer) Ren     | 9        |        |                  |
|  | K17        | 羨甲   | Jian Jia            | 1        |        |                  |
| G13  | K18        | 祖乙   | Zu (Ancestor) Yi    | 2        | K15    | 6, 7             |
| G14  | K19        | 祖辛   | Zu (Ancestor) Xin   | 8        | K18    | 1                |
|  | K20        | 羌甲   | Qiang Jia           | 1        |        |                  |
| G15  | K21        | 祖丁   | Zu (Ancestor) Ding  | 4        | K19    | 6, 7             |
|  | K22        | 南庚   | Nan Geng            | 7        | K20    |                  |
| G16  | K23        | 陽甲   | Yang Jia            | 1        | K21    |                  |
|  | K24        | 盤庚   | Pan Geng            | 7        |        |                  |
|  | K25        | 小辛   | Xiao (Lesser) Xin   | 8        |        |                  |
|  | K26        | 小乙   | Xiao (Lesser) Yi    | 2        |        | 7                |
| Earliest divination records appear at Anyang |            |      |                     |          |        |                  |
| G17  | K27        | 武丁   | Wu Ding             | 4        | K26    | 8, 10, 5         |
| G18  | K28        | 祖己   | Zu (Ancestor) Ji    | 6        | K27    |                  |
|  | K29        | 祖庚   | Zu (Ancestor) Geng  | 7        |        |                  |
|  | K30        | 祖甲   | Zu (Ancestor) Jia   | 1        |        | 5                |
| G19  | K31        | 康丁   | Kang Ding           | 4        | K30    | 8                |
| G20  | K32        | 武乙   | Wu Yi               | 2        | K31    | 5, 10            |
| G21  | K33        | 文武丁  | Wen Wu Ding         | 4        | K32    |                  |
| G22  | K34        | 帝乙   | Di Yi               | 2        | K33    |                  |
| G23  | K35        | 帝辛   | Di Xin              | 8        | K34    |                  |

TABLE 3. The Shang King list (after Chang Yuzhi 1987, p. 134).<sup>11</sup>

| Day-Names                                   | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 | Day 9 | Day 10 | Total |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
| Count<br>(entire list)                      | 7     | 6     | 2     | 7     | 1     | 2     | 4     | 3     | 2     | 1      | 35    |
| Count for<br>Anyand<br>Period<br>(from k24) | 1     | 3     | 0     | 3     | 0     | 1     | 2     | 2     | 0     | 0      | 12    |

TABLE 4. Frequency of day-names in Shang king list (from table 3).

inevitably occur in the names of multiple kings. Various disambiguating epithets are applied. For instance, the seven kings with day-name 1/10 are disambiguated as ‘The Highest Day 1/10’ (K1 in table 3), ‘The Greater Day 1/10’ (K9), ‘The Lesser Day 1/10’ (K12), ‘Ancestor Day 1/10’ (K30), and in the remaining three cases (K17, K20, K23) by more unusual prefixes of uncertain meaning.

Although all ten possible day-names occur in the list, their distribution appears neither uniform nor random. Some patterns in the sequence are more remarkable than others. Those that have previously attracted most notice are the following. The king list begins with six day-names in the ordered sequence 1–2–3–4–9–10 (K1–K6). After this opening sequence, kings named Day 4/10 tend to reappear with an interval of two generations, often separated by kings named Day 1/10 or Day 2/10. No fraternal or filial successor shares a day-name with his immediate predecessor. Some day-names are considerably more frequent than others (table 4).

No fully satisfactory account has been provided for any of these patterns, and how terms from the 10-cycle were assigned to individuals is not perfectly understood. They do, however, make it unlikely that the day-names relate (in any straightforward, un-manipulated manner) to a uniformly distributed random variable such as date of birth or death. Earlier proposals along those lines can be ruled out. Nevertheless, a great deal more information about Shang day-names and the early calendrical functioning of the three cycles can be recovered from archaeological evidence in the form of contemporary divination records and bronze inscriptions.

### Late Shang divination records

Textual remains from the Late Shang period (ca. 1300–1050 BC) are overwhelmingly dominated, numerically speaking, by records of divination. Almost all of these records incorporate a cyclical date of some kind. These divination records were incised onto the bony parts of dead animals—most often turtle shells and scapulae of large mammals—that were themselves the instruments used in the pyro-osteomantic divination that the records served to document.<sup>14</sup> Although divination records are by far the most commonly attested textual genre at this stage, it is not obvious whether this points to a central role for divination record-keeping in incipient Chinese literacy, or to an accident of archaeological preservation and discovery.<sup>15</sup>

Pyro-osteomancy had been in widespread use throughout northern China from the latter half of the third millennium BC,<sup>16</sup> but without leaving any evidence of written

documentation or its direct precursors. Over the course of the second millennium, this form of divination appears to have been practiced with growing frequency, reaching a peak of intensity at large, late second-millennium sites associated with the Shang royal lineage. It is during the reign of the Shang king Wu Ding (K27, ca. 1250–1200 BC), and during the high-point in the elite patronage of pyro-osteomancy, that evidence of its written documentation first appears. Over the course of the twentieth century, many tens of thousands of such records were recovered from the large complex of archaeological sites near Anyang, in northern China's Henan Province. Ongoing excavations continue to produce further examples.

To date, only one other site contemporary with Anyang has provided unproblematic evidence of the written documentation of divination. At the site of Daxinzhuang in Shandong, 250 km east of Anyang, in addition to approximately 1,000 fragments of bones and shells used in divination, a single example inscribed with multiple records has also been found.<sup>17</sup>

At Anyang, divinations were performed and recorded on a daily basis by multiple teams of specialists on behalf of Wu Ding and succeeding kings of the Shang dynasty, and for certain members of their immediate family. These teams of specialists are distinguishable from one another by the scribal hands that kept the records, the named diviners mentioned in the records, and the differing localities within the moated enclosure at the centre of the Shang-period complex at Anyang where the remains of their activities have been found.<sup>18</sup> The diviners and their patrons were preoccupied with the health and well-being of the Shang royal family, social and political interaction, the weather, success in hunting, the exchange of goods, and with the frequent sacrificial rituals towards dead royal kin that were the focus of religious activity at Anyang.

The majority of records specify the date of the divination using cyclical dates, but only exceptionally with supporting notations of the month or year.<sup>19</sup> The forms that cyclical dates take in the divination records are most easily explained by example. Consider the inscriptions on HD17 (figure 2).<sup>20</sup> This is one of approximately 500 inscribed divinatory plastrons and fragments that were found together in a single pit at Anyang in 1991.<sup>21</sup> The plastrons and the nearly 2,500 divination records inscribed onto them represent the output of a team of diviners working for a patron who was almost certainly a son of the reigning Shang king Wu Ding (K27). The patron is referred to in the records as *zi* 子, literally 'the child', to be understood as something like 'the prince'. Plastron HD17 appears to have been used many times for divination, and two of those occasions have been recorded in inscriptions on its surface. One of these reads:

- (1) 甲辰·歲祖甲一牢·子祝。

Day 41/60, perform a *sui*-sacrifice to Male Ancestor Day 1/10 with one *lao*-ox, and with the Child invoking. (HD17)

The form of the sexagenary date notation used in divination records like these, consisting of a 10-cycle term (in this instance *jia* 甲 'day 1/10') followed by a 12-cycle term (*chen* 辰 'day 5/12'), is identical to that used in all later periods. The details of the *sui*-sacrifice, the *lao*-ox and the 'invocation' need not concern us here, and are in any case only imperfectly understood. The established understanding is that inscriptions like these record a proposition about an action to be performed that required validation or testing through divination. In this case, and in countless others like it, the proposition is that a particular

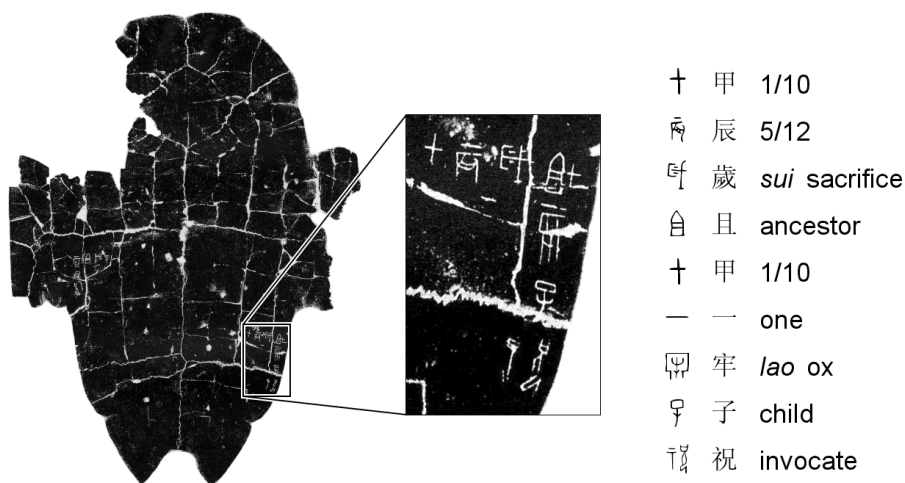


FIGURE 2: Plastron (HD17, ca. 1200 B.C.) bearing divination records with 60-cycle date notations. After: Zhongguo Shehuikexueyuan Kaogu Yanjiusuo (ed.), *Yinxu Huayuanzhuang dong di jiagu*. (Kunming: Yunnan Renmin Chubanshe, 2003), p. 102.

dead relative of the patron receive a particular kind of sacrifice on a particular day. Typically, the cyclical date that opens an Anyang divination record is explicitly marked as the date of the divination rather than of the proposed action, which may be some time later. In example (1), however, it is not made explicit whether the day 41/60 is the date of the divination or the sacrifice, but it is likely to be the date of both.

The recipient of the proposed sacrifice in (1) above is referred to by a combination of a kinship term and a term from the 10-cycle, in this case *zu* 祖 ‘male relative of grandparental or higher generation’ and *jia* 甲 ‘day 1/10’. This combination of kinship term and 10-cycle term is the standard form for day-names for referring to dead relatives in all Shang-period texts.<sup>22</sup> The kinship term is determined by a combination of the sex of the sacrificial recipient and his or her generation relative to the divinatory patron proposing to perform the sacrifice (table 5). Although we are used to referring loosely to the Shang elite’s ritualized relationship with their dead relatives as ‘ancestor worship’, it is worth noting that kin receiving sacrifice are by no means all ‘ancestors’ in the strict sense, since they include brothers, paternal uncles, paternal great-uncles, etc., and their wives. It should also be noted that, certainly for the royal lineage and perhaps for other Shang families too, several of the kinship terms refer to broader categories than their conventional English translations suggest. ‘Father’, for instance, can refer to paternal uncles as well as fathers, and the category ‘Brother’ probably includes half-brothers by different mothers, and cousins.

Sacrificial recipients with the same kinship term are distinguished from one another by the term from the 10-cycle which follows it. Unlike the kinship term, which varies depending on the relationship to the divinatory patron who is to perform the sacrifice, the term from the 10-cycle is fixed for any given recipient, no matter who is divining about the sacrifice. The Anyang period king Wu Ding (K27), for example, would be referred to



| Generations older than ego |                | Male   |             | Female  |
|----------------------------|----------------|--|-------------|---|
| 2 or more                  | <i>zu</i> 祖    | Paternal (great etc.) grandfather, and patrilineal great uncles. | <i>bi</i> 妣 | Paternal grandmother and other wives of <i>zu</i> . |
| 1                          | <i>fu</i> 父    | Father and paternal uncles.                                      | <i>mu</i> 母 | Mother and wives of <i>fu</i> .                     |
| 0                          | <i>xiong</i> 兄 | Elder brothers (and cousins?)                                    | —           |   |
| -1                         | <i>zi</i> 子    | Sons (and nephews?)  | —           |   |

TABLE 5. Common kinship terms in Shang day-names.

as ‘Father Ding’ (i.e. Father Day 4/10) by kin of his children’s generation, and as ‘Ancestor Ding’ (i.e. Ancestor Day 4/10) by younger generations.

The regular recipients of sacrifice mentioned in the Anyang divination records are for the most part precisely those individuals who appear in the Shang king list of the *Shi Ji*. Matching up the two sets of day-names was one of the foundational achievements of early scholarship on the Anyang inscriptions.<sup>23</sup> The divination records also refer frequently to sacrifice directed towards wives of members of the royal patriline, who are missing entirely from the received king list. Additional less frequently-occurring male day-names that cannot be matched with the king list are probably those of royal brothers who did not succeed to the kingship. Since almost all our examples of recorded divinations were produced under the patronage of a single family, and since that family targeted its sacrifices towards its own kin, the divination records provide no dependable examples of day-names belonging to individuals far removed from their patrilineal line of descent.<sup>24</sup> This restriction is compensated for by the evidence from bronze inscriptions reviewed below.

To return to example (1), it is not simply a coincidence that the date of the record, day 41/60, and the name of the sacrificial recipient both comprise the same term from the 10-cycle. A second record on the same plastron reads:

- (2) 乙巳，歲祖乙一牢，彘祝。

Day 42/60, perform a *sui*-sacrifice to Male Ancestor Day 2/10 with one *lao*-ox, and with [unknown name] invoking. (HD17)

Day 42 (2/10 and 6/12), a day later than the date in (1), corresponds to the second day in the 10-cycle. The sacrificial recipient’s day-name is Day 2/10. This well-known pattern, in which the day of a proposed sacrifice according to the 10-cycle corresponds with its recipient’s day-name, does not hold in all cases. Nevertheless, the association is a strong one. Table 6 shows the frequency across the HD corpus with which the two sacrificial recipients from examples (1) and (2) occur in records dated with different 10-cycle terms. The majority of records have dates that correspond with the day-name of the sacrificial recipient they mention. The most common exceptions have dates one day earlier than the day-name of the recipient. These for the most part reflect divinations carried out a day before the sacrifice they are intended to validate.<sup>25</sup>

There is, then, a strong interrelationship between the notation of days using the Shang 60-cycle and the sacrificial performances of Shang religion. The evidence just reviewed

| Day name               | Divination record dates |    |   |   |   |   |   |   |   |    | Total records |
|------------------------|-------------------------|----|---|---|---|---|---|---|---|----|---------------|
|                        | 1                       | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |               |
| Ancestor Day 1/10 (祖甲) | 49                      | 4  | 2 | 4 | 2 | 1 | 2 | 1 | 1 | 10 | 76            |
| Ancestor Day 2/10 (祖乙) | 17                      | 53 | 2 | 7 | 2 | 1 | 2 | 3 | 0 | 3  | 90            |

TABLE 6. Dates of HD divination records concerning sacrifice to Ancestors Day 1/10 and Day 2/10.

suggests that the day-names are primarily indicators of the day on which an individual routinely received sacrifice.

