SCIAMVS 12 (2011), 193-249

Wu xing zhan 五星占
'Prognostics of the Five Planets'

Christopher Cullen
Needham Research Institute and Darwin College, Cambridge
c.cullen@nri.org.uk

Preface

The title *Wu xing zhan* 五星占 'Prognostics of the Five Planets'[1] was given by its first transcribers to a MS of about 8,000 characters on silk excavated in 1973 from Han Tomb 3 at Mawangdui 馬王堆, Changsha 長沙, together with a number of other texts.[2] The original MS bears no title or indication of authorship. The tomb was closed in 168 BCE, and the final date in certain tables in the MS corresponds to 177 BCE. While this sets a lower limit to the final redaction of the MS, some of the material it contains would be consistent with a date in the later part of the Warring States period (fifth to third centuries BCE).

The importance of the *Wu xing zhan* lies in the fact that it is the earliest substantial surviving Chinese document to give an account of the apparent motions of the five visible planets, and to discuss their significance. It is therefore a document of considerable significance for the construction of a comparative world history of astronomy, and the annotated translation offered here may perhaps interest scholars from a wide range of backgrounds. For this reason, I have thought it proper to offer to SCIAMVS a translation of material that has long been known to specialists in the field, and I am grateful to the editors for giving it a place in their journal.[3]

In my study of this text, I have profited greatly from the work of colleagues who have striven to give us an accurate estimate of the nature of early writing about the planets in other cultures, such as ancient Greece and more particularly the Mesopotamian world. I hope that this translation, and the notes which accompany it, will be of some use to such scholars in return. For the purposes of the present publication, I have limited myself to the minimum of introduction and comment required to indicate the context, nature and purpose of the text I am translating. More detailed discussion of technical

[1] As in the ancient text, the word *xing* 星 'star' can refer to a planet.
[2] See Harper, Donald John 1998, 14-41, for helpful discussion of the context of this burial, as well as a description of other MSS found in this tomb. These include important texts relating to medicine and divination, as well as versions of certain philosophical texts known from received literature. The identity of the tomb occupant is still open to speculation: he was probably a member of the Li 利 family, who were prominent in the region at this period.
[3] I am also very grateful to David Pankenier for discussing my translation with me, and for allowing me to see his forthcoming translation and study of the *Tian guan shu* monograph of the *Shi ji* (see below). Of course any remaining errors and confusions are my responsibility alone.

questions will be found in Cullen, Christopher 2011a, to which reference will be made as appropriate in this article.

Not all readers will find all the introductory material I have provided equally necessary or useful. But since I hope that readers from a variety of different backgrounds may find this translation of interest, I have tried to provide entry points for all likely readers.

Setting the text in context: writings and practitioners

The writings studied here do not stand in isolation. They come from a period in China's past about which we know a good deal, and from which we have a large number of written sources, some transmitted by successive scribal copying and later printed, and some (like the *Wu xing zhan* material itself) in the form of ancient manuscripts excavated by archaeologists in recent decades.

The time when the *Wu xing zhan* was copied and entombed, the early second century BCE, falls into what western scholars often call the 'early imperial age' of China. Much of the East Asian land-mass was then beginning a period of unified administration under the emperors of the Han 漢 dynasty (206 BCE – 220 CE) that was to continue for four centuries, and despite later periods of division the imperial model was to remain both normative and (for long periods) normal until the twentieth century. But the political, social and intellectual structures that seemed natural to those who lived in early second-century China were still deeply influenced by a very different state of affairs - the preceding centuries of increasingly bitter conflict during the so-called 'Warring States' *Zhan guo* 戰國 period (5th-3rd centuries BCE), when China had been almost as culturally and politically divided as early mediaeval Europe. The western kingdom of Qin 秦, had indeed succeeded in crushing all its rivals in 221 BCE and seizing control of a huge expanse of territory. But although the king of Qin had proclaimed himself the first of a line of universal sovereigns that was intended to endure for ten thousand generations, his empire fell apart in renewed warfare soon after his death eleven years later. A new ruler fought his way to the top and proclaimed himself emperor of Han 漢, but without the advantage of hindsight, who was to know how long the Han dynasty would last?

Consequently, it is not surprising that the world-view within which the prognostications of the *Wu xing zhan* are made is still overwhelmingly a Warring States view: one of warfare, the rise and fall of kingdoms, and of associated natural disasters such as famine and flood. And in a time when local political identities were still strong, no-one found it strange to make use of a divinatory text that interpreted the heavens with reference to the old pre-imperial kingdoms, even if they had either been extinguished altogether or transformed into titular dominions of the Han imperial house.

But what kinds of specialists compiled and used texts like the *Wu xing zhan*, and who were their clients? The historical literature of the imperial age, written largely by imperial officials, may give us the impression that sky-watching, and all the work of interpretation, calculation and prediction that went with it, was overwhelmingly the concern of salaried bureaucrats whose work was ultimately designed to help in the

formation of imperial policy. Now a high degree of official concern with the heavens certainly was a striking feature of pre-modern Chinese culture. But as applied to the *Wu xing zhan*, I believe that this picture may be misleading in two ways. Firstly, even during periods of established imperial government, it was never the case that private interpretation and even prediction of celestial events was totally insignificant: one of the clearest evidences for this is the fact that from time to time there were official efforts to discourage such activity by legal and other types of sanctions. More than that, there is evidence that during the period when the framework of official astronomy was being constructed under the Han, the contribution of private practitioners was essential.[4] Secondly, the fact that a document such as the *Wu xing zhan* was found in the tomb of a person who seems to have been at best a minor provincial noble is in itself the clearest evidence that a quite detailed interest in interpreting and attempting to predict celestial phenomena could be found outside the corps of officials who worked in the official observatory at the national capital of Chang'an 長安. Seeking guidance about the future from the sky was just one part of the repertoire of divinatory practices which seem to have been important elements in the world-view and daily activity of many people, whether or not they were in government employment.

Let us now briefly review some of the textual sources that help us to evaluate the *Wu xing zhan* against the background of its time and place of origin. Some of these will cast more light on the personal identities and careers of those who might have used or written texts of the kind we are now studying.

Ancient writings with material on celestial divination in the received textual corpus[5]

(a) The 'Zuo commentary' *Zuo zhuan* 左傳

This book is thought to have been compiled during the 5th to 4th centuries BCE on the basis of pre-existing annalistic writings.[6] It contains historical material in the form of year-by-year entries connected with the much terser text of the 'Spring and Autumn [Annals]' *Chun qiu* 春秋. This latter text is a recension of the state annals of Confucius' home state of Lu 魯 for the years 722 to 479 BCE, commonly known as the 'Spring and Autumn' period. According to the analysis of Marc Kalinowski, out of 132 instances of divination reported in the *Zuo zhuan*, 19 are connected with the heavens.[7] Of these, the most common type concerns the position of Jupiter in the heavens, which follows a cycle close to twelve years in period. Next come interpretations of the seasonal risings and settings of the 'Fire Star' *Huo xing* 火星 (Antares, α Scorpii). Finally there are also a few discussions of the significance of solar eclipses.

---

[4] See for instance the accounts of the reform of the astronomical system in 104 BCE in *Shi Ji* 26, 1260, and *Han shu* 21a, 975; the second of these says that twenty experts 'from amongst the people' took part.

[5] Here I can only indicate a few landmark texts. For a brief survey of the background to divination in the imperial age, see Harper, Donald John 1999. Lagerwey, John and Kalinowski, Marc 2009 contains expert essays covering a wider but relevant context.

[6] See Loewe, M.A.N. (ed.) 1993, 189-195, 67-76.

[7] Lagerwey, John and Kalinowski, Marc 2009, 346-349. This number may be compared with divination by cracks induced on turtle plastrons by a heated point (46), yarrow stalks (18), dreams (26) and natural prodigies (15).