A final point about the Shang-period use of cyclical terms that can usefully be made here is that, in the various applications to which they are put, the 10-cycle appears dominant. The 12-cycle plays a more ancillary role, serving merely to disambiguate the consecutive passages of the 10-cycle. For example, although dates in divination records are typically expressed with the 60-cycle as in (1) and (2) above, using a compound of terms from the 10-cycle and the 12-cycle, there are nevertheless many examples of the systematic use of the 10-cycle alone, to record days modulo 10.<sup>26</sup> The use of the 12-cycle alone, on the other hand, is rare enough to appear anomalous when it does occur.<sup>27</sup> Furthermore, the ‘day-names’ of sacrificial recipients draw only on the 10-cycle and never on terms from the 12-cycle.<sup>28</sup>

The primacy of the 10-cycle is also clear from the fact that scribes responsible for maintaining divination records conceived of the 60-cycle as comprising six ten-day weeks (*xun* 旬, etymologically ‘cycle; round’) each corresponding to a single passage of the 10-cycle. (These will simply be referred to as ‘weeks’ henceforth). This is reflected in both the format of the date tables used for training scribes (described above),<sup>29</sup> and also in the practice of ‘divining for the week ahead’ (*bu xun* 卜旬). Records of ‘divining for the week ahead’ document a series of divinations at ten-day intervals, each on the last day of a *xun*-week (i.e. on a day 10/10), sometimes accompanied by additional statements of events that transpired during the week. Scribal conventions also mark a distinction between future dates that lie within the current week, and dates that lie beyond its end. Although one could imagine the 12-cycle similarly, as a concurrent twelve-day week, there is little sign that it was thought of that way by the Anyang scribes, who seem to have had no term parallel with *xun* to refer to it.

### ‘Day-names’ on Late Shang bronzes

The day-names for recipients of sacrifice that occur in the divination records from Anyang belong overwhelmingly to dead members of the royal family—the Shang kings and their wives—going back many generations and into the first half of the second millennium BC. However, the use of day-names for deceased kin was not confined to the Shang kings at Anyang, but was shared by the Shang-influenced elite of a much broader region of North China during the latter part of the Anyang period and the immediately subsequent centuries. This is clear from numerous short inscriptions on bronze objects, most often ritual food or drinking vessels, that feature exactly the same compounds of kinship term and day-name as those used by the Shang kings. The consensus is that bronze vessels of this kind were employed in ritual feasts offered to deceased kin, procedures similar to the

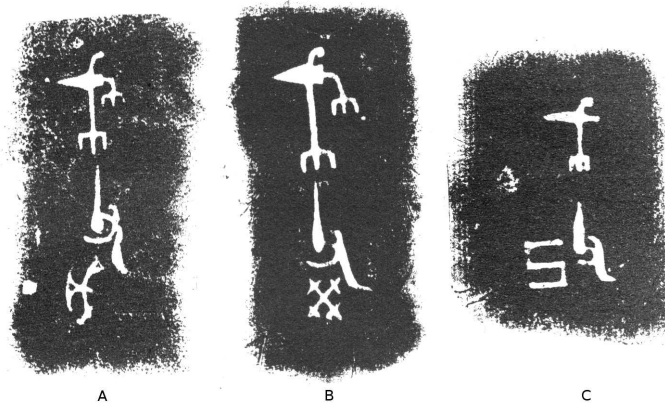


Figure 5: Day-name inscriptions on bronzes from Gaojiapu, each with the “dagger-axe” pictogram. A: Tomb M1, “Father Day 5/10”. B: Tomb M3, “Father Day 10/10”. C: Tomb M4, “Father Day 6/10”. After: Shaanxisheng Kaogu Yanjiusuo, *Gaojiapu Ge guo mu* (Xi’an: San Qin Chubanshe, 1995), pp. 23, 63 & 75.

sacrifices that the Anyang royal diviners frequently validated through divination. A day-name that appears on one of these bronze vessels is assumed to indicate the dead relative to whom the object was dedicated.

A second category of Late Shang bronze inscription is made up of the so-called ‘clan signs’ or ‘lineage emblems’ (*zuhui* 族徽).<sup>30</sup> These can occur either independently or together with day-names on the same bronze (figure 3). Unlike the day-names, the clan signs are not composed of signs from the script, but of typically more pictographic elements only loosely related to the script proper. The tendency for the same clan-sign to occur repeatedly in a single cemetery is the main reason why these are understood to indicate affiliation with descent groups of some nature.<sup>31</sup>

A third category of inscriptional content specifies the name of what might be called the maker or donor, or perhaps commissioner, of the bronze. Again, content of this kind can occur either with or without the other categories just mentioned. Inscriptions that go beyond these three simple categories are exceptionally rare during the Anyang period.

Inscriptions of these kinds on bronzes are, like the divination records, unknown prior to the Anyang period. Among the earlier examples of inscribed bronzes from Anyang are those from the only intact tomb of a member of the (nuclear) royal family to have been excavated, that of Fu Hao 婦好 (‘Wife Hao’). She was one of the spouses of Wu Ding (K27) and was buried with over 1,600 kg of bronze objects. She was also probably the mother of the patron of the HD divination records mentioned above.<sup>32</sup> The name ‘Fu Hao’ appears frequently, referring to a living individual, in divination records from the time of Wu Ding. Its appearance on many of the bronzes from the tomb, presumably cast and used during her lifetime, is the primary grounds for the identification of the tomb occupant. A second group of bronzes from the same tomb included two massive (120 kg each) quadripod vessels inscribed with the day-name ‘Mother Day 8/10’ (母辛).<sup>33</sup> Divination records make it clear that one of the wives of Wu Ding received sacrifice after her death under the day-name Day 8/10. The inscriptions from the tomb invite the conclusion that this day-name and ‘Fu Hao’ refer to the same individual. Fu Hao’s day-name

would then be one the very few that are known to occur in both divination records and bronze inscriptions. The identification is also significant in showing that the dedicatee of ritual bronzes buried in a tomb, and the referent of day-names inscribed upon them, can be the tomb occupant herself, as well as her deceased kin. Since day-names seem to have been exclusively posthumous appellations, it is likely that those bronzes from Fu Hao's tomb that bear her day-name were specially cast by one or more of her children in the interval between her death and her burial.

By the end of the Anyang period, a comparable use of day-names on ritual bronzes found buried in tombs had become widespread throughout northern China, from the Wei river valley in modern Shaanxi in the west, to the East Coast province of Shandong, an east-west range of over 1,000 km. Simple bronze inscriptions are the only known regularly-occurring examples of the Shang writing system outside Anyang. Their geographic distribution implies a widespread familiarity among northern Chinese elites with the 10-cycle and an apparently consistent understanding of its religious applications, but not necessarily with any more complex Shang calendrical schemes.

Many sites could be selected to illustrate the deployment of Shang-style day-names and clan-signs in mortuary contexts outside Anyang, and thus to demonstrate the geographically distributed nature of the day-name tradition towards the end of the second millennium.<sup>34</sup> Here we examine briefly the inscriptions from the cemetery at Gaojiapu, located 540 km away from Anyang, in Jingyang County, Shaanxi.<sup>35</sup> The four elite burials (M1–M4) that were excavated at the cemetery all date to around 1000 BC, at the very end of the Shang occupation of Anyang or during the early reigns of the Western Zhou (ca. 1050–771 BC).<sup>36</sup> Between them, these four tombs contained 140 kg of bronze ritual objects, and extensive evidence for their use in ritual feasting on the occasion of the burial. Many of the tripod and quadripod vessels contained deer, sheep or ox bones, or the evaporated crust of cereal porridge. The remains of hemp binding around the handles suggested to the excavators that the vessels had been positioned in the tomb while still hot.

Twenty-seven of the bronze objects from the tombs bore inscriptions, including a number of clan signs and day-names. The presence of the 'dagger-axe' (*ge* 戈) pictogram in eight of the inscriptions, distributed across all four of the tombs, led the excavators and subsequent commentators to conclude that the four tomb occupants were members of a descent group that took the 'dagger-axe' as its identifying emblem. The following day-names occur (figure 3):

Tomb 1 – Fathers Day 5/10 and Day 6/10,

Tomb 2 – Fathers Day 4/10 and Day 8/10,

Tomb 3 – Fathers Day 4/10 and Day 10/10,

Tomb 4 – Ancestor Day 10/10, and Fathers Day 4/10, Day 5/10, Day 6/10 and Day 10/10.

If we can assume that something similar to the practices and terminology of the Shang royal family are at work here also, the bronzes dedicated to 'Fathers' can be taken to include vessels cast and used by the tomb occupant, dedicated to his fathers and paternal uncles. There are probably also bronzes cast by mourners a generation below the occupant and dedicated to the occupant himself, in the same manner as the Mother Day 8/10 bronzes from Fu Hao's tomb.

Unfortunately, little can be said about the relationships of the four tomb occupants

to one another, and therefore to each others' inscriptional dedicatees, beyond some possibilities suggested by certain features of the bronzes and their inscriptions. For example an identical inscription mentioning both the day-name of the dedicatee (Father Day 4/10) and the personal name of the maker of the vessel occurs on two similar quadripod vessels from Tombs 3 and 4. Among the less convoluted explanations that could be imagined, is that the maker of the two vessels was the occupant of one of the tombs, and his Father Day 4/10 the occupant of the other. The two vessels could in that case have been cast at the same time, prior to the burial of Father Day 4/10. One was used in his interment ceremony and buried within the tomb, and the second retained for honouring the deceased in above-ground rituals, until it accompanied its maker into the second tomb.

When considering the appearance towards the end of the second millennium BC of geographically dispersed evidence for the 10-cycle, and of its Shang-style ritual use and written notation, a central question is whether this was due to routine and direct interaction with Anyang or whether the users of the 10-cycle were drawing on more ancient shared traditions. Several lines of argument converge on the likelihood that the adoption across much of North China of the 10-cycle and the uses we have been describing was a relatively rapid process under the influence of royal Shang models.

As we have noted, little evidence for literacy or its immediate precursors has been found in contexts earlier than Anyang,<sup>37</sup> nor does any category of text more complex than the simplest bronze inscriptions occur at locations outside Anyang until after the fall of the Shang. The Shang script itself has traits that imply it is a recent innovation. The first excursion of the writing system beyond the focal point of its application in the ritual life of the Shang kings may well have been to disperse a system of nomenclature for deceased relatives among neighbouring elites. Certainly, no regionalisms have been detected among bronze inscriptions of the kind we have been considering: the forms of the day-names show no sign of local variation. Clan signs also recur at widely dispersed locations. The 'dagger-axe' clan sign, for example, which has its most concentrated presence with eight exemplars in the cemetery at Gaojiapu discussed above, also occurs at 27 other localities, including Anyang, spread across eight provinces during the Late Shang and Western Zhou periods, implying considerable mobility of the inscribed objects and their owners.<sup>38</sup>

The large numbers of bronzes with Shang-style day-names (1,610 according to a recent count)<sup>39</sup> makes it possible to generate informative summary statistics that would not be possible with the much more limited data from the Shang king list. These reveal striking patterns in the use of day-names that also suggest that these appellations for dead kin were employed inter-regionally in a remarkably consistent (and probably Anyang-centric) fashion. Several studies have found that every even-numbered day-name is far more popular than any odd-numbered day-name (figure 4),<sup>40</sup> although the odd-numbered names also occur frequently. The pattern is clearly visible for the male kinship terms (86% of 1,321 day-names are even), and probably holds also for the much less well-attested female ones (84% of 57 female day-names are even). Like the previously-mentioned patterns within the king-list, but with far greater statistical force, this tendency demonstrates that the assignment of day-names is not a simple reflection of any evenly-distributed variable such as date of birth or death, as K. C. Chang was the first to remark.<sup>41</sup>

A less salient trend is the contrasting distribution of male and female day-names. From the bronze inscription data, the male day-names appear to be weighted towards the earlier days in the 10-day week: 48% are days 2/10 and 4/10, rather than the 40% expected from an even distribution. Names of female kin are weighted towards the later days: days 8/10

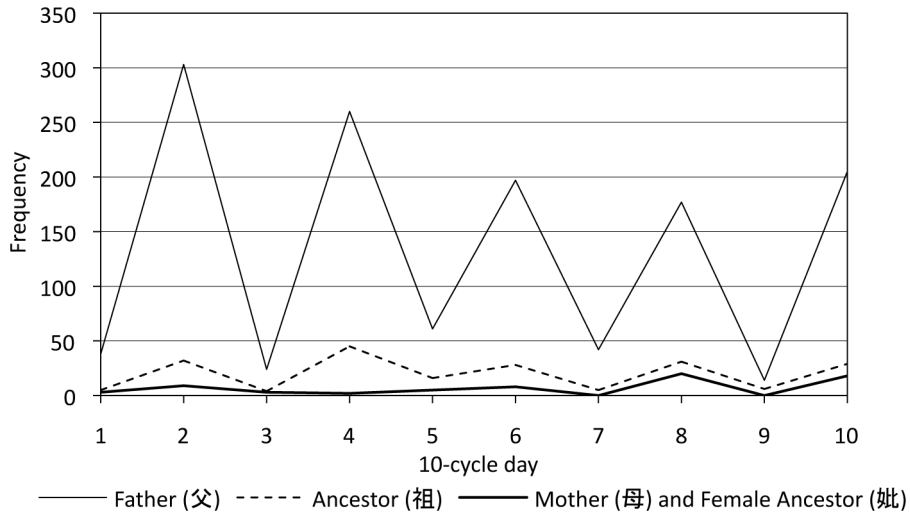


Figure 4. Frequency of 10-cycle day-names in bronze inscriptions. Chart redrawn from data in Yan Zhibin & Hong Mei (2008), p. 185.

and 10/10 make up 67% of the total (compared with the expected 40%).