(b) The 'Book of the Master of Huai nan' *Huai nan zi* 淮南子

Interesting as the *Zuo zhuan* material may be, it dates from several centuries before the time of the *Wu xing zhan*, and can therefore only serve as 'deep background' for our interpretation. With the *Huai nan zi* we are within a few decades of the date when the text was entombed. This book is a compendium of learning assembled by scholars under the patronage of Liu An 劉安, prince of the Han kingdom of Huai nan, and presented to the throne in 139 BCE.[8] Its third chapter gives a systematic account of the regularities of the cosmos as made manifest in the heavens.[9] There are short sections devoted to the cosmic correlations of the five visible planets, the periodicities of their motion, and the significance of departures from expected behaviour. Jupiter and its 12-year cycle are given special emphasis. There are a number of passages of text that show close parallels to parts of the *Wu xing zhan*: some of these will be mentioned later. It would be assuming too much to conclude from such parallels that the writers of *Huai nan zi* were able to consult and copy from a text substantially identical to the MS under discussion here: no more is implied than that the *Huai nan zi* and the compiler of what we now call the *Wu xing zhan* were drawing on a common fund of material.[10] Unfortunately we do not know the names of the experts who contributed to the compilation of the *Huai nan zi* material relevant to our enquiry.[11]

(c) The 'Records of the Historian' *Shi ji* 史記

From the first century BCE onwards, there survives a series of major historical works that have certain features in common. These are the 'standard histories' *zheng shi* 正史, sometimes referred to in English as 'dynastic histories'. Almost all of them deal with the entirety of a period when China was ruled by one particular imperial clan - a 'dynasty' - and have as their core the annals of the emperors of that dynasty. In addition they contain biographies of prominent figures of their period, and monographic accounts of the operation of the major institutions of the state.

The first of the standard histories is of most concern to us here. This is the 'Records of the Historian' *Shi ji* 史記, completed by Sima Qian 司馬遷 about 90 BCE.[12] While its structure set the model for later works, its time coverage was unusual, since it dealt with the history of the world as known to its author from the beginnings of human culture to his own day, which was around the middle of the first half of the Han dynasty – the so-called Western or Former Han, as opposed to the Eastern or Later Han that followed it. In succession to his father Sima Tan 司馬談 he held the office of 'Grand Clerk' (or 'Grand Annalist/Scribe') *Tai shi* 太史, which gave him responsibility for record keeping, but also for the calendar and for celestial divination. His long monograph on 'The Celestial Offices' *Tian guan* 天官, which deals with planetary motions amongst other celestial omens, was therefore written less than a century after the *Wu xing zhan*

---

[8] On this book, see Loewe, M.A.N. (ed.) 1993, 189-195.

[9] See the translation and study of this chapter in Major, John S., with an appendix by Christopher Cullen 1993, 55-139.

[10] My present view is therefore different from that expressed by John Major two decades ago in Major 1993, 55-139.

[11] Major 1993, 4, and Roth, Harold David 1992, 18-23.

[12] *Shi ji 史記 'Records of the Historian'*. The translation of *shi* 史 as 'historian' is conventional in rendering this title, but may be a little misleading.

was entombed, and is clearly invaluable to us as a comparison. As with the *Huai nan zi*, the frequency of parallels between the *Tian guan* monograph and the *Wu xing zhan* makes it clear that Sima Qian was drawing on a fund of textual material that was known fairly widely amongst the relevant specialists in the Western Han.

(d) The 'History of the [Western] Han dynasty' *Han shu* 漢書
This is the second of the standard histories, largely written by Ban Gu 班固 (32-92 CE).[13] The section of interest to us is however the *Tian wen zhi* 天文志 'monograph on the celestial patterns', which deals with the interpretation of omens in the sky, including planetary movements. While Ban Gu may have completed at least a draft version of his entire work c. 76-79 CE, well before his death, later accounts suggest that his text may have later been added to or edited by others. In particular, it has been suggested that the *Tian wen zhi* as we have it today came from the brush of Ma Xu 馬續 (fl. c. 120 CE?), younger brother of Ma Rong 馬融 (79-166 CE).[14] There are clear parallels between much of this text and the *Tian guan* monograph of the *Shi Ji*. For reasons of textual structure as well as chronology it seems most likely that the simplest explanation of this is the correct one, and that the *Han shu* is drawing on the *Shi ji*.[15] Even apart from the *Shi ji* parallels, the *Han shu* monograph contains substantial material paralleling the *Wu xing zhan*.

(e) The 'Kai yuan reign period divination manual' *Kai yuan zhan jing* 開元占經
This divinatory compendium, compiled before 729 CE by Qutan Xida 瞿曇悉達 (Gautama Siddhartha), a member of a clan of Indian astronomers at the Tang court, contains many passages that parallel parts of the *Wu xing zhan*. These are ascribed to a large number of texts (mostly now lost), some anonymous and some linked with names of authors.

Ancient practitioners of celestial divination

We turn now to the question of what these texts have to tell us about the kind of people who specialised in the celestial prognostication with which the *Wu xing zhan* is concerned. We have the names of a number of expert interpreters of celestial omens in the *Zuo zhuan*, and although we cannot tell how they learned what they knew, or how they were rewarded for their skills, it is clear that they functioned as respected technical experts who might be called upon to speak at a prince's court. The following example of the interpretation of Jupiter omens (set in 541 BCE) represents an early example of the exploitation of planetary periods for divinatory purposes, a pattern that is one of the main foundations of the *Wu xing zhan*:

> The king of Zhou asked [his astrologer] Chang Hong 萇弘: "Among today's princes, who will have good or ill fortune?" He obtained the following reply: "Ill fortune will strike the prince of Cai. Jupiter is stationed now in the Shiwei mansion which is that of the year [12 years ago] when the present prince, Ban,

[13] *Han shu 漢書 (History of Western Han dynasty)*. The title might be more literally rendered as 'Documents on the Han'.
[14] See Clark, Anthony E. 2008, 26-27 and *Hou Han shu 後漢書 (History of Eastern Han dynasty)*, 84, 2785.
[15] See Pankenier, forthcoming.

had the preceding prince killed. Before the cycle is finished, Chu will take possession of Cai and will reach the height of its iniquities. [In two years], when Jupiter crosses the Daliang mansion, Cai will get back his land and Chu, in its turn, will know misfortune."[16]

The information that Sima Qian gives us about the experts on celestial divination known to him in preceding ages, as well as in his own time is highly relevant to this study. In a short essay on the significance of celestial divination with which his monograph concludes, he lists the names of 'those who have previously passed on the celestial reckonings' *xi zhi chuan tian shu zhe* 昔之傳天數者.[17] Of the fourteen names he gives, eight are from the Spring and Autumn Period, and the Warring States period that followed it. Two of the experts he names, 'the honourable Mr Gan' Gan Gong 甘公 (whose full name according to later commentators was Gan De 甘德) and Shi Shen 石申 are of particular relevance to this discussion. Sometimes texts refer to these two person as Gan Shi 甘氏 'Mr Gan' and Shi shi 石氏 'Mr. Shi'. Both were to lend their names to collections of omen interpretation frequently cited in later centuries. It is notable, however, that Sima Qian himself gives no more information about these diviners than their names and the states in which they were active: he does not cite material said to have been authored by them at any point in his monograph.[18] Nor does he quote explicitly from writings by anybody else – even in the case of Tang Du 唐都, whom he names as the best known Han period expert on stellar divination *xing zhan* 星占, and identifies as his father's teacher as well as a collaborator of his own.[19] The most economical interpretation of this evidence (or rather lack of evidence) is surely that while writings with information on celestial divination were in circulation in the time of Sima Qian around 100 BCE – as the existence of the *Wu xing zhan* and the occurrence of parallels between it and other texts clearly proves – these writings were not seen as being 'books' created by a named author.

The situation in the *Han shu tian wen zhi* seems to confirm this impression. The later part of the monograph (page 1301 onwards) gives a list of celestial portents drawn from Western Han records, many of which are accompanied by a note beginning 'the prognostication said' *zhan yue* 占曰, or less frequently 'the commentary said' *zhuan yue* 傳曰. At one point (page 1306) however, a note is introduced by the sentence 上以問候星者。對曰 'The emperor asked the observers of the stars about [the portent], and in reply they said:'. A little later (page 1306) we are even given names: 漢宦者梁成恢及燕王候星者吳莫如見蓬星出西方 'The eunuch of the Han [court] Liang Chenghui and the

[16] Lagerwey and Kalinowski 2009, 366. As Kalinowski points out, the prediction about Chu is apparently based on the fact that two years after the time of the conversation recorded here would be 12 years after the assassination of the previous king of Chu by the present holder of the title, so that Jupiter would be in the same one of the twelve divisions of the sky as before.

[17] *Shi ji* 27, 1343.

[18] One possible exception is at *Shi ji* 89, 2581, where a person named as Gan Gong is said to have predicted the success of the King of Han (later to become the first Han emperor), and the failure of his enemy from the state of Chu 楚, from his having entered the territory of Qin at the time of a planetary conjunction in a division of the heavens corresponding to Qin. But this is so clearly a contemporary comment that it cannot be interpreted as a citation from a writer of the Warring States period.

[19] *Shi ji* 27, 1349; 130, 3288; 26, 1260. In the last of these references we are told that Tang Du was a 'recipe gentleman' *fang shi* 方士, a reference used for non-official persons specialising in technical arts of various kinds.

Prince of Yan's observer of the stars Wu Moru saw a *peng* star [sc. 'comet'] appear in the west'. It therefore seems likely that the 'prognostications' elsewhere are simply the interpretation of omens recorded at the time they were observed, and given by 'the observers of the stars' at court on the basis of knowledge which they may or may not have been drawing directly from collections of written material like the *Wu xing zhan*. At no point in any of this material is there any evidence that anybody in the Western Han attributed a prognostication to Gan De or Shi Shen.

If we examine the earlier parts of this text that deal with general principles of divination, and were presumably composed by Ban Gu or Ma Xu in the Eastern Han, the situation is more complex. In the discussion of the omens for Mars, Venus, Mercury and Saturn, no mention is found of Gan De or Shi Shen, not indeed is there any sign of an explicit citation from any other text. It is only in certain sections that these names occur. The first is found shortly after the beginning of the section on Jupiter omens (*Hou Han shu*, 1280-81), and contains parallels to sections 25-29 of the *Wu xing zhan*, which discuss the kinds of comets that will supposedly result if Jupiter performs certain anomalous motions; in the *Wu xing zhan*, of course, no names are mentioned. For each kind of omen in the *Han shu*, both 'Mr Gan' and 'Mr Shi' are cited. The second occurs somewhat later (*Hou Han shu*, 1289-91), where a listing is given of the groups of lodges in which Jupiter is located during each year of a twelve-year cycle. For each year we are given three groups of lodges, which are often slightly different, the first for 'Mr Shi', the second for 'Mr Gan', and the third for the *Tai chu* 太初 astronomical system. Finally we are told (*Hou Han shu*, 1290-91), that these two persons were the first to take notice of retrogradations in the motion of Mars and Venus. From this we are entitled conclude that whoever wrote the *Han shu* material in the Eastern Han had access to collections that named Gan and Shi as authors of at least a small amount of material. Other Eastern Han dynasty references to one of the ancient diviners named by Sima Qian are to be found in two memorials of the first and second centuries CE, one by Jia Kui 賈逵 (fl. c. 90 CE), who quotes briefly from a text he calls 'Mr Shi's canon of the stars' *Shi shi xing jing* 石氏星經,[20] and the other from Lang Yi 郎顗 (fl. c. 133 CE), who quotes from 'Mr Shi's canon' *Shi shi jing* 石氏經.[21] Although this material is not copious, we have clear evidence that something has changed since the Western Han, when Gan and Shi were never directly quoted. After the *Han shu* we have to wait about four centuries before a further reference of this kind is found, this time in an omen interpretation relating to Mercury, ascribed to 'Mr Shi' by the editor of the monograph on celestial divination in the *Song shu* 宋書, a text known to have been added to the original work some time after 500 CE. [22]

A further indication of the lack of material explicitly attributed to Gan and Shi in the Western Han may be gathered from the bibliographical monograph of the *Han shu* 漢書, which was probably based on a catalogue of the imperial library compiled around 10 BCE. Although at one point the editors do recite a list of specialists in divination similar in part to that given by Sima Qian, including the names of Gan and Shi,[23] none of the books listed under the relevant section are attributed to Gan De or Shi Shen, or indeed to

[20] *Hou han shu, zhi* 2, 3027-3028.
[21] *Hou han shu* 20b, 1073.
[22] *Song shu* 24, 701.
[23] *Han shu* 30, 1775.

any other individual human being: most are anonymous compilations with the title indicating only the topic.[24] We may even suspect that the titles given – such as 'Verification by subsequent events of prognostications from the five stars [sc. planets], comets and novae under the Han, in eight rolls' *Han wu xing hui ke xing shi zhan yan* 漢五星彗客行事占驗八卷 – are little more than labels on files containing material on a given topic rather than the titles of what would nowadays be called books. It is not until we read the bibliographical monograph of another history, the 'Book of the Sui' *Sui shu* 隋書, whose monographs were added in 656 CE, that we first begin to find books with such titles as 'Mr Shi's stellar divination' *Shi shi xing zhan* 石氏星占 or 'Mr Gan's divination from the patterns of heaven' *Gan shi xing zhan* 甘氏天文占.[25] All are now lost.

Seventy years later, however, Qutan Xida's *Kai yuan zhan jing* gives us copious citations from works attributed to Gan and Shi. We may reasonably conclude that fairly substantial collections of material attributed to Shi and Gan were known in the 7th-8th centuries CE. What are we to make of this situation? To recapitulate, we have:

(a) Two persons said to have lived in the period 5th-3rd centuries BC, but whose supposed writings are not cited by anybody until around 100 CE.

(b) Such references as there are to divinatory judgements before the Eastern Han are either anonymous or name contemporary persons rather than citing the ancients.

(c) Large amounts of material under their names known to have been available about six centuries later, some of it paralleling parts of the *Wu xing zhan*.

There is always something suspicious about a story which becomes more and more detailed the later it is told, and in the present case it seems reasonable to wonder whether all the material ascribed to Shi Shen and Gan De in the *Kai yuan zhan jing* more than a thousand years after their supposed lifetimes can really be by them. But if it is not by them, where did it come from, and how can we explain the parallels with the *Wu xing zhan*, which last saw the light of day in 168 BCE? The solution lies, I suggest, in a phenomenon that has already been well documented in the case of ancient Chinese medical learning, and which also seems to have occurred in the case of mathematics.[26] Certain types of technical knowledge seem to have circulated in the last few centuries BCE in the form of relatively short and independent passages, which were collected by experts and would-be experts through copying and transmission to students. However, by the beginning of the common era, collections of such material began to take on a fixed and often quite highly ordered form, to which a name might be attached. In the case of medicine, the *Han shu* bibliographical monograph records a number of collections under different names – The Yellow Lord *Huang di* 黃帝, Bian Que 扁鵲, and Mr. Bai *Bai shi* 白氏, as well as a collection of what was perhaps seen as unattributed material under the title *pang pian* 旁篇 'other chapters'.[27] Only the first, 'Yellow Lord', collection had successors which are still extant under the same name. It seems likely that this is what has happened to the astronomical divinatory material that we now possess under the names of

[24] *Han shu* 30, 1763-1764.
[25] *Sui shu* 34. 1018-1021. The second of these works is mentioned as having been known from a slightly earlier catalogue.
[26] Cullen, Christopher 2007, Loewe 1993, 196-215.
[27] *Han shu* 30, 1776.