Fu Hao, or posthumously Mother Day 8/10, is the only possessor of a bronze-inscribed day-name whose spouse we can identify in the Anyang divination records. As mentioned previously, her husband can be identified as Wu Ding, posthumously named Day 4/10. We thus have a couple, of which the male has a day-name earlier in the week than his wife. Including Fu Hao, the day-names of twenty-two wives of Shang kings are known from the sacrifice divinations from Anyang. Nineteen of these are day-names later in the week than those of their husbands, and only three are exceptions to this tendency (K5, K6 & K19, see table 3).<sup>42</sup> Among the known royal wives, the three exceptions are additionally distinctive in that they are the only ones with husbands whose day-names occur in the last three days of the week, and they include the only two instances of wives with day-names at the very beginning of the week. Moreover, as mentioned previously, there are no instances of royal wives with the same day-names as their husbands.

Thus, the procedure for assigning day-names seems to have treated a Shang king and his wives as a unit, endeavouring to accommodate them on separate days within a single week with males ordered before females. When for whatever reason a male was assigned a more unusual day-name late in the week, there would be a likelihood that his spouse would 'roll over' to a similarly unusual (for a woman) day-name at the beginning of the following week. Similar procedural constraints are likely to have been behind the patterning of the bronze-inscription day-names noted above.

The counts of inscribed bronzes mentioned above, and their wide region of distribution, are striking. However, it is important to remind ourselves that the institution of the day-name can only be firmly associated with a very small portion of the late second-millennium population. It was only a very small proportion of individuals that had bronzes buried with them, and only a small proportion of those bronzes that had day-names inscribed onto them. For example, of the 939 Late Shang burials, predominantly of



humble status, that were excavated from the ‘western zone’ cemetery at Anyang, only 61 tombs contained bronze ritual vessels, and only 14 day-names occur among the inscriptions.<sup>43</sup> Elite tombs can also sometimes surprise with an absence of day-name inscriptions. Tomb M160 from the Guojiazhuang cemetery at Anyang, although not furnished with quite the richness of Fu Hao’s tomb, was nevertheless far more lavishly filled than the tombs from Gaojiapu discussed above, and contained 250 kg of bronze objects.<sup>44</sup> Forty-one of the ritual bronzes from the tomb are inscribed, in almost all cases with variants of a single emblem, presumably identifying the occupant or his kin group. The absence of any day-names implies that, if the ritual food and wine vessels were dedicated to dead kin in the usual manner, a rather different labelling convention was being followed from that of either the Gaojiapu tombs or that of Fu Hao.

### **The Procedure for Assigning Shang Day-Names: A Review of Candidate Hypotheses**

Having surveyed the two major sources of contemporary evidence concerning the Shang use of day-names, we are now in a position to review attempts to elucidate the institution that lay behind it. Besides general plausibility within the cultural context, candidate hypotheses have to fulfil two criteria in order to be viable: they must explain, or at least comfortably accommodate, the distributional patterns described above, and they must account for the evidently calendrical nature of the day-name institution, that is, they must explain why the names given to dead kin are also names for days in the 10-cycle.<sup>45</sup>

Chang Kwang-chih, initially focusing only on the apparent regularities within the Shang king list, proposed a highly elaborate and unusual system of royal succession.<sup>46</sup> The Shang kings, according to Chang, were all members of a single clan. They were, however, divided into ‘ten exogamous descent groups’, with the same names as the ten days of the week. Successive Shang kings were alternately taken from these patrilineal descent groups, from some more frequently than others, but with the rule that no group could provide two successive kings. Successors were picked by a ‘council of elders’, and the ten groups bound together by cross-cousin marriage, so that kings would be maternal uncles of their successors.

Despite its evident shortcomings, Chang’s proposal did much to stimulate renewed interest in the question, and continues to inspire kinship-based solutions of the day-names problem. Chang was also the first to produce statistical summaries of day-names in bronze inscriptions of the kind that we reviewed above. Nevertheless, the hypothesis is in conflict with too many independent lines of evidence to be in any way tenable. It requires that the all the assertions of paternity and fraternity in the received king list be rejected—neither the received king list nor contemporary texts give any sense that the kingship is alternating between different descent groups. It does nothing to explain why clans should be named after days of the week or why even-numbered clans should appear very much more often in bronze inscriptions than odd-numbered ones. The idea of rulership alternating by consensus between lineages is perhaps conceivable, but what version of this alternation could be imagined to apply to all the other elite lineages that used day-names?<sup>47</sup> Since membership of a descent group is determined by birth, it is odd that the names of Chang’s ten groups are only ever used to refer to dead recipients of sacrifice. Finally, the patterns of male vs. female day-names become puzzling under Chang’s interpretation—why do the descent groups that produce the most named males produce the fewest females?

Similar kinship-based models inspired by Chang's are vulnerable to the same objections. Zhang Fuxiang's proposal that day-names are matrilineal names is perhaps sociologically more credible, but again fails to account either for the patterns in the use of names or for the fundamentally calendrical nature of the institution.<sup>48</sup>

Ma Chengyuan, drawing attention to the principle of kings having day-names earlier in the week than their wives, proposed that divination was used to assign males a day-name as a 'courtesy name' (*zi* 字) at their coming-of-age 'capping ceremony' (*guan li* 冠禮), and to females at their betrothal.<sup>49</sup> The evidence of a central role for divination is appealing and will be considered in detail below. However, the evidence Ma offered in support of an association with the capping ceremony is exceedingly weak. Ma understood the capping ceremony primarily from compendia of ritual prescriptions that took their current form a millennium after the appearance of the 10-cycle and day-names.<sup>50</sup> Although similarities between prescriptions of the ritual compendia and attested Shang practice are in some spheres remarkable (we will examine some subsequently), continuity between the two must be demonstrated rather than assumed. The practice of choosing a 'courtesy name' at the coming-of-age is firmly established for the Eastern Zhou period (770–256 BC) upper classes, but this was a name for use by one's peers outside the family, not a posthumous name used by kin. Ma collected an interesting list from Eastern Zhou literary texts of names of living individuals that include 10-cycle terms, but this can readily be explained as a product of the ongoing interest in their calendrical or magical associations. Perhaps most puzzling in Ma's approach is the idea that the Shang would have attempted to distinguish themselves from one another socially using courtesy-names drawn from a repertoire of just ten possibilities.

A more promising account for Shang day-name usage can be arrived at by considering the interaction of three different aspects of Shang religious practice that have each been the subject of intensive discussion in the Chinese-language literature: funeral divination, funeral scheduling and an evolving calendrical structure that I will refer to as the 'Cyclical Sacrificial Roster' (CSR). The complexities of the CSR will be dealt with in the following section. Here we examine the evidence for funeral scheduling and the divinatory determination of day-names and funeral days.

The accidents of preservation and discovery have preserved for us a detailed divinatory record of the funeral of precisely one individual at Anyang, a royal wife, probably the wife of Zu Geng (祖庚, K29).<sup>51</sup> She has the title 'Lesser Queen' (*xiao hou* 小后), but since no phonological value has been identified for her personal name we will have to refer to her as 'Lesser Queen X'. There are at least eighteen divination bones or fragments thereof that mention this woman in the context of her funeral arrangements or her posthumous receipt of sacrifice.<sup>52</sup> Most of the divinations were performed by diviners Chu 出, Xiong 兕 and Da 大, three colleagues from a divination workshop. The inscriptions produced by this workshop are classified as the 'Chu Group' (*Chu zu* 出組) of divination records, named after the first of the diviners.<sup>53</sup> Since many of the records specify the month as well as a cyclical day, what might be called the 'microchronology' of this set of inscriptions is relatively clear.

In the eighth month of an unknown year, probably during the reign of Zu Geng, a routine 'divination for the week ahead' (*bu xun*) was performed on day 20/60. The record, which was copied onto two bones (HJ04962, HJ04963), is badly damaged. Enough remains to see that a 'verification' (*yan ci* 驗辭, a statement of 'what really happened' after the divination was performed) was added. It mentioned that on the subsequent day



26/60 an uncertain event involving Lesser Queen X took place. The following week her funeral was being planned, and so it is likely that the event was, or somehow involved, her death.

On day 33/60, in what must surely be the same eighth month, a divination was carried out by Diviner Chu testing the proposition,

- (3) 作小后X日·惠癸。

In making a day for Lesser Queen X, it should be day 10/10.

The proposition appears on three separate bones (HJ23712–HJ23714). This divination seems to be the one that determined Queen X's posthumous day-name, the popular female name of Day 10/10. The following day, day 34/60, sees a flurry of divinatory activity related to the funeral process, and also to the selection of a new queen.<sup>54</sup> Subsequently, in the tenth month, and on days 50/60 and 20/60 in months unknown, we find divinations concerning sacrifice to Minor Queen X of sheep, oxen and humans. Note that the cyclical days for the sacrifices are both day 10/10, and thus match the previously determined day-name.<sup>55</sup>

Having reviewed late second millennium evidence that establishes a relationship between divination, funerals and day-name determination, we can now examine later literature for comparative examples and signs of cultural continuity. Two sources have been found to be especially relevant. The first are the ritual texts, the *Zhou Li* 周禮, *Yi Li* 儀禮 and *Li Ji* 禮記, which probably reached their present form during the last centuries of the first millennium BC but nevertheless contain material reflecting institutions and practices of varying dates across the first millennium.<sup>56</sup> The second is the so-called *Springs and Autumns* (*Chun Qiu* 春秋) chronicle of the state of Lu 魯, which documents a selection of significant events, including deaths and funerals, over the span from 722 to 481 BC. The chronicle preserves chronological information with considerable accuracy, and of a kind that could not readily be constructed retrospectively but which would have required contemporary record-keeping (the solar eclipse records in the text will be discussed subsequently).<sup>57</sup>

Inoue Satoshi was the first to link the prescriptions of the ritual compendia and the funeral dates in the Springs and Autumns with the evidence for Shang practice, in particular the day-name frequency data collected by K.C. Chang.<sup>58</sup> Inoue's treatment of the testimony in received textual sources has been extended considerably by Yu Wanli in a recent article on names and appellations during the Shang and Zhou periods.<sup>59</sup> To these should be added an important paper by Liu Xu that provides a complete tabulation and analysis of the funeral dates in the Springs and Autumns.<sup>60</sup>

Inoue's contribution was to recognize that the Shang bias in favour of even-numbered day-names is matched by an even more absolute bias in favour of even-numbered days for funerals recorded in the Springs and Autumns. This accords with prescriptions in the ritual texts and their early commentaries that funeral events take place on even-numbered days (so-called 'soft days' *rou ri* 柔日) to be determined by divination. Inoue concluded that the day-name was simply the day of interment (*zang ri* 葬日) determined according to such a procedure.

Yu Wanli makes the important observation that the interment itself was not the only stage of the funeral process that required scheduling. Other post-burial ritual performances specified by the ritual texts include a repeated procedure (*yu* 虞) for 'settling' the

interred, and another (*fu* 祔) after the ‘termination of wailing’ (卒哭) for accommodating the deceased together with other kin as a recipient of regularized sacrifice in the lineage temple. The ritual texts and their commentaries make similar prescriptions about these later funerary activities taking place on even-numbered days, though not on the same 10-cycle day as the burial. Yu makes the specific claim that the Shang day-names reflect the 10-cycle day of the *fu* procedure, when the deceased was installed in the lineage temple. The (even) number of days between the burial and the *fu* procedure is, according to Yu’s reconstruction, a function of the social rank of the deceased, while the day of burial is determined by divination.

Yu’s scheme is appealing as a sketch of how the Shang day-names might be linked to divination, burial and the initiation of sacrificial routine. However, it also stretches the methodology of comparing the ritual texts with the second millennium evidence beyond plausible limits, resulting in a misleadingly precise conclusion—the identity of the Shang day-name with the day of the *fu* procedure. The terminology of the ritual texts is largely alien to the Shang period inscriptions. There is no sign from the divination records that *fu* or *yu* procedures were distinguished by the Shang, still less that they were scheduled according to Yu’s reconstruction. The terminology and scheduling of Minor Queen X’s funeral arrangements for example, to the extent that they can be made out, appear to be entirely different. The terminology of ‘hard’ (odd-numbered) and ‘soft’ (even-numbered) days is similarly a product of late first-millennium BC, and not inherited from the Shang.

Although there is continuity between the second and first millennia in the use of the 10-cycle to schedule elite funerals, there are clear differences also. The data from the Springs and Autumns presented by Liu Xu is particularly valuable in this respect. Liu tabulates all 35 records of burials (*zang*) that specified the 60-cycle date on which the event was scheduled to take place.<sup>61</sup> All are burials of the highest ranking aristocrats, that is, rulers of states and their wives. Of these 35 burials, only one is scheduled on a ‘hard’ or odd-numbered day.<sup>62</sup> This is clearly distinct from the Shang day-names, where odd-numbered day-names, though the minority, are nevertheless common in both the bronze inscriptions and the king list. The relative frequency of the five ‘soft days’ also differs from the Shang model: days later in the week are distinctly more frequent than earlier days (figure 5), despite the great majority of the deceased being male.

In summary, there is good evidence that divination played a role in the assignment of Shang day-names after death, and in funerary arrangements more generally. Divination can accommodate the right mix of deterministic and aleatoric procedural constraints (as well as human manipulation) of the kind that might have produced the statistical patterns discussed above. The favouring by elites of the first-millennium of even-numbered days for burials, determined by divination, likely represents inheritance with modification of aspects of Shang funerary procedures and their symbolic imprint on the system of cyclical days. Second- and first-millennium elites were both commemorated ritually in lineage temples, and the Shang day-names reflected the day of the 10-cycle on which that commemoration typically occurred. However, there is no grounds for thinking that the day-name was set by an event in the Shang funerary schedule, either the burial or any other, that can be simply identified with procedures known from later texts.