Shi Shen and Gan De. Originally, this was part of a common fund of material that was not necessarily attached to those names – as exemplified by its occurrence in the *Wu xing zhan*. But by the time of the *Kai yuan zhan jing* all surviving material of this type had long been gathered into named collections. When therefore we write of 'Shi Shen' and 'Gan De' as saying such and such, we should probably no more imagine that we have the words of actual Warring States sky-watchers of those names than, for instance, we imagine that we have the words of Hippocrates of Kos before us when we read the *Hippocratic Corpus.* It is safer to assume that these names simple refer to collections of writings, which at most represent the common knowledge or techniques of a particular school or tradition. Nor, given the evidence set out above, is it safe to view any such material as actually dating from the Warring States period during which Shi Shen and Gan De are said to have lived: where dating is possible, the indications point to the early imperial age as the time when at least part of the extant material was created.[28]

Preliminary orientations: heaven and earth in the early imperial cosmos.

Mapping celestial space

In order to understand the *Wu xing zhan* on its own terms it is important to begin by forgetting some familiar concepts with which a modern reader naturally approaches any discussion of the heavens as seen from the point of view of a terrestrial observer. Most fundamentally, we must forget the idea of a celestial sphere laid out with the great circles of the equator and ecliptic, together with their associated coordinate systems of right ascension and declination for the equator, and celestial longitude and latitude for the ecliptic. The notion that the heavens could be regarded as a sphere centred on the observer is not well attested in China until nearly two centuries after the date of the *Wu xing zhan*; nor was any other geometric model of the cosmos important in understanding quantitative statements about the observed motions of the heavenly bodies in the period we are discussing. We are therefore in a situation similar to that of ancient Mesopotamia in this regard.

How then were the motions of the planets described? The key reference system in early imperial times was the sequence of 'lodges' *xiu* 宿,[29] associated with a chain of 28 asterisms of markedly unequal extent stretching round the sky from west to east in a belt that is (in modern terms) not a good fit for either the equator or the ecliptic. The width of

[28] See for instance the conclusions reached in Sun, Xiaochun and Kistemaker, Jacob 1997, 37-69, where a careful mathematical analysis strongly suggests that the data on the positions of stars in the quotations from 'Mr Shi's canon of the stars' *Shi shi xing jing* 石氏星經 given in the *Kai yuan zhan jing* represent data observed in the period 78±20 years BCE. Sun and Kistemaker argue that many of the constellation names in material attributed to Shi Shen, Gan De and other pre-imperial sky-watchers refer to official posts and organisations that did not exist before the imperial age.

[29] It has been customary amongst some scholars to translate this word by 'lunar lodges' or related terms, thus suggesting that the lodge system has a particular association with the moon. My reasons for abstaining from this practice are set out in Cullen, Christopher 2011b.

each lodge is defined in a unit called the *du* 度, a word which in this context we may translate as 'measure' . The numbers of *du* allocated to the lodges in ancient sources typically add up to 365 ¼. Since these sources also give 365 ¼ days as the length of the annual solar cycle,[30] it is clear that 1 *du* represents the daily motion of the sun against the background of the stars, at that period assumed to be constant. It was only from the first century CE, when the concepts of ecliptic and equator (and the distinction between them) began to be an issue, that we find discussions of which of these two great circles provides the more appropriate reference for solar motion. It was also at that time that the traditional widths of the lodges came to be understood as quantities related to the equator, equivalent to what would nowadays be called differences of right ascension.

At the time of the *Wu xing zhan,* solar, lunar and planetary motion, together with the extents of the successive lodges, was however seen as simply being directed 'round the sky'. The following table gives the names of the lodges, together with the modern identifications of the stars defined as marking the divisions between them. There are signs that the widths associated with the lodges may have changed around 100 CE.[31] Both systems are shown here. The 'reference star' of each asterism served to mark the initial point at the western extreme of each lodge from which its width was measured.

[30] I use this imprecise term deliberately. At the period we are discussing, the distinction between a 'tropical year' (the interval at which the seasons repeat, more precisely the interval between e.g. successive winter solstices) and the slightly longer 'sidereal year' (the interval at which the sun returns to the same position relative to the stars) was not yet made. The discrepancy between the two, known as the 'year difference' *sui cha* 歲差 was not taken account of systematically until the 4th century CE.

[31] See the study of Wang Jianmin 王健民 and Liu Jinyi 刘金沂 1989; this makes use of the 'lodge dial' bearing lodge names and graduations in *du* round its circumference, excavated from a tomb of c. 165 BCE. The significance of this and similar devices is discussed in Cullen, Christopher 1981 .

	New system		Old system	
Lodge[32]	Reference star	width *du*	Reference star	width *du*
Jue 角 'Horn'	α Virginis	12	α Virginis	12
Kang 亢 'Gullet'	κ Virginis	9	κ Virginis	11
Di 氐 'Base'	α^2 Librae	15	α^2 Librae	17
Fang 房 'Chamber'	π Scorpii	5	π Scorpii	7
Xin 心 'Heart'	σ Scorpii	5	α Scorpii	11
Wei 尾 'Tail'	μ^1 Scorpii	18	λ Scorpii	9
Ji 箕 'Winnower'	γ Sagittarii	11 1/4	γ Sagittarii	10
Dou 斗 'Dipper'	φ Sagittarii	26	φ or σ Sagittarii	22
Niu 牛'Ox'	β Capricorni	8	α^2 Capricorni	9
Nu 女'Woman'	ε Aquarii	12	ε Aquarii	10
Xu 虛 'Barrens'	β Aquarii	10	α Equulei	14
Wei 危'Rooftop'	α Aquarii	17	θ Pegasi	9
Shi 室 'House'	α Pegasi	16	η Pegasi	20
Bi 壁'Wall'	γ Pegasi	9	α Andromedae	15
Kui 奎 'Straddler'	η Andromedae	16	β Andromedae	11
Lou 婁 'Harvester'	β Arietis	12	β Arietis	15
Wei 胃 'Stomach'	41 Arietis	14	β Persei	11
Mao 昴 'Mane'	η Tauri	11	17 Tauri	15
Bi 畢 'Net'	ε Tauri	16	α Tauri	15
Zui 嘴 'Beak'	λ^1 Orionis	2	λ^1 Orionis	6
Shen 參'Triaster'	ζ Orionis	9	α Orionis	9
Jing 井 'Well'	μ Geminorum	33	γ Geminorum	29
Gui 鬼 'Ghost'	θ Cancri	4	θ Cancri	5
Liu 柳 'Willow'	d Hydrae	15	δ Hydrae	18
Xing 星 'Star'	δ Hydrae	7	ι Hydrae	13
Zhang 張 'Spread'	α Hydrae	18	μ Hydrae	13
Yi 翼'Wing'	α Crateris	18	γ Crateris	13
Zhen 軫'Axletree'	γ Corvi	17	γ Corvi	16

Table 1: The 28 lodges

A second important reference system, linked to that of the lodges, were the 'twelve [Jupiter] stations' *shi er ci* 十二次. These were taken to represent the regions occupied by Jupiter for each year of its supposed twelve-year cycle, and as one would

[32] For simplicity of comparison, I retain the English names for lodges used in Cullen, Christopher 2011a. For a discussion of possible revisions to these translations, see Sivin, Nathan 2009, 92.

expect the earliest sources that allocate widths in *du* to the stations show them as equal in extent. Our earliest sources, such as *Huai nan zi* chapter 3 and the *Tian guan* monograph in *Shi ji* limit themselves to saying that Jupiter is 'in' certain lodges for each year of its cycle, adding by way of clarification that these are the lodges with which Jupiter rises at dawn. Each year of the cycle could also be identified by three other designations:

(a) A unique name of two or three characters.[33]

(b) A character from a standard set of twelve 'cyclical characters', identifying the position corresponding to Jupiter on an idealised disc-model of the heavens used by diviners.[34] Since the sequence of cyclical characters runs from east to west, Jupiter progresses through them in reverse order as it moves from west to east.