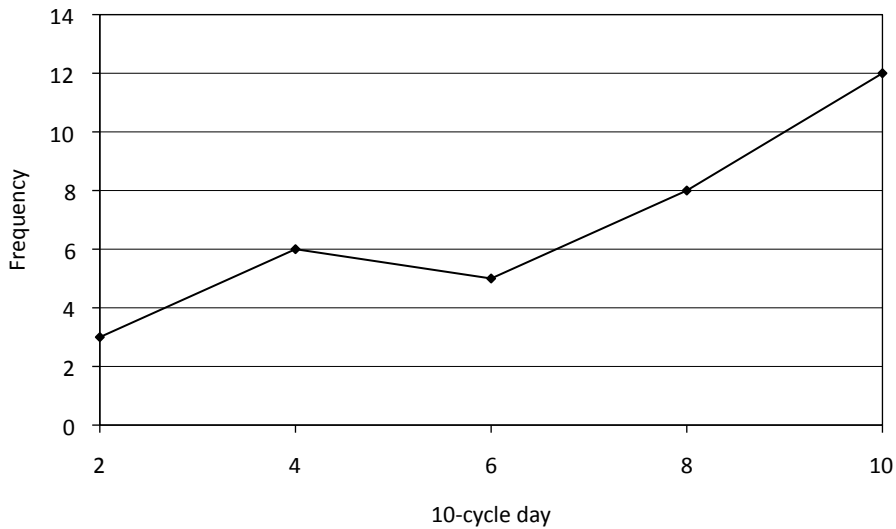


Figure 5. Distribution of 34 even-numbered funeral days in the Springs and Autumns. Chart prepared from data in Liu Xu (1994), table 3, p. 195.

### The Cyclical Sacrificial Roster

What I will refer to here as the ‘Cyclical Sacrificial Roster’ (CSR, *zhou ji zhidu* 周祭制度) is a complex structure based, ultimately, on the 10-cycle, that was used to schedule ritual procedures performed on behalf of the current king, and directed at his dead predecessors and their wives. It illustrates how the wish to schedule the royal family’s commemoration of dead kin drove the evolution of mechanisms capable of tracking events and processes over long periods of time. Indeed, the written documentation that sustained the CSR may have provided important systematic data to stimulate interest in predictive, as opposed to observational, timekeeping.

The existence of the CSR has been known about since Dong Zuobin’s pioneering attempt in the 1940s to reconstruct it on the basis of Anyang divination records. Reconstructions based on his work continue to be refined and applied to chronological questions, specifically to the absolute dating of the reigns of the last few Shang kings. The demonstration that the *Shi Ji* king list was substantially accurate, and corrections of its errors of detail, were dependent on the reconstruction of the CSR. Problems and uncertainties remain in aspects of the reconstruction, but the system of the CSR is understood in great detail. What follows is a necessarily highly compressed summary, focusing on the results of reconstruction efforts and only alluding to the elaborate argumentation that lies behind them.<sup>63</sup>

We noted previously, in discussing citations (1) and (2) above, the tendency, visible in the earliest records from Anyang, for kin to receive sacrifice on their name-days. A second tendency is for kings to receive sacrifices in the order of their succession. The CSR seems

|    |    |    |    |    |
|----|----|----|----|----|
| S1 | S2 | S3 | S4 | S5 |
| 翌  | 祭  | 崇  | 魯  | 彡  |

TABLE 7. The five procedures of the Cyclical Sacrificial Roster.

to have emerged through a progressively stricter application of these two principles to a king list that grew with the death of each king.

Five kinds of sacrifice are regulated according to the CSR. Table 7 shows conventional transcriptions of the graphs used in the divination records to write the sacrificial procedures.<sup>64</sup> Since in several cases we have no readily typeable transcription or romanization for their names, I will simply refer to them as S1 through S5. During the periods when the CSR can be shown to be in operation, it is not the case that all sacrifices are scheduled according to the CSR. Even sacrifices S1–S5, or those to kings and their wives that feature in the roster, can be scheduled outside as well as within the scheme of the CSR. Only sacrifices of type S1–S5 that can be shown to be scheduled according to the complex arrangement based on day-name and order of succession to be described below are considered instances of the CSR in operation.

The CSR is most completely understood from 365 inscriptions in the so-called Huang Group of divination records, which date to the last three reigns at Anyang (K33–K35, ca. 1100–1050 BC). The Chu Group (which includes the divinations about Minor Queen X discussed above), includes 140 further examples dating to the reign of Zu Jia (K30, ca. 1150 BC). A continuous evolutionary history can probably be presumed for the CSR outside the testimony of these chronologically disjoint groups, but insufficient inscriptions from the interim are available to reconstruct it to any degree. As we will see, the CSR was still evolving during the period of the Chu Group inscriptions, but had reached a stable state before the time of the Huang Group records.

The CSR provides a schedule according to which all five of the sacrificial procedures (S1–S5) could be applied, one after the other, to an uninterrupted sequence of kings in the king list, in order of royal succession, and to their wives. Shang Jia (K1), the first Shang ancestor to have a day-name, begins the sequence. The list of kings appearing in the roster had not yet reached its greatest extent during the period of the Chu Group records. In the Chu Group records, it terminated with Zu Geng (K29), referred to (from the perspective of his younger brother, Zu Jia, K30) as ‘Elder Brother Day 7/10’. From the later Huang Group records, it can be seen that the list was subsequently extended to include Zu Jia (K30) and Kang Ding (K31), but no further. K32–34 were not incorporated into the CSR by their successors.<sup>65</sup>

Table 8 shows the schedule according to which the CSR sacrifices were performed to each of the kings and their wives. The same schedule was followed for each of the procedures S1–S5, but staggered at intervals as described below. The schedule was spread over nine weeks during the period of the Chu Group records, and over ten for the Huang Group.

The following principles can be seen to apply:

1. Kings and wives receive sacrifice on their personal name-days (cf. table 3).
2. No two kings occupy the same slot, nor do any two wives (with one exception

|         | Day 1 | Day 2 | Day 3 | Day 4                   | Day 5 | Day 6 | Day 7 | Day 8    | Day 9 | Day 10 |  |
|---------|-------|-------|-------|-------------------------|-------|-------|-------|----------|-------|--------|--|
| Week 1  | K1    | K2    | K3    | K4                      |       |       |       |          | K5    | K6     |  |
| Week 2  |       | K7    |       | K8                      |       |       | K5:7  |          |       |        |  |
| Week 3  | K9    |       | K10   |                         | K8:5  |       | K11   | K9:8     | K11:9 |        |  |
|         | K6:1  |       | K7:3  |                         |       |       |       |          |       |        |  |
| Week 4  | K12   |       |       |                         | K13   | K14   |       |          | K13:9 |        |  |
| Week 5  |       |       |       | K15                     |       | K15:6 |       |          | K16   | K15:10 |  |
| Week 6  | K17   | K18   |       |                         |       | K18:6 | K18:7 | K19      |       |        |  |
| Week 7  | K20   |       |       | K21                     |       | K21:6 | K22   |          |       |        |  |
|         | K19:1 |       |       |                         |       |       | K21:7 |          |       |        |  |
| Week 8  | K23   |       |       |                         |       |       | K24   | K25      |       |        |  |
| Week 9  |       | K26   |       | K27                     |       | K28   | K29   | K27:8    |       | K27:10 |  |
|         |       |       |       |                         |       |       | K26:7 | (Fu Hao) |       |        |  |
|         |       |       |       | Chu Group CSR ends here |       |       |       |          |       |        |  |
| Week 10 | K30   |       |       | K31                     | K27:5 |       |       | K31:8    |       |        |  |
|         |       |       |       |                         | K30:5 |       |       |          |       |        |  |

TABLE 8. CSR schedule of sacrifices to 31 kings and 20 wives (after Chang Yuzhi 1987, p.110). Kings are indicated by their K-numbers from table 3. Wives are indicated by their husband's K-number, followed by the number of their own day-name. Thus Fu Hao appears as K27:8, since she is wife of K27 (Wu Ding) and named 'Day 8/10'.

mentioned below), though a king and another's wife may occupy a single slot.

3. Kings are in order of their succession.
4. Wives fill the first available slot after their husbands, and after all wives of earlier kings have been accommodated. Notice, for example, how this last rule pushes wives K6:1, K7:3 and K8:5 into a later week than might otherwise be expected, due to the precedence of K5:7.
5. Only wives of kings on the main line of descent are represented in the CSR. Remember that because of instances of fraternal succession (table 3), some kings are not strict ancestors of their successors. Those kings are present in the CSR but their wives are not.

The exception to rule 2 is in Week 10 (Huang Group only), where the two wives K27:5 and K30:5 occupy the same slot on day 5/10. K27:5 could not have been placed in the open slot in the previous week because of the precedence of K26:7. K30:5 would thus be expected to occupy a slot in a subsequent Week 11. A Week 11 could also have accommodated Kings K32 and K33. However, although the CSR was extended by a week after the period of the Chu Group inscriptions, it was not extended again to include additional weeks. This is so even during the reigns of K34 and K35, who might be expected to have done so, and who did in fact offer non-CSR rituals to those of their predecessors whom such an extension could have accommodated. The probable rationale for this will

|             | S1                        | S2                        | S3                        | S4                        | S5                        |
|-------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Week 1      | Presentation of S1 Roster |                           |                           |                           |                           |
| Weeks 2–11  | S1 Sacrifices             |                           |                           |                           |                           |
| Week 12     |                           | Presentation of S2 Roster |                           |                           |                           |
| Week 13     |                           | S2 Sacrifices             | Presentation of S3 Roster |                           |                           |
| Week 14     |                           |                           | S3 Sacrifices             | Presentation of S4 Roster |                           |
| Weeks 15–22 |                           |                           |                           | S4 Sacrifices             |                           |
| Week 23     |                           |                           |                           |                           |                           |
| Week 24     |                           |                           |                           |                           |                           |
| Week 25     |                           |                           |                           |                           | Presentation of S5 Roster |
| Weeks 26–35 |                           |                           |                           |                           | S5 Sacrifices             |
| Week 36     | Rest Week                 |                           |                           |                           |                           |

TABLE 9. The 36-week CSR during the period of the Huang Group (after Chang Yuzhi 1987, pp. 191–200).

be considered below, but one consequence of the reluctance to extend the schedule was the cramming of the two ‘Day 5/10’ wives into the same slot in Week 10.<sup>66</sup>

Prior to the performances of a round of sacrifices according to the scheme of table 8, a week was given over to a procedure known in the divination records as the *gong dian* 工典. The precise meaning of this term is obscure, but the second word almost certainly refers to a written document of some kind. It will be translated here as ‘Presentation of the Roster’. Including this ‘Presentation of the Roster’, a single round of any one of the five sacrificial procedures S1–S5 thus took eleven ten-day weeks. If performed head to tail, the five procedures would have taken 550 days to complete. However, reconstructions of the CSR have shown that sacrifices S2–S4 were performed staggered by a week, and also that a ‘rest week’ with no CSR-related activities completed the sequence (table 9) before the entire cycle was begun again.<sup>67</sup>

This brings the total time required for a complete round of the Huang Group CSR (five sacrifices, S1–S5, applied to 31 kings, K1–K31, and their wives) to 36 10-day weeks or 360 days, approximating the length of the solar year.<sup>68</sup> In addition, three sets of divination inscriptions individually attest to the insertion of an additional ‘rest week’, either after the ‘Presentation of the Roster’ for S1 (i.e. after the 1st week) or after the ‘Presenta-

tion of the Roster' for S2 (after the 12th week). Either of these insertions would bring the period of the CSR to 370 days, a move probably intended to keep the running average of the period of successive CSR rounds close to a solar year.<sup>69</sup> The realization that the round of sacrifices could be used to approximate a solar year provides a reason for the apparent reluctance to extend the schedule of table 8 into an eleventh week. That would have brought the period of the entire cycle to a total of 390 days—too long to be a creditable approximation for the solar year—if the terminating rest-week and staggered arrangement of S2–S4 were to be retained. Any further extensions to include the last generations of Anyang kings would, if the basic shape of the CSR were to be conserved, have removed the period even farther beyond a year.

Maintaining and executing a complex scheduling apparatus like the CSR would presumably have required an explicit visual schema of some kind, the Shang equivalent of our tables 8 and 9, especially during episodes of the concurrent performance of S2–S4, when sacrifices to multiple kings and multiple wives might fall on the same day. The terminology of the 'Presentations of the Rosters' seems to refer to something of this nature. However, it is important to realize that no such complete document or table has been found, and we can only imagine what its visual and information-bearing characteristics might have been. Instead, the reconstruction of the CSR is dependent on local snapshots of its global structure provided by the records of divinations that were routinely performed to validate its progress or reassure its royal patrons that it was functioning correctly.

These CSR divinations follow a number of different formats. Some were performed at the initiation of the five sub-sequences, S1–S5. Others were 'divinations for the week ahead' (*bu xun*), done on the final day of a week to validate the sacrifices scheduled for the coming week. Others reference the sacrifices to be performed on a specific day. Because divination scapulae and plastrons were typically used multiple times, they often bear sequential records that can be used to track the progress of the CSR over several weeks. It is by chaining together these sets of sequential records that the global structure of the CSR has been pieced together.

Contemporary with the CSR of the Huang Group records, characterized by its potential for a controlled alignment with the solar year, there appears for the first time evidence for an interest in maintaining counts of years. Earlier inscriptions sometimes record a count of months within a year (as with the Lesser Queen X records discussed above), presumably counting lunations from some observed or stipulated beginning of the year, the nature of which remains obscure.<sup>70</sup> The early inscriptions refer to years only relatively, however, as for example in divinations about the prospects of a forthcoming agricultural year.<sup>71</sup> No counts of reign years are attested. This changes by the period of the Huang Group records, when the date of divinations begins to be recorded not just with 60-cycle dates, and sometimes lunation counts, but with reign years also. The notation of years is applied to CSR divination records, to hunting and military campaign divinations, and also to a small number of longer bronze inscriptions that begin to appear during this period.<sup>72</sup>

The decisive role that the existence of the 360- to 370-day CSR is likely to have played in inspiring this innovation is suggested by two things. First of all, the term used for 'year' in these notations (*si* 祀) is a word that in other contemporary and later contexts means something like 'sacrificial ritual' or 'religious service'. A 'year' was thus, etymologically at least, a ritual cycle. Secondly, the current position within the CSR (i.e. the current sacrifice S1–S5, or the current recipient from table 8) was used as a way of specifying dates of



events that were not directly connected with the performance of the CSR itself.<sup>73</sup> Consider the following two dates excerpted from Shang bronze inscriptions:

- (4) 甲子... 在十月又二，遯祖甲魯日，唯王廿祀。  
Day 1/60 ... in the 12th lunation, coinciding with the S4 sacrifice to Zu Jia (K30), being the 20th year (i.e. si 'sacrifice') of the [reigning] king.<sup>74</sup>
- (5) 隹王六祀，多日，才四月。  
It is the [reigning] king's sixth year (i.e. si 'sacrifice'), an S5 day, in the 4th lunation.<sup>75</sup>

In both of these cases, the inscription on the bronze serves to commemorate its own manufacture consequent to a royal gift, an event not directly related to the status of the CSR which is used to mark the date. Note also that in (4) the position in the CSR is specified almost unambiguously, the only uncertainty being whether one of the additional 'rest weeks' discussed above has been inserted into the cycle. If no insertion has been made, the position in the cycle is the first day of Week 24 (i.e. Week 10 of S4), and the 60-cycle dates for all other events in that round of the CSR can be determined from the basis of the 60-cycle date given in the inscription (day 1/60).