(c) A character from the same set of twelve, but this time identifying the position on the diviners model of what is called the 'Year[-star] yin' *sui yin* 歲陰 or "Great Year' *tai sui* 太歲,[35] an imaginary marker that moves through the sequence in the normal order.

The development and changing significance of the Jupiter cycle in Chinese chronology, celestial divination and calculations about the motion of the planet is a complicated story that cannot be gone into fully on this occasion.[36] For the moment, we may simply note that there seems to have been no single account of what the Jupiter cycle was: the information given about the lodges with which Jupiter rises in different years of its cycle is somewhat inconsistent between different parts of the *Wu xing zhan* itself, and is quite different from that given in near contemporaneous sources such as *Huai nan zi chapter 3* and *Shi ji*. The *Han shu tian wen zhi* compares three different lists, one from 'Mr Shi', one from 'Mr Gan' and one from the '*Taichu* [astronomical] system' (possibly c.104 BCE). The *Han shu* (1290) offers the following explanation:

> 甘氏、太初曆所以不同者，以星贏縮在前，各錄後所見也。其四星亦略如此。
>
> 'The reason why [the lists of] Mr Gan and the Taichu system are not the same [as Mr Shi's list] is that previously the planet had advances and retardations, and each of [these listings] is seen [some time] after being recorded.[37] The [other] four planets are also more or less like this.'

---

[33] Two ancient sets of twelve are known, of which the first refers mainly to the year of the cycle, and the second names the relevant region of the sky. It is the first set that occurs in the *Wu xing zhan*. These year-names make little or no sense in Chinese, and are thought by many scholars to have originated in some minority culture now unidentifiable, or in some culture outside the Chinese culture-area altogether. See Major 1993, 120-122.

[34] Major 1993, figure 3.9 p. 123. This device in question was the *shi* 栻, a simple model of the cosmos in which a disc representing heaven rotated above a square plate representing earth: see Cullen 1981.

[35] The reference here is to the well-known ancient Chinese cosmological principle of polar duality, in which objects and processes are organised into pairs of complementary opposites labelled as *yin* 陰 (passive, dark, cold, female, terrestrial etc.) and *yang* 陽 (active, bright, warm, male, celestial etc.). The *sui yin* is not the name of a celestial body – what has been called by some scholars a 'counter-Jupiter' – but is essentially a chronological and divinatory marker. When it has a spatial reference, it is moving round the horizon rather than in the heavens.

[36] In particular, as noted in Liu Lexian 刘乐贤 2004, 32, we may need to distinguish between the *Tai yin* that is linked with the celestial position of Jupiter, and the use of the same changing cyclical sign for a year-count that is no longer tied to the movement of that planet. See also Chen Jiujin 陳久金 1978.

[37] The precise sense of these words is not clear. But the idea is fairly certainly that the differences between lists stem from variations in the planet's pattern of motion.

It may also be that different sources gave data based on different understandings of what it meant to see Jupiter rise 'with' a certain lodge. On the other hand the discrepancy may be taken as suggesting that the link with actual observation (as opposed to idealised schemes such as those on the *shi* cosmic model) was not such a close one as one might expect if one approaches the ancient sources with the bias caused by ideas about what is obvious and normal drawn from modern astronomical practice. The following table summarises the situation in the sources mentioned. Missing data is shown by asterisks *; restored text is shown in square brackets [ ].

	Wu xing zhan						
Year of cycle	Month from Jupiter section	Rising lodges from Jupiter section:	Year name from Jupiter section	Rising lodges from table	*Huai nan zi*, *Shi ji*, and *Han shu* 'Mr Shi'	*Han shu* 'Mr Gan'	*Han shu* 'Tai chu system'
1	1	House	Shetige 攝提格	House	Dipper, Ox	Establishment [=Dipper], Woman	House, Wall
2	*	*	Dan'e 單閼	Wall	Woman, Barrens, Rooftop	Barrens, Rooftop	Astride, Harvester
3	3	Stomach	Zhixu 執徐	Harvester	House, Wall	House, Wall	Stomach, Mane
4	4	Net	Damang[luo] 大 荒[落]	Net	Astride, Harvester	Astride, Harvester	Triaster, Punisher
5	*	*	[Dunzang] [敦牂]	Well	Stomach, Mane, Net	Stomach, Mane, Net	Well, Ghost
6	*	*	Xieqia 協洽	Willow	Beak, Triaster	Triaster, Punisher	Spread, Stars
7	7	Spread	Tuntan 涒灘	Spread	Well, Ghost	Bow	Wing, Axletree
8	8	Axletree	[Zuo'e] [作鄂]	Axletree	Willow, Stars, Spread	Pouring [=Willow], Spread	Horn, Gullet
9	*	*	[Yanmao] [閹茂]	Gullet	Wing, Axletree	Stars, Wing	Base, Chamber, Heart
10	10	Heart	Dayuanxian 大淵獻	Heart	Horn, Gullet	Axletree, Horn, Gullet	Tail, Winnower
11	11	Dipper	Kundun 困敦	Dipper	Base, Chamber, Heart	Base, Chamber	Establish-ment [=Dipper], Ox
12	12	Barrens	[Chifenruo] [赤奮若]	Woman	Tail, Winnower	Heart, Tail	Woman, Barrens, Rooftop

Table 2: the 12 stations

Correlating heaven and earth

The *Wu xing zhan* is a divinatory text, not an abstract treatise on celestial kinematics. The heavens are to be observed and interpreted carefully because they both predict and help us to understand important events down here on earth. So far as planetary divination is concerned, the key to making it work is a careful system of correlation that enables events in the heavens to be linked with what will happen on earth.

Early Chinese celestial divination as transmitted to us through the scribal tradition is concerned in the main with large-scale political entities rather than with individuals, except in so far as those individuals (such as a ruler, a minister, a general) represent the fortunes of the state in their own persons. It is clear that for the *Wu xing zhan*, as for other early Chinese texts on divination, one way of correlating the heavens with the terrestrial world is by simple mapping of the political structures of the earth onto the sky. Things that happen in a region of the sky correlated with a certain state tell us about the fate of that state; this is the so-called 'division of fields' *fen ye* 分野 system. For instance, we read in reference to Saturn:

> 49. 所往之野吉，得土。
> The Field that it goes to is fortunate, and will obtain territory.

Unfortunately, we do not have a full listing of the celestial/territorial system used by the *Wu xing zhan*. The earliest record of this kind in the received literature is found in *Huai nan zi* chapter 3, and links the lodges with the kingdoms of late Warring States period:

Horn, Gullet	Zheng 鄭
Base, Chamber, Heart	Song 宋
Tail, Winnower	Yan 燕
Dipper, Ox	Yue 越
Woman	Wu 吳
Barrens, Rooftop	Qi 齊
House, Wall	Wey[38] 衛
Astride, Harvester	Lu 魯
Stomach, Mane, Net	Wei 魏
Beak, Triaster	Zhao 趙
Well, Ghost	Qin 秦
Willow, Stars, Spread	Zhou 周
Wing, Axletree	Chi 楚。

Table 3: lodges and states

A further feature of the *Wu xing zhan*, not found in *Huai nan zi* chapter 3 is that when more than one state is involved, they may be related as a yin-yang pair, for example:

[38] Non-standard romanisation of 衛 to distinguish it from Wei 魏。

125. 日冬至，[大白]在日北，至日夜分，陽國勝；
On the day of winter solstice, if Big White [=Venus] is to the north of the sun, up to the division of day and night (sc. 'equinox'), the yang state will win.

Shortly after this we are told how to establish which states in a group are yang with respect to the others, and thus by implication which are yin. A state may of course be yin with respect to some states, and yang with respect to others. The relationship appears to depend on geographical directions. Time could also be correlated with territory, as the *Wu xing zhan* indicates here in relation to Venus:

115. 太白始出，以其國日觀其色，色美者勝。
When Big White first comes out, observe its colour on the day of the state [in question]; when the colour is beautiful, there is victory.

Once again we have to use *Huai nan zi* chapter 3 to see how states can be correlated with days. There we find a systematic linking of states and neighbouring peoples in terms of the ten-fold and twelve-fold sets of cyclical characters that together are used to designate the 60-day cycle that is fundamental to Chinese dating.

甲 Jia.1	Qi 齊
乙 Yi.2	Eastern Yi tribes 東夷
丙 Bing.3	Chu 楚
丁 Ding.4	Southern Yi tribes 南夷
戊 Wu.5	Wei 魏
己 Ji.6	Hann[39] 韓
庚 Geng.7	Qin 秦
辛 Xin.8	Western Yi tribes 西夷
壬 Ren.9	Wey 衛
癸 Gui.10	Yue 越

Table 4: ten day cycle and states

子 Zi.1	Zhou 周
丑 Chou.2	Di 翟
寅 Yin.3	Chu 楚
卯 Mao,4	Zheng 鄭
辰 Chen.5	Jin 晉
巳 Si.6	Wey 衛
午 Wu.7	Qin 秦
未 Wei.8	Song 宋
申 Shen.9	Qi 齊
酉 You.10	Lu 魯
戌 Xu.11	Zhao 趙
亥 Hai.12	Yan 燕

Table 5: twelve day cycle and states

[39] Non standard romanisation of 韓 to distinguish it from Han 漢.

Finally, the *Wu xing zhan* structures some of its statements about the planets through their correlations in the five-fold cosmology that was to play a basic role in the construction of the early imperial world-view. The divinatory material relevant to each planet is introduced by a statement of its correlation with the five regions of the cosmos and the five phases *wu xing* 五行 ; in all but the case of Jupiter the material concludes with a further set of correlations, including a season, a pair of days from the standard 10-day cycle, an associated lunar position, and a note of which group of states is associated with it (this last being identical with the previously stated regional correlate). Similar material (apart from the lunar references) is found in the *Tian guan* monograph of the *Shi ji*, and in *Huai nan zi* chapter 3. Missing material is supplied here in brackets.

Planet	Region	Phase	Season	Days	Lunar position	States
Jupiter	East	Wood	[Spring]	[甲乙 (1,2)]	[in east]	[eastern]
Mars	South	Fire	Summer	丙丁 (3, 4)	east of meridian	southern
Saturn	Centre	Earth	(none)	戊己 (5,6)	on meridian	central
Mercury	North	Water	Winter	壬癸 (9,10)	in west	northern
Venus	West	Metal	Autumn	庚辛 (7,8)	west of meridian	western

Table 6: planet correlations in *Wu xing zhan*

One primary use of this system is in discussing how the planets interact to produce a given divinatory outcome. Thus we have, for instance:

110. 大白與營或(熒惑) 遇，金、火也，命曰樂(鑠)，不可用兵。

When Big White [=Venus] meets with Dazzling Deluder [=Mars], it is Metal and Fire. This is named 'melting'. Troops may not be used.

111. 營或(熒惑) 與辰星遇，水、火[也，命曰焠，不可用兵舉]事;大敗。

If Dazzling Deluder [=Mars] meets with the Chronogram Star [=Mercury], it is Water and Fire. This is named 'quenching'. One cannot use troops or begin affairs; there will be great defeat.

Naming the planets

The 'modern' (i.e. 21st century English) names of the visible planets are of course simply versions of the Latin names of some of the principal gods of the ancient Mediterranean pantheon: Jupiter, the king of the gods, his father Saturn, Mars the god of war, Venus the goddess of love, and Mercury the messenger and patron of (amongst other things) merchants and thieves. Although the tutelary spirits of the planets are named in the *Wu xing zhan* as each is introduced, their names are not used to refer to the planets in the rest of the text. There is some variety in the names actually used, but it is not on the whole difficult to determine which planet is being referred to. For each planet the principal name used is given first, followed by some alternate names found in the text.

Jupiter	歲星 'Year Star'	相星 'Minister Star' , 天維 'Celestial Bond'
Mars	熒惑 'Dazzling Deluder'	
Saturn	填星 'Garrison Star'	
Mercury	辰星 'Chronogram Star'	小白 'Little White'
Venus	大白 'Big White'	太白 'Great White', 明星 'Bright Star', 殷 'Yin ['Grand One'?]

Table 7: names of planets

Some of these names, such as those for Mars and Venus, are clearly descriptive or honorific. 'Year Star' for Jupiter evidently refers to its role in marking the passage of time through its 12-year cycle, as well as to the year-long interval between its first and last visibilities; the other names for this planet are obscure. 'Garrison Star' as a name for Saturn is explained in the text as referring to its passage through the 28 lodges in turn (hence 'garrisoning' them) in the course of its 30-year cycle. No explanation of the name 'Chronogram Star' is given in the text, but it may be connected with the role of Mercury as an approximate seasonal marker. 'Little White' is clearly based on a comparison with Venus ('Big White') as the other planet with similar behaviour in the region of the rising and setting sun.

Observing planets: synodic periods, rising and settings

I have already suggested that it can be distracting to approach the *Wu xing zhan* with the celestial sphere, its great circles and its coordinate systems in mind. There are also some more subtle traps to be avoided, and here are two of them:

Oversimplifying the results of modern astronomical theory.

If an observer on the earth watches one of the outer planets, such as Mars, Jupiter or Saturn, for a prolonged period, it will be seen to make a regular circuit of the sky against the background of the stars, moving from west to east.[40] Meanwhile, the sun is doing the same more rapidly than any of these three planets, at the rate of one circuit about every 365 ¼ days. As a result, the sun will catch up and pass each of these three planets at more or less regular intervals, and the interval at which this happens is called the *synodic period* of the planet.

For the inner planets, Mercury and Venus, the situation is rather different. For a terrestrial observer they appear to broadly follow the sun round the sky, while swinging from one side of it to the other, so that they are sometimes to the east of the sun and sometimes to the west, but never more than a certain distance away from it. The synodic period of these planets is conventionally taken as the interval between two passages of the planet past the sun from east to west.[41]

Modern textbooks frequently give tables of values of synodic periods, such as the following:

---

[40] Regular observation will reveal that when each outer planet is opposite the sun in the sky, so that it is visible in the south near midnight, it appears to slow down, stop, and then moves backwards (east to west) for a while. This 'retrograde' motion then stops in its turn, and the planet resumes its 'direct' west to east motion. This phenomenon is easily explained on a heliocentric view as a result of the combined orbital motions of the planet and of the earth.

[41] These east-west passages are in modern terms the moments when the inner planet lies between the earth and the sun, normally called 'inferior conjunction', a term borrowed from the older geocentric view of the solar system.