It will be clear from the preceding presentation that complex dates of this kind, because they combine years, lunations and a ritual sequence with the rigid counts of the 60-cycle, hold out the promise of an absolute chronology for the period of the Huang Group records (reigns K33–35). This was one of the goals of Dong Zuobin's pioneering but now superseded reconstruction of the CSR in the 1940s. It remains a focus of contemporary studies, including those within the institutional framework of the Xia-Shang-Zhou Chronology Project.<sup>76</sup>

The basic procedure for deriving such an absolute chronology is clear. Relationships between dates put constraints on where within a lunation a particular 60-cycle date may fall, enabling one to determine a set (hopefully very small) of possible 60-cycle days for the new moon that began that lunation. Using tables of calculated new-moon dates, one may then derive a list of years in which the 60-cycle date of a new moon (in an appropriate season) belonged to that set. Although the procedure is clear, the assumptions that are required to carry it out are complex. To illustrate, I will summarize a recent argument used by Xu Fengxian to determine possible absolute dates for the reign of Di Xin (K35). Rather than attempting to assess the validity of the argument in its entirety, I will simply emphasize her explicit and implicit assumptions as they occur.<sup>77</sup>

Xu identifies 15 dated objects from the reign of Di Xin bearing notations of years (*si*), months, 60-cycle dates, and references to the current state of the CSR. These include a mixture of bronze inscriptions, divination records and an inscribed tiger bone (a hunting trophy). The first assumption, naturally, is that the reconstruction of the CSR that is being used, the philological treatment of the inscriptions, and the attribution of these objects to the reign of Di Xin, are all correct. A second is that the texts themselves contain no scribal errors affecting the dates. A third assumption concerns the minimum and maximum number of days in a month.<sup>78</sup> Under those assumptions, Xu claims that the data from these 15 objects is sufficient to derive the following constraint:

*Day 53/60 (bing chen 丙辰) in the first month of the second year of the reign (K35) must be either the first or the last day of that month.*<sup>79</sup>



To move from numbered months to astronomical new moons requires an additional decision about the nature of the Shang month. Xu assumes that the first day of the month will always be either the date of conjunction of the sun and moon (*shuo* 朔), or the first visibility of the new moon (*fei* 朏) which she takes to be one or two days after conjunction.<sup>80</sup> This gives six possible 60-cycle dates for the conjunction near the beginning of the first month of the second year of K35. Knowing the season in which the month fell, or equivalently, knowing the approximate point in the solar year from which the Shang counted their months, narrows down the number of possible years to which the date might correspond.

Xu takes the position, based on what appears to be rather modest evidence, that the first month of the year corresponded to the lunation in which the winter solstice fell (*jian zi* 建子), or the following lunation (*jian chou* 建丑), or the one after that (*jian yin* 建寅).<sup>81</sup> Xu's final explicit assumption, that the first year of the reign of Di Xin fell in the range 1100–1050 BC, depends on proposed dates for the Zhou conquest (set at 1046 BC by the Chronology Project to which her work is a contribution). With these limits, she finds fifteen possible correspondences of the day 53/60, falling in eight different years.<sup>82</sup>

One other assumption that is made in this argument, which remains unspoken, is that of unbroken continuity of the 60-cycle with later periods, when its correspondence with Julian days can be explicitly determined.<sup>83</sup> Although there is no positive reason to think that such a disruption to the 60-cycle ever took place, the issue of continuity in its use will be considered in the following section.

In considering reconstructions of the CSR and its probable role as a frame of reference for time-keeping, there is one additional aspect that should be mentioned, and which suggests (to this author at least) that some substantial unresolved problems remain in our understanding of the institution. We have discussed three separate phenomena that could all in some sense be taken to represent the beginning of the Shang year: the first numbered month of the year (when the year-count in *si* is incremented), the beginning of a new CSR round,<sup>84</sup> and some fixed season (or observable point such as a solstice) in the solar year. Given that periodically inserting intercalary months, and the additional 'rest week' in the CSR, are presumed to have been done with the aim of keeping both the first month and the ritual cycle aligned with the seasons, it is puzzling to find that current reconstructions imply that no such alignment was successfully maintained.

In Chang Yuzhi's reconstruction of the CSR for one reign, the beginning of the CSR (the 'Presentation of the Roster' for S1) drifts from a position at the end of seventh month in the first year (*si*), to the beginning of the tenth month by the tenth year of the reign. This is substantially due to the fact that she reconstructs no intercalary months for this interval.<sup>85</sup> Her reconstructions for other reigns find the beginning of the CSR variously in the third, fourth or sixth months.<sup>86</sup>

Xu Fengxian takes a somewhat different approach to the reconstruction, correcting at least one error in Chang's analysis. Nevertheless, she concludes that a similar phenomenon is taking place: during the reign of Di Yi (K34), either the beginning of the CSR, or the first month, or both, were drifting rapidly against the backdrop of the solar year.<sup>87</sup>

Having described the functioning of the CSR, we are now in a position to make some concluding remarks about the question that we left behind in the previous section—the assignment of day-names and their patterning. We have already established that divination is likely to have played a role in the determination of the particular day from the 10-cycle with which a relative would be posthumously labeled. We have seen that one of the cen-

tral roles of the day-name was to set the 10-cycle day on which the dead individual would routinely receive sacrifice. We also considered the possibility that funeral scheduling—the interment itself, or subsequent rituals serving to incorporate the deceased into the regular round of sacrifices—may have been reflected in the choice of day-name.

The positioning of kings within the CSR suggests a further rationale that may have informed the choice of day-name. Consider once again table 8 and notice that, apart from the exceptional (and wife-free) Week 1, a single week typically accommodates two to three kings, rising to four in the busiest Week 9. It seems likely that this represented a ritually pleasing and administratively tractable spacing of sacrificial events, compact but not crowded. Certainly, any assignment of the same day-name to successive kings (something which never occurs in the king list) would have resulted in a sparse ritual program for the week separating them in the CSR. Although the CSR is only clearly attested from the reign of K30, long after most of the day-names in the king list had been determined, it is nevertheless probable that it represents an evolved form of earlier patterns of sacrificial scheduling.

### Continuity and Change After the Zhou Conquest

The production of divination records at Anyang, and all other significant elite activities at the site, terminated with the Zhou conquest (ca. 1050 BC).<sup>88</sup> From that date, all textual production shifted abruptly from a focus on the activities of the Shang kings and their family members, to a new preoccupation with events and perspectives centred on the Zhou court. The site at Anyang was largely abandoned and a new, eastern capital for the Zhou was founded at Cheng Zhou 成周 (now Luoyang), approximately 250 km to the southwest.

Many Shang cultural institutions were left to continue their gradual evolutionary development across the rupture of regime change. The writing system in particular, and the language it was used to write, continued into the first millennium, initially without dramatic change. So too did the technologies required to produce bronzes and ritual objects in other media. Continuity of this kind likely represents continuity in patronage of those families of technical specialists who had been employed at Anyang. Both contemporary evidence and later literary accounts can be used to support a picture of the redeployment of expertise from Anyang to Cheng Zhou, and to other major centres of the Western Zhou (ca. 1050–771 BC) state.

The Western Zhou calendar, too, for the most part retained the fundamental properties that it had had during the last reigns at Anyang. A count of years, presumed to be approximations of solar years, was maintained for each king's reign. The term for the count of reign years inherited from Anyang, *si* 祀 '[round of] sacrifice', probably a terminological by-product of the mature CSR as we have seen, was gradually over the course of the Western Zhou displaced by *nian* 年, a term meaning 'harvest' in the Shang inscriptions but stripped of that sense in its use in the Western Zhou and later calendars. Lunations were counted for each year, from a point within the year that was probably routinely determined by seasonal observation of uncertain accuracy, rather than by dependable long-term calendrical calculation. The location of this start of the year, from which the months were numbered, is conjectured to have been close to the winter solstice, on the assumption of continuity with the later royal Zhou calendar reflected in the *Springs and Autumns* (722–481 BC). The existence of an early Western Zhou bronze dated by inscription to a

'14th month' certainly implies that determinations of the start of the year and the placement of intercalary months were at times haphazard.<sup>89</sup> The 60-cycle continued its role as the only means of maintaining a count of days.<sup>90</sup>

For the Western Zhou period, there is no conclusive means of demonstrating that the 60-cycle was uninterrupted, either in its progress from the earlier Shang period, or onwards to later periods when the mapping of Julian days to 60-cycle days can be performed with complete confidence. Conceivably, the 60-cycle could have been reset in an assertive act of calendrical reform. However, no trace of such a move is to be found in any text, and scholarly doubts about the continuity of the 60-cycle are seldom raised.<sup>91</sup>

An argument for unbroken continuity might emphasize the functions and significance of the 10-cycle beyond the sphere of the calendars maintained under the direct control of the Zhou court and their Shang predecessors. We noted previously the geographically dispersed occurrences of bronzes bearing day-name dedications, notationally indistinguishable from contemporary models at Anyang, which suggest that elite groups across much of North China were, before the end of the second millennium, already synchronized with respect to the 10-cycle, and carrying out ancestral rituals scheduled with reference to it. Although the royal Zhou lineage seems to have shown no interest in constructing anything similar to the CSR, and employed a different terminology for referring to dead ancestors, many families living under and participating in the Zhou regime continued to employ the day-name system in commemorative bronze inscriptions.<sup>92</sup>

The best-known such family deposited a spectacular hoard of bronzes, many with lengthy inscriptions, at a location near the modern village of Zhuang-Bai in Fufeng County, Shaanxi, which was excavated in 1976.<sup>93</sup> The bronzes were cast on behalf of multiple generations of the same patriline, and span the stylistic range of the Western Zhou period. Four generations of the patriline are referred to in the inscriptions using posthumous day-names (Day 2/10, Day 8/10, Day 2/10, Day 4/10).<sup>94</sup> A number of features of the bronzes and their inscriptions invite the conclusion that this lineage transferred its loyalty, and its literate and administrative expertise, from the Shang to the Zhou around the time of the Conquest. Other Western Zhou bronzes that employ day-names in their inscriptions have similarly been associated with families of pre-Conquest Shang affiliations.<sup>95</sup> Whether or not the use by certain elite families of day-names in the Shang manner should be understood in terms of a persisting and distinctive Shang identity, it certainly implies that any resetting of the 10-cycle would have had consequences beyond the royal calendar and considerable cultural inertia to overcome.

The use of day-names declined noticeably, however, over the course of the Western Zhou, and they were extinct before the middle of the first millennium.<sup>96</sup> This decline in the earlier religious or ritual significance of the cyclical terms seems to have made possible a projection on to them of modified significations, often of a magical nature, and a redeployment of the cyclical terms for a much more diverse set of uses than previously. For unknown reasons, day 24/60 (*ding hai* 丁亥) becomes overwhelmingly popular as the date for a bronze inscription. The tendency towards the use of this 'auspicious day' is already apparent toward the end of the Western Zhou, and during the Eastern Zhou period (770–256 BC) a majority of inscriptions with 60-cycle dates bear this particular date.<sup>97</sup> Whether days 24/60 were in fact given over to the casting of bronze vessels, or whether the date is merely a conventionalized fiction is impossible to determine. The patterning of funeral days in the Springs and Autumns, discussed above, is another phenomenon that seems to reflect distantly the Shang application of cyclical dates for scheduling significant

events, but stripped of the original specificities of their ancestral cult.

A proliferation of calendars, in simultaneous use by the multiple independent, literate states that asserted themselves during the Eastern Zhou period, was probably another stimulus to experimentation and speculation regarding the 10- and 12-cycles and their possible human and cosmological correlates. However, perhaps precisely because of the difficulties of inter-state timekeeping using multiple calendars, the 60-cycle count of days was the one constant feature amongst the competing counts of reign-years and lunations. The period of the Springs and Autumns annals (722–481 BC) is the first time that dates kept using the 60-cycle can be mapped to Julian days beyond any doubt.

The *Springs and Autumns* contains 37 accounts of solar eclipses during its 240-year span, all but three of which are recorded with a 60-cycle day, as well as a month and year according to the calendar of the state of Lu.<sup>98</sup> Although the nature of the Lu month (the schedule of intercalary months, the pattern of alternation of long months with short, and the positioning of the first month of the year) is still not entirely agreed upon, the seasons in which the numbered months occur and the absolute years of the successive reigns are known. This makes possible a demonstration that 31 of the eclipse records accurately document real eclipses. Three of them, moreover, are accurate records of near-totality.<sup>99</sup> The argument for this conclusion is normally presented with 60-cycle continuity as an assumption. However, the density of the recorded observations of solar eclipses also means that the argument can be turned around to demonstrate that only one possible mapping from Julian days to the 60-cycle is compatible with the records.<sup>100</sup>

The final great diversification in the applications of the 60-cycle and its sub-cycles took place during the Warring States (mid 5th century – 221 BC), as a reflection of what Donald Harper has referred to as “the idea that all phenomena and human activity were linked in microcosmic synchronicity”, a dominant thread in the intellectual history of the late Warring States period.<sup>101</sup> We have already reviewed the earlier history of the use of 60-cycle days as ‘lucky days’, significant for the scheduling of significant social or religious events. This practice continued in a much more elaborated fashion during the Warring States and into the Qin (221–206 BC) and early Western Han (206 BC – 25 AD). ‘Day books’ (*ri shu* 日書) consisting of tables categorizing cyclical days according to their fitness for a variety of activities, including religious procedures, divination, child birth, illness, marriage, journeys and building projects have been recovered from a number of late 3rd century and early 2nd century tombs, the most complex and intensively studied of which are those from Shuihudi tomb 11, sealed ca. 217 BC.<sup>102</sup>

A more innovative departure is the application of the 12-cycle to a division of the constellations (*xing xiu* 星宿), and to the periods of time marked by the passage of heavenly bodies through those divisions. The earliest representation of these constellations occurs in the form of a lacquer-painted diagram on a clothes chest from the late 5th century tomb of Zeng Hou Yi.<sup>103</sup> The names of the 28 constellations are distributed in a ring, around a depiction of the Big Dipper at the centre. The process that led to the partition of these 28 constellations into twelve clusters and their correlation with the terms of the 12-cycle is not fully clear. However, it was probably inspired by the observation of two phenomena that have periods of approximately 12 when expressed in appropriate units. The first is the orbit of Jupiter, with a period of just under twelve years (11.86 years). The second is the solar year, taking somewhat more than twelve lunar months. The approximate coincidences of these two periods with the number of terms in the 12-cycle, the only duodecimal cycle available from earlier Chinese textual history, presumably motivated the adaption

of the 12-cycle to this innovative use. The fact that both the orbit of Jupiter and the solar year can be tracked by observing the positions of the respective heavenly bodies against the backdrop of the *xing xiu*, provided a common rationale for the grouping of those constellations into twelve clusters. The orbit of Jupiter was presumably of interest from a purely astronomical or astrological point of view. Keeping the lunar calendar aligned with the solar year, on the other hand, was a priority for administrative timekeeping and state calendars. The first extant text explicitly to fix the twelve months of the year to the position of the sun among the constellations is the *Yue Ling* (月令 ‘Monthly Ordinances’) compiled in the 3rd century BC.<sup>104</sup> The correlation with the 12-cycle is made explicit in a number of other visual and textual representations from the 3rd and 2nd centuries BC. The earliest of these may be an astrological instrument (*shipan* 式盤) from Wangjiatai tomb 15, in Jiangling, Hubei, dated to the mid-3rd century, although only a brief verbal description has been published.<sup>105</sup> The instrument consists of a wooden board indicating the Five Phases, the ‘months’ (whether numbered, or indicated by the 12-cycle, or both, is not clear from the description), and the *xing xiu*. The 12-cycle and the numbered months are clearly present on a more complex version of the same piece of equipment from the tomb Xiahou Zao 夏侯竈 in Fuyang, Anhui (165 BC).<sup>106</sup> Like the clothes chest from the tomb of Zeng Hou Yi, mentioned above, this instrument also bears a depiction of the Big Dipper. Observation of the orientation of the Dipper provided an alternative and equivalent means of tracking the progress of the solar year, and the twelve orientations of the Dipper were similarly mapped to the terms of the 12-cycle. The *Huai Nan Zi* 淮南子 (c. 139 BC) is the earliest received text to document the seasonal orientations of the Dipper and their mapping to the terms of the 12-cycle.<sup>107</sup>

Although the movement of Jupiter through twelve divisions is likely to have motivated the adoption of the 12-cycle as a way of counting years, its long-term use as a year-count is handicapped by an accruing discrepancy: after 84.7 years, Jupiter is precisely one term ahead in the cycle.<sup>108</sup> This discrepancy may already have been noted by the 3rd–2nd century BC, and prompted the decoupling of the 12-cycle year count from the observed motion of Jupiter.<sup>109</sup> Interestingly, an additional set of names for the years of the Jovian cycle also appears around this time. Although written using Chinese graphs, these polysyllabic names are etymologically opaque in Chinese and invite the suspicion that the technical vocabulary of some unidentified language was drawn upon, and rendered using Chinese phonetic transcription.<sup>110</sup>

For a cyclical year-count with a longer period, a natural move was to extend the 12-cycle count just described by combining it with the 10-cycle in precisely the same manner that had been used since the second millennium to count days. The earliest example of such a usage is an annotation on a diagram of the 60-cycle appearing among the silk manuscripts from Mawangdui tomb 3, sealed in 168 BC. An annotation marking the first year of the reign of Qin Shi Huang 秦始皇 (246 BC) is applied to the diagram next to the position of the 60-cycle term 52/60 (*yimao* 乙卯). Two later reign years are similarly marked on the diagram.<sup>111</sup> The correspondence between 60-cycle terms and years seen in the document from Mawangdui is identical to that in subsequent uninterrupted continuity throughout Chinese history, employed in parallel with counts of reign-years and entirely divorced from any synchronization with the orbit of Jupiter.

## Notes

1. During the Han period (206 BC – 220 AD) and subsequently, the terms of the 10-cycle were known as the ten ‘stems’ (*gan* 干, or ‘heavenly stems’ *tian gan* 天干) and those of the 12-cycle as the twelve ‘branches’ (*zhi* 支, or ‘earthly branches’ *di zhi* 地支). The terms used to refer to the cycles at the time of their first appearance are unknown.
2. A number of influential general books on Chinese culture state that the 12-cycle at the time of its appearance was associated with the moon or counting months (e.g. de Bary (1999), p. 351 and Wilkinson (2000), p.177). I cannot find a basis for this claim in the specialist literature. Its first attested use as an indicator of a twelve-fold division of the solar year was not until the 2nd century BC.
3. A variety of spatial arrangements used during different historical periods are surveyed in Kalinowski (2007).
4. Kalinowski (2007) p. 158, fig. 3; Smith (2010).
5. Bartle (1978).
6. For proposals of a Babylonian origin for the 12-cycle, originally published in 1931, see Guo Moruo (1982). For suggestions of trans-Pacific connections, see Whittaker (1991). For possible Austronesian linguistic connections, see Norman (1985). Pulleyblank (1991; 1995) proposed that the cyclical signs corresponded to the 22 simple consonants he reconstructed for Old Chinese. None of these proposals has met with any general acceptance. There is an obvious connection between the 10-cycle and myths about ten suns (Allan 1991 ch. 2), although the literary texts in which the mythical accounts are preserved long post-date the first attestation of the 10-cycle. More recently, Pankenier (2010) has suggested connections between the origins of the cycles and specific early practices of astronomical observation.
7. The graph used to write 6/12 was redeployed to write 1/12 around the middle of the first millennium BC, hence the apparent mismatch between ancient and modern graph forms in table 1.
8. Dates are given according to those in Xia Shang Zhou Duandai Gongcheng Zhuanjia Zu (2000). Since all Shang dates are approximate or tentative, I will consistently round Shang dates to the nearest 50 years.
9. A recent English translation is provided by Nienhauser (1994), “The Yin, Basic Annals 3”, pp. 41–54.
10. See the extensively annotated tables in Keightley (1985), pp. 185–187, 204–209.
11. Note that the succession is probably the sequence of appointed heirs, some of whom (e.g. K28) may not have inherited the kingship. The record of fraternal vs. filial succession (‘Generation’ and ‘Son of columns’) is substantially dependent on the received *Sbi Ji* rather than excavated sources. The royal wives on the other hand are known only from the texts excavated at Anyang.
12. This is to ignore the sequence of proto-ancestors that, in the *Sbi Ji*, precedes the sequence of kings with day-names.
13. Yu Wanli (2006), pp. 38–39, provides a concise review of ancient and modern attempts to explain the Shang king’s day-names.
14. The best overview of the Shang divination records in English remains Keightley (1985), supplemented by Keightley (1997; 2000). For an up-to-date and comprehensive Chinese summary, see Wang Yuxin and Yang Shengnan (1999).
15. Bagley (2004) has argued that the divination records are a highly unrepresentative sample of Shang literacy, with more representative textual genres having been lost with the decay of the wood or bamboo on which they were written.
16. Flad (2008), p. 408.
17. Li Min (2008), pp. 156–221.
18. A detailed typological study of the Ayang divination records is provided by Li and Peng (1996), whose classificatory scheme is followed in this chapter.
19. One major class of exceptions is connected with the Cyclical Sacrificial Roster, described subsequently.
20. Abbreviations for published sources of inscriptions are given at the head of the list of references.
21. The primary publication for the HD inscriptions is Zhongguo Shehuikexueyuan Kaogu Yanjiusuo



- (2003). HD numbers are given according to that publication. The most important study and authoritative edition of the texts is Yao Xuan (2006). For an English overview of the HD inscriptions, see Smith (2008), ch. 3, pp. 174–302.
22. In a minority of cases, more frequently on bronze inscriptions than in divination records, the word *ri* 日 ‘sun; day’ is inserted between the kinship term and the day-name. This makes it especially clear that day-names for kin are derivative of names of the week. See, for example, the three dagger-axes (*ge* 戈) inscribed with multiple day-names discussed by Ma Chengyuan (2002).
  23. The identifications were first made by Wang Guowei in 1917 (Wang Guowei 1959, pp. 409–450; Wang Yuxin and Yang Shengnan 1999, p. 337).
  24. The situation is only made moderately more complicated by the ‘non-royal divination records’ (*fei wang buci* 非王卜辭). These groups of inscriptions, contemporary with the reign of Wu Ding (K27), each use a distinct set of day-names that only partially aligns with those used by the king’s diviners. However, it is likely that the divinatory patrons were close relatives of the Shang kings (Li Xueqin and Peng Yushang 1996, pp. 313–327).
  25. Sometimes the record makes this explicit, as with a record dated Day 30/60 (i.e. a day 10/10) on HD426. The proposition reads, “Tomorrow, day 1/10, *sui*-sacrifice to Male Ancestor Day 1/10 ... at sunrise.” Perhaps divination a day in advance was required to allow for preparations for a sacrifice early the next day.
  26. Chang Yuzhi (1998), pp. 89–93, counts 268 examples of plastrons or scapulae on which dates recorded modulo 10 appear. Note, however, that in all the cases that she transcribes, the divination itself is dated modulo 60. The modulo 10 dates occur within the divinatory propositions and can be assumed to be within 10 days of the divination date. They are thus still unambiguous modulo 60. The HD corpus, published subsequent to Chang’s survey, is distinctive in its frequent use of 10-cycle dates for dating the divination records themselves, as an alternative to the more usual 60-cycle dates, which are nevertheless also common with HD. The choice of one convention over the other within the HD corpus is correlated with the writing style of the scribes that produced the inscriptions (Smith 2008, pp. 246–253).
  27. Chang Yuzhi (1998), pp. 93–95, counts nine examples and Gan Lu (2002) lists only 14 more from the entire available corpus.
  28. The only exception is the distant and shadowy proto-ancestor Wang Hai 王亥, whose name appears to include the 12-cycle term Day 12/12 (Zhang Guangzhi 1983).
  29. Smith (2010), pp. 181–189, figs. 6.1, 6.2, 6.3; Pankenier (2010), fig. 2.3, table 2.1.
  30. He Jingcheng (2009); Barnard (1986).
  31. During the Western Zhou period (ca. 1050–771 BC), there are demonstrable instances of the heritability of clan signs within patrilineal lines. The best example is provided by the inscriptions from the Zhuang-Bai hoard, discussed subsequently.
  32. For the excavation report, see Zhongguo Shehuikexueyuan Kaogu Yanjiusuo (1980); for a study of the inscriptions, see Cao Dingyun (1993); for the relationship with the HD patron, see Yao Xuan (2006); for scholarship in English, see the papers collected in Chang (1986), pp. 65–140.
  33. Zhongguo Shehuikexueyuan Kaogu Yanjiusuo (1980), pp. 34–38, col. pl. 1; Cao Dingyun (1993), pp. 105–124.
  34. Yan Zhibin and Hong Mei (2008), p. 179, report 1,275 inscribed Shang-period bronzes from known locations, of which 867 are from Anyang. Figures provided by Venture (2002), p. 390, annexe iii, show that almost all these examples come from the five Central Plains provinces through which the Yellow River flows: Shaanxi, Shanxi, Henan, Hebei and Shandong.
  35. Shaaxisheng Kaogu Yanjiusuo (1995).
  36. Shaaxisheng Kaogu Yanjiusuo (1995), pp. 121–129.
  37. The best candidates for written signs related to but earlier than the Anyang script are those found at the Middle Shang site of Xiaoshuangqiao (ca. 1450–1400 BC), brush written in red pigment on pottery vessels (Song Guoding 2003).
  38. He Jingcheng (2009), pp. 113–123.
  39. Yan Zhibin and Hong Mei (2008), pp. 184–185. The authors state that this is a count for ‘Shang

- period bronzes', implying that it excludes the many early Western Zhou bronzes with Shang-style day-names.
40. Chang (1978); Yan Zhibin and Hong Mei (2008), p. 185; Ma Chengyuan (2002), p. 199. All data used here are from Yan Zhibin and Hong Mei (2008).
  41. Chang (1978), p. 17.
  42. Ji Dewei [Keightley] (1989); Ma Chengyuan (2002), pp. 198–199. There are a number of minor points of disagreement in the scholarship matching royal wives' day-names to those of the kings. The 'Wives' day-names' column in my table 1 is based on the most sophisticated and comprehensive presentation, that of Chang Yuzhi (1987), pp. 113–138. For a comparison of the alternatives, see Wang Yuxin and Yang Shengnan (1999), p. 444, table 17.
  43. Zhongguo Shehuikexueyuan Kaogu Yanjiusuo Anyang Gongzuodui (1979).
  44. Zhongguo Shehuikexueyuan Kaogu Yanjiusuo (1998).
  45. Here I selectively review only those proposals that, whether still viable or not, have contributed significantly to the current understanding of the functioning of the 10-cycle within attested Shang practice.
  46. Chang (1978); Zhang Guangzhi (1983).
  47. Zhu Fenghan (1990) has shown that the clan signs or lineage emblems on Shang bronzes are essentially free to co-occur with any day-name.
  48. Zhang Fuxiang (2005).
  49. Ma Chengyuan (2002).
  50. For concise overviews of these anthologies of ritual usage, see their respective entries ("Li chi" & "I li") in Loewe (1993), pp. 234–243, 293–297.
  51. For aspects of her status as a Shang queen and the identification of her husband, see Guo Xudong (2009).
  52. HJ04962–3, HJ17097–8, HJ22559, HJ23708–19, HJ24951.
  53. More precisely, in the scheme of Li Xueqin and Peng Yushang (1996), pp. 128–132, the inscriptions are assigned to Chu Group I Subgroup 2, dated to "the reign of Zu Geng [K29] or the very end of the reign of Wu Ding [27]."
  54. The details are not entirely clear, but the graph identified as *yun* 蕴 'enclose; pile up' presumably refers to either the interment or the encoffining. Guo Xudong (2009) understands some of the day 34/60 divininations (HJ23715–6), to be attempts to predict the day of death of the queen. But if the microchronology presented above is correct, she was already dead by the time these divinations were performed. The diviner was certainly trying to determine a date of some kind—day 4/10 is the proposal—but I suspect that it was a component of the funeral schedule.
  55. This identification of day-name determination by divination was first proposed by Li Xueqin (1957), p. 123. A second example proposed in the same article, possibly divining the day-name for the recently deceased king Kang Ding (K31) has also been supported by subsequent scholarship (Peng Yushang 1999, p.8; Wang Yuxin and Yang Shengnan 1999, pp. 600-601; Ji Dewei [David N. Keightley] 1989, p.21). For a competing proposal that the divination concerns the day of the funeral, rather than the day-name, see Cao Dingyun and Liu Yiman (2004).
  56. Loewe (1993), "Chou li" pp. 24–32; "I li", pp. 234–243; "Li chi", pp. 293–297.
  57. Loewe (1993), "Ch'un ch'iu", pp. 67–76.
  58. Inoue (1990).
  59. Yu Wanli (2006), pp. 38–46.
  60. Liu Xu (1994).
  61. Liu Xu (1994), p. 195, table 3. Note that two of the 35 examples are imported from the *Zuo Zhuan* 左傳, a text distinct from though related to the Springs and Autumns.
  62. In addition to the one exception, two more of the 35 interments are not completed on schedule, however, and are recorded as being delayed a day by rain, pushing them onto 'hard' odd-numbered days.
  63. The best recent study is that of Chang Yuzhi (1987), on which the summary provided here is based. For a briefer overview, see Wang Yuxin and Yang Shengnan (1999), pp. 603–627. Xu Fengxian (2006) is an important recent attempt to build an absolute chronology on the basis of the reconstructed CSR.