Planet	Synodic period/day
Mercury	115.88
Venus	583.92
Mars	779.94
Jupiter	398.88
Saturn	378.09

Table 8: mean synodic periods

What is not usually made clear, however is that these are only *mean* values of the intervals between apparent passages of each planet close to the sun in the sky (conjunctions), taken over a long period. The planets orbit the sun in ellipses of significant eccentricity, not concentric circles, and they consequently move at different speeds during different portions of those orbits. As a result the intervals between conjunctions can vary significantly from the mean, as anybody with desktop planetarium software can easily verify. Here for example, to the nearest day, are a series of conjunctions of Jupiter with the sun not long before the time of the *Wu xing zhan,* as calculated by the desktop application *Voyager 4.5*:

Date at Greenwich (Julian calendar)	Julian day number	Interval since last conjunction/day, to nearest day
Jan 2, 210 BCE	1644722.8201	--
Feb 7, 209 BCE	1645123.4319	401
Mar 16, 208 BC	1645525.6937	402
Apr 22, 207 BCE	1645928.3194	403
May 29, 206 BCE	1646329.9048	402

Table 9: some conjunctions of Jupiter and the sun

These intervals are clearly variable, and are also (for the years shown here) significantly larger than the mean value given above. For Mars in particular the variation can be greater:

Date at Greenwich (Julian calendar)	Julian day number	Interval since last conjunction/day, to nearest day
May 18, BCE	1644493.1555	--
Jun 28, 209 BCE	1645264.8673	772
Aug 4, 207 BCE	1646032.1652	767
Sep 10, 205 BCE	1646799.8750	768
Oct 23, 203 BCE	1647573.2055	773

Table 9: some conjunctions of Mars and the sun

Even over a long run of observations, obtaining the ‘correct’ synodic period for Mars may not be a simple matter. If we count the last conjunction listed above as number one, then conjunction number 28 was seen in China on July 15 145 BCE at Julian day number 1668657.7340. Taking the interval as 27 synodic periods, we obtain a mean of 780.91 days – still about a day different from the ‘correct’ figure of 779.94 days.

It should be clear from this that:

(i) Even if one does know an accurate mean synodic period for a planet, that may not enable one, on that basis alone, to make accurate predictions about when conjunctions with the sun, or other phases of planetary motion such as retrogradation in the case of the outer planets, will actually occur.

(ii) One should observe some caution in passing judgement on an ancient writer who gives a mean synodic period significantly different from those accepted today.

Oversimplifying observation and prediction.

When Jupiter is in conjunction with the sun, it naturally rises at nearly the same moment that the sun rises: this phenomenon is called the *true morning rising* (TMR) of the planet.[42] Conjunctions of planets with the sun cannot however be observed by terrestrial sky-watchers using the naked eye, since the planet is so close to the sun that it is lost in the glare. In the *Wu xing zhan*, as in many ancient texts from other cultures, an attempt is made instead to predict the *observable* risings and settings of the planets, concentrating on the dates when these occur for the first and last time in a planetary cycle.

Thus for example, after the date of TMR, when Jupiter rises with the sun, the sun (which moves twelve times faster across the sky than Jupiter) continues to move further east of the planet, and eventually Jupiter will be far enough to the west of the sun so that the planet rises above the eastern horizon long enough before sunrise to become visible for a short period before the light of rising sun blots it out. This is its *apparent morning rising* (AMR) – and it is this moment which is the centre of attention of the *Wu xing zhan* tabulation dealing with the motions of Jupiter, and indeed Saturn.

As the days pass and the sun moves further away from the planet, Jupiter will rise earlier and earlier before sunrise, and be visible for a longer part of each night before the dawn blots it out, until eventually it is opposite the sun, and like the full moon rises near sunset and sets near dawn, remaining visible for much of the night. As the cycle continues, the observer will notice for the first time that when the sky darkens enough for Jupiter to be visible after sunset, it has already risen. Thereafter it is seen further and further towards the west each sunset, and hence closer to the sun – since the sun is catching up with it again. Finally there will come a time when just after sunset Jupiter is so close to the sun in the west that it is barely visible, and after a brief appearance follows the setting sun down over the horizon. There follows a period during which Jupiter is never visible at all because it is too close to the sun, until as before the sun passes Jupiter going eastwards, and the cycle restarts when the planet eventually reappears just before dawn at a new AMR.

As would be expected, the phenomena shown by the inner planets Venus and Mercury, which appear to oscillate from one side of the sun to the other, are rather more

[42] Here and subsequently I use an almost self-explanatory set of terms modelled on those introduced in reference to the risings and settings of stars by the Greek writer Autolycus, a contemporary of Aristotle in the mid fourth century BCE: see Robinson, M. 2009 and Heath, T. L. 1921 repr. 1981 vol 1, 352-3. As Evans, James 1998, 197 remarks, there are a number of more modern, but more opaque and potentially confusing terms for these phenomena, including a set of Greek letter labels used by students of Mesopotamian astronomy. These need not be discussed here. Note that Evans prefers to write ‘visible’ rather than ‘apparent’.

complicated: for each there is a *first morning rising* (FMR),[43] followed by a *last morning rising* (LMR) as it approaches the sun again. After a period of invisibility close to the sun, during which conjunction occurs, the planet reappears to the east of the setting sun in the evening, and sets not long after it, its *first evening setting* (FES), and eventually moves back close enough to the sun to have its *last evening setting* (LES), followed by invisibility again, and eventually another first morning rising.[44]

Now clearly the instant of conjunction with the sun is a central moment in the cycle set out here, and, as we have seen, a knowledge of the mean value of the synodic period of the planet is of considerable help – though not an infallible guide - in predicting what the interval between successive conjunctions will be. But it is quite a poor guide to predicting what the interval will be between (say) successive apparent morning risings of Jupiter. The key difference here is that while a conjunction is an objective event – the instant when the centres of the visible discs of the sun and the planet are closest together when seen from a terrestrial position – an apparent morning rising (etc.) can only be said to have occurred when a human observer has succeeded in seeing the planet against the dawn or dusk sky. It is therefore inherently subjective, and apart from the observer's eyesight its occurrence will depend critically on atmospheric conditions, as well as on the brightness of the object concerned and its precise position in relation to the sun and the horizon.

From ancient times there have been attempts to specify objective conditions that, if fulfilled, should guarantee that the planet is actually seen. In China, the *Wu xing zhan* represents the earliest type of attempt, which consists of saying how many days the planet's periods of invisibility will last. In the case of the inner planets, that implies one value for the shorter period near inferior conjunction when the planet is between earth and sun, and a longer value for the longer period around superior conjunction when it is on the other side of the sun. The lengths of the periods of visibility are also given. Thus we have for instance, from sections 131-133 the information that Venus has two periods of invisibility, a long one of 120 days, and a short one a little over 16 days. On the assumption that the relations of the sun and Venus to the horizon are similar at appearance and disappearance, we may take it that these periods will be at least approximately symmetrical with respect to the moment of conjunction. A little work with a planetarium application suffices to indicate that these durations are approximately equivalent to saying Venus will become visible when about 15 or 16 degrees from the sun. The Triple Concordance astronomical system *San tong li* 三統曆, probably dating from around 10 AD, went a step further by simply specifying directly that the planet would be seen whenever it was beyond a certain angular distance from the sun.[45] The problem with reliance on such a method is of course that, for any given angular separation from the sun, Venus is much less likely to be seen when the line Venus-Sun is nearly parallel to the

[43] All the phenomena observed in relation to Venus and Mercury are of course 'apparent'.

[44] The interval between LMR and FES is considerably longer than the interval between LES and FMR. On a heliocentric view this is easily explained by the fact that the planets (seen from above the earth's north pole, orbit the sun anti-clockwise. To get from LMR to FES, an inner planet has to go all the way round the other side of the sun, as seen from the earth, but to get from LES to FMR it only has to go the shorter distance across the front of the sun on the same side as the earth.

[45] See *Han shu* 21b, 998, where a description of the motion of Jupiter begins 晨 始 見 去 日 半 次 'It is first seen at dawn, distant half a station from the Sun.' A 'station' is close to 30 degrees. The lack of realism here is shown by the fact that exactly the same expression begins the description of the motion of Mercury, which is much fainter and harder to see.

horizon, so that sun and Venus rise or set at nearly the same instant, than when that line is nearer to the vertical so that their rising or setting is separated by a considerable time interval. The inclination of the line Venus-Sun will of course depend on exactly when in the year the rising or setting occurs, since the inclination of the ecliptic to the horizon at that moment varies with the seasons, as well as on the planet's distance from the ecliptic, which can be significant though it was not systematically studied in ancient China.