- The only English-language study is that of P'an Wu-su (1976).
64. I will refer to these procedures as 'sacrifices' for convenience, and because that is the translation most readily suggested by the term used in Chinese scholarship (*ji* 祭). It should be noted, though, that not enough is known about the procedures of the CSR to be sure that this is an accurate term. 'Ritual service' or 'ritual procedure' might be more precise.
  65. On this point, Chang Yuzhi (1987), pp. 126–133, departs from the conclusions of some of her predecessors.
  66. It will also be noticed that K27:5 falls outside the scope of the Chu Group schedule, whereas her husband Wu Ding (K27) falls within it. Perhaps K27:5 was still alive when the Chu Group divinations and their corresponding rituals were being performed in the reign of K30.
  67. The rest weeks and their positioning are another point where Chang Yuzhi's reconstruction is at variance with some earlier versions (Chang Yuzhi 1987, pp. 213–216).
  68. Chang Yuzhi (1987), p. 199, proposes that the period of the less well-attested Chu Group CSR was 32 weeks, as one would expect to be if one week of sacrifices were removed from S1 schedule, from the concurrent S2–S4 set, and from S5.
  69. Chang Yuzhi (1987), pp. 199–200; Xu Fengxian (2006), p. 33.
  70. Chang Yuzhi (1998), pp. 383–422.
  71. Chang Yuzhi (1998), pp. 341–352.
  72. Chang Yuzhi (1998), pp. 352–366.
  73. Keightley (1985), pp. 115–116, nn. 99, 102 and 107.
  74. Qin Luan *fang ding* 寢斲方鼎 (Zou Heng et al. 2000, vol. 3, p. 348). The year notation in this inscription is controversial. See Xu Fengxian (2006), pp. 146–155, for a review of the debate that concludes that the date indicated is in fact the first, not the twentieth, year of a reign.
  75. Xiao Chen Yi *jia* 小臣邑斲, JC09249.
  76. Xu Fengxian (2006).
  77. Xu Fengxian (2006), ch. 3, pp. 45–83.
  78. For example, at Xu Fengxian (2006), p. 55, last full para, Xu states that in a month with only two days 1/10, the second must be the 20th day of the month. This is true only under the assumption that no 28-day months occur, where the second day 1/10 could fall on either the 19th or the 20th day. Given the evidence gathered by Chang Yuzhi (1998), pp. 267–299, regarding the irregular nature of the Shang month, the assumption does not seem entirely safe.
  79. Xu Fengxian (2006), p. 57.
  80. It is thought that two successive Shang months were typically 59 days in length. However, instances of two short months (each 29 days or less) in succession, as well as of two long months (each 30 days or more), are known to occur in the divination records. There are also six known instances of months of at least 31 days, and one of a month with fewer than 29 days (Chang Yuzhi 1998, pp. 275–281; Xu Fengxian 2006, pp. 43–44). It seems likely that the start of a Shang month was routinely determined by sight of the new moon.
  81. Xu Fengxian (2006), pp. 65–66. Attempts have been made to determine the season of the first month of the Shang year by examining the correlations of numbered months with meteorological or agricultural divinations (Xu Fengxian 2006, pp. 41–42; Chang Yuzhi 1998, pp. 383–422). Results of such studies have placed the first month everywhere from late spring to mid winter. They offer no support for Xu's assumption, but since they are based largely on early (reign of Wu Ding, K27) divination records, their relevance is uncertain. More relevant is the dramatic change in the position of the first month of the year that reconstructions of the CSR for the preceding reign (K34) seem to suggest.
  82. Xu Fengxian (2006), p. 67, table 3–2.
  83. Keightley (1977), p. 271, n. 8, gives the formula for converting to the 60-cycle as "dividing the Julian Day number by 60 and adding 50 or subtracting 10 from the remainder".
  84. The 'Presentation of the Roster' for S1, according to Chang Yuzhi (1987), pp. 186–191.
  85. Chang Yuzhi (1987), pp. 256–259. The absence of intercalary months would imply that it is primarily the numbered months that are moving relative to the seasons, rather than the CSR. She reconstructs

- four long CSR rounds of 370 days, and six of 360 days during this span. As Xu Fengxian (2006), pp. 39–40, points out, there is at least one certain (and uncharacteristic) error in Chang's reconstruction, namely her assumption that over this long period of ten years, every month would contain three days 1/10 (*jia* 甲). In the long run, approximately one in twenty months will have only two days 1/10.
86. Chang Yuzhi (1987), pp. 263–298.
  87. Chang Yuzhi (1987), pp. 263–298.
  88. For the conquest and its background, see Loewe and Shaughnessy (1999), pp. 307–313, 385–389.
  89. Li Boqian (2001); Shang Tongliu and Sun Qingwei (2001), p. 9.
  90. See Shaughnessy (1991), pp. 134–155, for a concise overview of the the Western Zhou calendar.
  91. The only expression of skepticism regarding the continuity of the 60-cycle that I am aware of in Chinese-language scholarship is by Li Xueqin (1957), p. 122. Shaughnessy (1991), pp. 135–136, and Keightley (1977), p. 267, simply note the nature of the assumption being made.
  92. A small number of important exceptions to the general rule that Shang-style day-names were not used for members of the royal Zhou lineage and their close relatives are discussed by Zhang Maorong (2009).
  93. Yin Shengping (1992); von Falkenhausen (2006), pp. 29–73; Shaughnessy (1991), pp. 1–4, 183–192.
  94. An additional day-name (Day 4/10) appears on two of the earliest bronzes. However, other than their presence in the hoard, there is nothing to tie the objects or their inscriptions to the same lineage.
  95. Shaughnessy (1991), pp. 209–210. See also von Falkenhausen (2006), pp. 169–203, for a more wide-ranging review of archaeological evidence for distinctively Shang cultural traits persisting after the Conquest.
  96. This is not to say that personal names of various kinds do not sometimes incorporate terms from the 10- or 12-cycle. See the examples collected by Ma Chengyuan (2002). However, these are names used by living individuals, without any kinship prefixes.
  97. Huang Ranwei (1995), pp. 96–107.
  98. For a recent reconstruction of the Lu calendar, see Gassman (2002).
  99. Stephenson and Yao (1992); Guan Liyan (1998; 2000).
  100. Note that a similar approach is not possible for the small number of lunar eclipse records that have been identified in Anyang divination records. The chronological arguments of Chang Yuzhi (1998), pp. 20–65, and Zhang (2002) that involve these lunar eclipse records are dependent on 60-cycle continuity as an assumption. If correct, they do not help to support that assumption.
  101. Harper (1999), p. 831.
  102. Loewe (1994); Kalinowski (1986; 2008).
  103. Harper (1999), pp. 833–836, fig. 12.1.
  104. Kalinowski (1996), p. 71. Versions of the text of the Yue Ling are preserved in a number of received texts, including the Lüshi Chunqiu, compiled in 239 BC. For a translation, see Knoblock and Riegel (2000), pp. 59–273.
  105. Jingzhou Diqu Bowuguan (1995); Harper (1999), p. 841.
  106. Described and illustrated in Harper (1999), pp. 836–840, fig. 12.5. See also Kalinowski (1996), pp. 71–72.
  107. For a translation of this section of the Huai Nan Zi, see Major (1993), pp. 88–92. For the correspondence between the months and path of the sun along the ecliptic in the same text, see pp. 127–128.
  108. Zhongguo tianwenxue shi zhengli yanjiu xiaozu (1981), p. 115.
  109. As Kalinowski (1998) notes, the details of this shift from an astrologically-inspired Jovian year count to a simple count of solar years using the 12-cycle are far from clear. The situation is made additionally complex in the period under discussion by the positing of an entirely imaginary heavenly entity (*taiyin* 太陰, *taisui* 太歲 or *suiyin* 歲陰) rotating through the twelve stations in the opposite direction to Jupiter but with a similar 12-year period (Zhongguo tianwenxue shi zhengli yanjiu xiaozu 1981, pp. 114–116; Kalinowski 1998, pp. 148–154).
  110. Isolated instances of the use of these names are found in 3rd century BC texts, and a systematic listing

appears twice in the *Huai Nan Zi* in association with the astrological schemes relating to the Jovian cycle (Major 1993, pp. 118–126, 136–139).

111. Kalinowski (1998), pp. 135–148, fig. 3.

## References

- HD: Zhongguo Shehuikexueyuan Kaogu Yanjiusuo 中國社會科學院考古研究所, 2003, *Yinxu Huayuan-zhuang dong di jiagu* 殷墟花園莊東地甲骨 (Kunming: Yunnan Renmin Chubanshe 雲南人民出版社).
- HJ: Guo Moruo 郭沫若 (ed.), 1978-1983, *Jiaguwen beji* 甲骨文合集 (13 vols.) (Beijing: Zhonghua Shuju 中華書局).
- JC: Zhongguo Shehuikexueyuan Kaogu Yanjiusuo 中國社會科學院考古研究所 (ed.), 1984-. *Yin Zhou jinwen jicheng* 殷周金文集成 (18 vols.) (Beijing: Zhonghua Shuju 中華書局).
- Allan, S., 1991, *The Shape of the Turtle: Myth, Art, and Cosmos in Early China* (Albany, NY: State University of New York Press).
- Bagley, R., 2004, “Anyang Writing and the Origins of the Chinese Writing System”, in S. Houston (ed.), *The First Writing: Script Invention as History and Process* (Cambridge UK: Cambridge University Press) 190–249.
- Barnard, N., 1986, “A New Approach to the Study of Clan-sign Inscriptions of Shang”, in K. Chang (ed.) *Studies of Shang Archaeology: Selected Papers from the International Conference on Shang Civilization* (New Haven: Yale University Press), 141–206.
- Bartle, P. F. W., 1978, “Forty Days: The Akan Calendar”, *Africa: Journal of the International African Institute* 48(1), 80–84.
- de Bary, W., 1999, *Sources of Chinese Tradition: From Earliest Times to 1600*, vol. 1 (New York: Columbia University Press, 2nd ed.).
- Cao Dingyun 曹定雲, 1993, *Yinxu Fu Hao mu mingwen yanjiu* 殷墟婦好墓銘文研究 (Taipei: Wenjin Chubanshe 文津出版社).
- , and Liu Yiman 劉一曼, 2004, “Yinren bu zang yu bi ‘fu ri’” 殷人卜葬與避‘復日’, in Wang Yuxin 王宇信 et al. (eds.), 2004 *nian Anyang Yin Shang wen ming guo ji xue shu yan tao hui lun wen ji* 2004年安陽殷商文明國際學術研討會論文集 (Beijing: Shehui kexue wenxian chubanshe 社會科學文獻出版社), 294–298.
- Chang, K. (ed.), 1986, *Studies of Shang Archaeology: Selected Papers from the International Conference on Shang Civilization* (New Haven: Yale University Press).
- , 1978, “T’ien kan: a Key to the History of the Shang”, in D. Roy & T. Tsien, (eds.), *Ancient China: Studies in Early Civilization* (Hong Kong: Chinese University Press), 13–42.
- Chang Yuzhi 常玉芝, 1987, *Shangdai zhouji zhidu* 商代周祭制度 (Beijing: Zhongguo Shehui Kexue Chubanshe 中國社會科學出版社).
- , 1998, *Yin Shang lifa yanjiu* 殷商歷法研究 (Changchun: Jilin Wenshi Chubanshe 吉林文史出版社).
- Falkenhausen, L., 2006, *Chinese Society in the Age of Confucius (1000-250 BC): the Archaeological Evidence* (Los Angeles: Cotsen Institute of Archaeology, University of California).
- Flad, R., 2008, “Divination and Power: a Multiregional View of the Development of Oracle Bone Divination in Early China”, *Current Anthropology* 49(3), 403–437.
- Gan Lu 甘露, 2002, “Jiaguwen dizhi jiri bu li 甲骨文地支紀日補例”, *Yindu xuekan* 殷都學刊 2, 5–7.
- Gassmann, R., 2002, *Antikchinesisches Kalenderwesen: die Rekonstruktion der chungju-zeitlichen Kalender des Fürstentums Lu und der Zhou-Könige* (Bern: Lang).
- Guan Liyan 關立言, 1998, “Chunqiu rishi sanshiqi shi kao 春秋日食三十七事考”, *Shixue Yuekan* 史學月刊 2, 95–103.
- , 2000, “Chunqiu rishi kao bu yi 春秋日食考補遺”, *Kaifeng Daxue Xuebao* 開封大學學報 14(1), 62–74.

- Guo Moruo 郭沫若, 1982, “Shi zhi gan 釋支干”, in *Guo Moruo quanji, kaogu bian, di yi juan* 郭沫若全集—考古編—第一卷 (Beijing: Kexue Chubanshe 科學出版社), 155–340.
- Guo Xudong 郭旭東, 2009, “Yinxu buci suo jian Shangdai pinli wanghou zhidu kao 殷虛卜辭所見商代品立王后制度考”, *Wen shi zhe* 文史哲 1, 121–129.
- He Jingcheng 何景成, 2009, *Shang Zhou qingtongqi zushi mingwen yanjiu* 商周青銅器族氏銘文研究 (Jinan: Qi Lu Shushe 齊魯書社).
- Huang Ranwei 黃然偉, 1995, *Yin Zhou shiliao lunji* 殷周史料論集 (Hong Kong: Sanlian Shudian 三聯書店).
- Inoue Satoshi 井上聰, 1990, “Shangdai miaohao xin lun 商代廟號新論”, *Kaogu yu wenwu* 考古與文物 2, 54–60.
- Zhongguo tianwenxue shi zhengli yanjiu xiaozu 《中國天文學史》整理研究小組, 1981, *Zhongguo tianwenxue shi* 中國天文學史 (Beijing: Kexue Chubanshe 科學出版社).
- Ji Dewei 吉德煒 [David N. Keightley], 1989, “Zhongguo gudai de jiri yu miaohao 中國古代的吉日與廟號”, in Hu Houxuan 胡厚宣 (ed.), *Yin xu bo wu yuan kan (chuang kan hao)* 殷墟博物苑苑刊(創刊號) (Beijing: Zhongguo Shehui Kexue Chubanshe 中國社會科學出版社), 31–70.
- Jingzhou Diqu Bowuguan 荊州地區博物館, 1995, “Jiangling Wangjiatai 15 hao Qin mu 江陵王家台15號秦墓”, *Wenwu* 文物 1, 37–43.
- Kalinowski, M., 1986, “Les traités de Shuihudi et l'hémérologie chinoise à la fin des Royaumes-Combattants”, *T'oung Pao* 72, 175–228.
- , 1996, “The Use of the Twenty-eight Xiu as a Day-count in Early China”, *Chinese Science* 13, 55–81.
- , 1998, “The Xingde 刑德 Texts from Mawangdui”, *Early China* 23–24, 125–202.
- , 2007, “Time, Space and Orientation: Figurative Representations of the Sexagenary Cycle in Ancient and Medieval China”, in F. Bray (ed.), *Graphics and Text in the Production of Technical Knowledge in China: The Warp and the Weft* (Leiden: Brill), 137–168.
- , 2008, “Les livres des jours (rishu) des Qin et des Han: la logique éditoriale du recueil A de Shuihudi (217 avant notre ère)”, *T'oung Pao* 94, 1–48.
- Keightley, D. N., 1977, “On the Misuse of Ancient Chinese Inscriptions: an Astronomical Fantasy”, *History of Science* 15, 267–272.
- , 1985, *Sources of Shang History: the Oracle-bone Inscriptions of Bronze Age China* (Berkeley, CA: University of California Press, 2nd edn.).
- , 1997, “Shang Oracle-bone Inscriptions”, in E. Shaughnessy (ed.), *New Sources of Early Chinese History: An Introduction to the Reading of Inscriptions and Manuscripts* (Berkeley: Society for the study of Early China and the Institute of East Asian Studies, University of California Berkeley), 15–55.
- , 2000, *The Ancestral Landscape: Time, Space, and Community in Late Shang China, ca. 1200-1045 B.C.* (Berkeley: University of California, Berkeley, Center for Chinese Studies).
- Knoblock, J., and Riegel, J., 2000, *The Annals of Lü Buwei: a Complete Translation and Study* (Stanford CA: Stanford University Press).
- Li Boqian 李伯謙, 2001, “Shu Ze fang ding mingwen kaoshi 叔父方鼎銘文考釋”, *Wenwu* 文物 8, 39–41.
- Li Min, 2008, *Conquest, Concord, and Consumption: Becoming Shang in Eastern China* (PhD dissertation, University of Michigan).
- Liu Xu 劉緒, 1994, “Chunqiu shiqi sangzang zhidu zhong de zang yue yu zang ri 春秋時期喪葬制度的葬月與葬日”, in Beijing Daxue Kaoguxi 北京大學考古系 (ed.), *Kaoguxue yanjiu (er)* 考古學研究(二) (Beijing: Beijing Daxue Chubanshe 北京大學出版社), 189–200.
- Li Xueqin 李學勤, 1957, “Ping Chen Mengjia Yinxu buci zongshu 評陳夢家《殷虛卜辭綜述》”, *Kaogu xuebao* 考古學報 3, 119–130.
- , and Peng Yushang 彭裕商, 1996, *Yinxu jiagu fenqi yanjiu* 殷虛甲骨分期研究 (Shanghai: Shanghai Guji Chubanshe 上海古籍出版社).
- Loewe, M., 1993, *Early Chinese Texts: A Bibliographical Guide* (Berkeley, CA: Society for the Study of Early China; Institute of East Asian Studies University of California Berkeley).

- , 1994, “The Almanacs (Jih-shu) from Shui-hu-ti: a Preliminary Survey”, in *Divination, Mythology and Monarchy in Han China* (Cambridge & New York, NY: Cambridge University Press), 214–235.
- , and Shaughnessy, E. L., 1999, *The Cambridge History of Ancient China: from the Origins of Civilization to 221 B.C.* (Cambridge: Cambridge University Press).
- Harper, D., 1999, “Warring States Natural Philosophy and Occult Thought”, in M. Loewe and E. L. Shaughnessy (eds.), *The Cambridge History of Ancient China: from the Origins of Civilization to 221 B.C.* (Cambridge UK & New York: Cambridge University Press), 813–884.
- Ma Chengyuan 馬承源, 2002, “Guanyu Shang Zhou guizu shiyong rigan chengwei wenwi de tantao 關於商周貴族使用日干稱謂問提的探討” in *Zhongguo qingtongqi yanjiu* 中國青銅器研究 (Shanghai: Shanghai Guji Chubanshe 上海古籍出版社), 187–200.
- Major, J., 1993, *Heaven and Earth in Early Han Thought: Chapters Three, Four and Five of the Huainanzi* (Albany: State University of New York Press).
- Nienhauser, W. H., 1994, *The Grand Scribe's Records Volume I: the Basic Annals of Pre-Han China* (Bloomington–Indianapolis: Indiana University Press).
- Norman, J., 1985, “A Note on the Origins of the Chinese Duodenary Cycle”, in G. Thurgood et al. (ed.) *Linguistics of the Sino-Tibetan Area* (Canberra: Australian National University), 85–89.
- Pankenier, D., 2010, “‘Heavenly Pattern Reading’ 天文 and the Origin of Writing in China”, in D. Branner & Li Feng (eds.), *Writing and Literacy in Early China* (Seattle: University of Washington Press), in press.
- P'an Wu-su, 1976, *Religion and Chronology in Shang China: the Scheduled Ancestor Rituals and the Chronology of the Late Shang Period* (PhD dissertation, University of Pennsylvania).
- Peng Yushang 彭裕商, 1999, “Shifa tanyuan 謚法探源”, *Zhongguo shi yanjiu* 中國史研究 1, 3–11.
- Pulleyblank, E. G., 1991, “The Ganzhi as Phonograms and their Application to the Calendar”, *Early China* 16, 39–80.
- , 1995, “The Ganzhi as Phonograms”, *Early China News* 8, 29–30.
- Shaaxisheng Kaogu Yanjiusuo 陝西省考古研究所, 1995, Gaojiapu Ge guo mu 高家堡戈國墓 (Xi'an: San Qin Chubanshe 三秦出版社).
- Shang Tongliu 商彤流, and Sun Qingwei 孫慶偉, 2001, “Tianma-Qucun yizhi Beizhao Jin Hou mudi di liu ci fajue 天馬—曲村遺址北趙晉侯墓地第六次發掘”, *Wenwu* 文物 8, 4–21.
- Shaughnessy, E., 1991, *Sources of Western Zhou History: Inscribed Bronze Vessels* (Berkeley: University of California Press).
- Smith, A.D., 2008, *Writing at Anyang: the Role of the Divination Record in the Emergence of Chinese Literacy* (PhD dissertation, UCLA).
- , 2010, “The Evidence for Scribal Training at Anyang”, in D. Branner & Li Feng (eds.), *Writing and Literacy in Early China* (Seattle: University of Washington Press), in press.
- Song Guoding 宋國定, 2003, “Zhengzhou Xiaoshuangqiao yizhi chutu taoqi shang de zhushu 鄭州小雙橋遺址出土陶器上的朱書”, *Wenwu* 文物 5, 35–44.
- Stephenson, F. R., and Yau, K. K. C., 1992, “Astronomical Records in the Ch'un-Ch'iu Chronicle”, *Journal for the History of Astronomy* 23, 31–51.
- Venture, O., 2002, *Étude d'un emploi rituel de l'écrit dans la Chine archaïque (XIIIe-VIIIe siècle avant notre ère): réflexion sur les matériaux épigraphiques des Shang et des Zhou occidentaux* (PhD dissertation: Université Paris 7).
- Wang Guowei 王國維, 1959, *Guan Tang ji lin* 觀堂集林 (Beijing: Zhonghua Shuju 中華書局).
- Wang Yuxin 王宇信, and Yang Shengnan 楊升南 (eds.), 1999, *Jiaguxue yibai nian* 甲骨學一百年 (Beijing: Shehui Kexue Wenxian Chubanshe 社會科學文獻出版社).
- Whittaker, G., 1991, *Calendar and Script in Protohistorical China and Mesoamerica: A Comparative Study of Day Names and their Signs* (Bonn: Holos).
- Wilkinson, E., 2000, *Chinese History: A Manual* (Cambridge, MA: Harvard University Asia Center, rev. & enl.).



- Xia Shang Zhou Duandai Gongcheng Zhuanjia Zu 夏商周段代工程傳家組 (ed.), 2000, *Xia Shang Zhou Duandai Gongcheng 1996-2000 nian jieduan chengguo baogao: jian ben* 夏商周段代工程1996—2000年階段成果報告—簡本 (Beijing: Shijie Tushu Chubanshe Beijing Gongsi 世界圖書出版公司北京公司).
- Xu Fengxian 徐鳳先, 2006, *Shang mo zhou ji sipu heli yanjiu* 商末周祭祀譜合歷研究 (Beijing: Shijie Tushu Chubanshe Beijing Gongsi 世界圖書出版公司北京公司).
- Yan Zhibin 嚴志斌, and Hong Mei 洪梅, 2008, *Yinxu qingtongqi* 殷墟青銅器 (Shanghai: Shanghai Daxue Chubanshe 上海大學出版社).
- Yao Xuan 姚萱, 2006, *Yinxu Huayuanzhuang dong di jiagu buci de chubu yanjiu* 殷墟花園莊東地甲骨卜辭的初步研究 (Beijing: Xianzhuang Shuju 線裝書局).
- Yin Shengping 尹盛平 (ed.), 1992, *Xi Zhou Wei shi jiazhu qingtongqiquan yanjiu* 西周微氏家族青銅器群研究 (Beijing: Wenwu Chubanshe 文物出版社).
- Yu Wanli 虞萬里, 2006, “Shang Zhou chengwei yu Zhongguo gudai biwei qiyuan 商周稱謂與中國古代避諱起源”, in Qian Hang 錢杭 (ed.), *Chuantong Zhongguo yanjiu jikan* 傳統中國研究集刊 (Shanghai: Shanghai Shehuikexueyuan 上海社會科學院). <http://www.historicalchina.net/admin/WebEdit/UploadFile/NameWL.pdf> (last accessed: 5th April 2010).
- Zhang Fuxiang 張富祥, 2005, “Shang wang minghao yu shanggu riming zhi yanjiu 商王名號與上古日名制研究”, *Lishi Yanjiu* 歷史研究 2, 3–27.
- Zhang Guangzhi 張光直, 1983, “Tan Wang Hai yu Yi Yin de jiri bing zai lun Yinshang wangzhi 談王亥與伊尹的祭日並再論殷商王制”, in *Zhongguo qingtong shidai* 中國青銅時代 (Taipei: Lianjing Chubanshe 聯經出版事業公司), 197–222.
- Zhang Maorong 張懋鎔, 2009, “Zai lun ‘Zhou ren bu yong ri ming shuo’ 再論‘周人不用日名說’”, *Wenbo* 文博 3, 27–29.
- Zhang, P., 2002, “Determining Xia-Shang-Zhou Chronology through Astronomical Records in Historical Texts”, *Journal of East Asian Archaeology* 4(1–4), 347–357.
- Zhongguo Shehuikexueyuan Kaogu Yanjiusuo Anyang Gonzuodui 中國社會科學院考古研究所安陽工作隊, 1979, “1969–1977 nian Yinxu xiqu muzang fajue baogao 1969–1977年殷墟西區墓葬發掘報告”, *Kaogu Xuebao* 考古學報 1, 27–146.
- Zhongguo Shehuikexueyuan Kaogu Yanjiusuo 中國社會科學院考古研究所, 1998. *Anyang Yinxu Guojiazhuang Shangdai muzang: 1982 nian - 1992 nian kaogu fajue baogao* 安陽殷墟郭家莊商代墓葬：1982年~1992年考古發掘報告 (Beijing: Zhongguo Da Baike Quanshu Chubanshe 中國大百科全書出版社).
- , 1980, *Yinxu Fu Hao mu* 殷墟婦好墓 (Beijing: Wenwu Chubanshe 文物出版社).
- , 2003, *Yinxu Huayuanzhuang dong di jiagu* 殷墟花園莊東地甲骨 (Kunming: Yunnan Renmin Chubanshe 雲南人民出版社).
- Zhu Fenghan 朱鳳瀚, 1990, “Jinwen riming tongji yu Shangdai wanqi Shangren riming zhi 金文日名統計與商代晚期商人日名制”, *Zhongyuan Wenwu* 中原文物 3, 72–77.
- Zou Heng 鄒衡, Beijing Daxue Kaoguxuexi Shang Zhou zu 北京大學考古學系商周組, and Shanxisheng Kaogu Yanjiusuo 山西省考古研究所 (eds.), 2000, *Tianma-Qucun (1980–1989)* 天馬——曲村(1980–1989) (Beijing: Kexue Chubanshe 科學出版社).