In the west, followers of the tradition established by Ptolemy specified what came to be called in Latin an *arcus visionis*, generally interpreted as a critical angle of depression of the sun below the horizon at the instant that the star or planet crossed the horizon.[46] When this was exceeded, it was expected that the star or planet should be visible as it rose. This has some obvious advantages over the Chinese method, since it takes account not only of angular distance of the planet from the sun, but also of the inclination of the line planet-sun to the horizon. However, as historians of astronomy have begun to pay more attention to what it means to observe a planetary rising under particular conditions of place, season, weather and planet observed, it has become plain that no method of calculation presently known can produce exact predictions for a given observer. The best we can hope for is a prediction that may turn out to be within an error margin of five or six days.[47] With all these cautions in mind, one may make use of the software developed and made freely available for download by Noel Swerdlow.[48] A salutary feature of this software is that it leaves to the user the decision of exactly which parameters are to be used in the calculation, including one quantity not so far mentioned, the so-called 'critical altitude', the minimum elevation above the horizon required for the planet to be visible at all under given atmospheric conditions. It is therefore easy to see how much difference changing assumptions make to the predicted observations.

Finally, we must take account of two further obstacles to any exact evaluation of the statements about planetary phases made in the *Wu xing zhan*.

(a) We do not know exactly what the person who composed these tables meant when he said that a planet 'came out' *chu* 出 or 'went in' *ru* 入 'with' *yu* 與 a particular one of the 28 lodges. He certainly did not mean that the planet had the same longitude as the lodge in question, since the concept of longitude was not then known.[49] I have adopted the most intuitively simple interpretation, which is that this refers to the planet becoming visible for the first time in obvious association with the lodge – either being located within the actual asterism, or being on a level with it above the horizon so that it seems to have risen or to be about to set with it. This seems to make good sense of the statements made in the text.[50]

---

[46] The relevant calculations appear near the end of the *Almagest*, at XIII:7. See Toomer, G. J. 1998, 636-647.. The arcs vary from 5 degrees for Venus to 11 ½ degrees for Mars. However, as Robinson 2009, 14 notes, elsewhere Ptolemy expresses a low opinion of the reliability of calculations of this kind as predictors of actual planetary visibility: see *Almagest* IX:2, Toomer 1998, 420-421.

[47] See the careful comparison of different methods of calculation and their results in Robinson 2009, 12-13.

[48] This application 'Planetary, Lunar, and Stellar Visibility 3', is available for download from Alcyone Software, http://www.alcyone.de/planetary_lunar_and_stellar_visibility.html. It essentially works by a more sophisticated application of the *arcus visionis* method due to Ptolemy.

[49] This is, nevertheless, the basis of the analysis in Xi Zezong 席泽宗 1989.

[50] Cullen, Christopher 2011a.

(b) The references to months in the Venus table, and in the references to Jupiter in the main text may seem to add precision, but in fact they do little to help, since we are dealing with lunar months, and the link between a particular month and an instant in the annual solar cycle was not a tight one. Since a normal civil year of twelve lunar months is 354 days, which is shorter by 11 days than the 365 ¼ day solar cycle, after three civil years have passed a given month will have moved over a month away from its initial position in relation to the seasons. The time would then be ripe for the insertion of an extra 'intercalary' month to allow the seasons to catch up with the calendar. This means that a statement that something happens 'in the third month' does not define an interval of about thirty days in the solar cycle, but more like sixty given the fact that the month may shift as described before intercalation can correct it. We may note that there is a precedent for linking predictions that are essentially solar to months that are essentially lunar and hence constantly shifting in relation to solar phenomena: that is exactly what is found in the listing of solar positions and of dusk and dawn 'centred' *zhong* 中 (sc. 'culminating') constellations in the 3rd century BC *Yue ling* 月令 'Monthly ordinances' sections of the *Lü shi chun qiu* 呂氏春秋.

I have gone into such technical questions in detail elsewhere,[51] and I shall not repeat the discussion here. My conclusions amount, in essence, to the claim that the tables in the *Wu xing zhan* are a considerable distance from actual observation at any epoch, and represent instead the result of idealised schemes of prediction for each planet. Thus for Jupiter the lodges tabulated for Apparent Morning Rising are predicted precisely if one makes use of the figure given in the text of (30 + 105/240) *du* per year for the planet's displacement, together with the 'old' lodge extensions. For Saturn, the system seems to have been simpler still: the planet is simply shown as spending one year in each of the 28 lodges, even the narrowest, with the small adjustment that it spends two years in each of the rather wide lodges House (20 *du* on the old system) and Well (29 *du* on the old system), making a total cycle 30 years in length. The lodges for Venus are apparently predicted by ignoring the displacement of the planet from one side of the sun to the other and back, and simply stepping through the lodges by the same number of *du* that the sun moves in the given interval. Especially in the case of Venus, these procedures are idealized enough to be unrealistic. The tables none the less served a useful purpose to a diviner precisely because the deviations of the planet from prediction provided rich material for prognosticatory interpretation.

Previous studies

The Wu xing zhan has been referred to by many writers on the history of early Chinese astronomy and divination over the last three decades. My object here is simply to list the main landmarks in the literature that deal principally with this text and its significance.

---

[51] Cullen 2011a.

The first study of the text to appear was Liu Yunyou 刘云友 (pseudonym for Xi Zezong) 1974, an article published pseudonymously by an eminent historian of astronomy, following the cautious practice adopted by a number of Chinese scholars during the Cultural Revolution. Accompanying this article was Anon 1974, which gave a transcription of the tables at the end of the text, but omitted the parts of the text concerned with divination. The pseudonymous 1974 article was republished with corrections and additions under the author's real name as Xi Zezong 席泽宗 1978 in the collection of articles on the history of astronomy assembled as *Zhongguo tianwenxue shi wenji* 中国天文学史文集 'Collected documents on the history of Chinese astronomy', Anon 1978b, and appeared once more eleven years later in effectively the same revised form in another collection devoted to the archaeology of objects related to astronomy, Anon 1989, as Xi Zezong 席泽宗 1989. Xi's work made it possible for preliminary discussion of the *Wu xing zhan* material to be given as part of Teboul, Michel 1983.

Meanwhile Yabuuti Kiyosi had published Yabuuti Kiyosi 薮内清 1984 in which he went over some of the same ground as Xi. As for transcriptions of the *Wu xing zhan*, while Anon 1974 gave a version of the tabular part of the material, the whole of the text did not appear in print (transcribed into simplified characters) until the version published in the same collection as Xi Zezong 席泽宗 1978: see Anon 1978a. This text became the basis of a number of publications taking the form of annotated versions of the text, with explanatory notes and paraphrases.

In chronological order, the first of these to appear was Kawahara Hideki 川原秀城 and Miyajima Kazuhiko 宮島一彦 1985, a product of characteristically intensive study by the group of scholars at that time led by Yamada Keiji at Kyoto University's Research Institute for Humanistic Studies. In addition to making use of all textual and photographic material previously published, the authors of this study state that they were also able to have discussions on a number of points with Xi Zezong himself. The text is presented in nine sections, each consisting of several numbered paragraphs in full-form characters, followed by a series of notes discussing textual points or issues arising from the content of the text. For each section there is also a helpful translation into modern Japanese. In restoring lacunae in the text, the authors naturally exploit obvious parallels within the text itself, but also make careful use of parallels in a number of apparently related ancient texts, whose contents are also helpful in shedding light on the significance of obscure passages. Next appeared the annotated version which forms one of the chapters of Zheng Huisheng 鄭慧生 1995. The study of Chen Jiujin 陳久金 2002 likewise bases itself on the transcription of Anon 1978a, rewritten in full-form characters, to which it adds explanatory notes and a paraphrase in modern Chinese.

Of course, real progress in improving our ability to be sure of the content of the original text depends on close inspection of the decayed fragments of silk on which it survives, or failing that on the inspection of high quality fine resolution photographs. Astonishingly, over 30 years after the discovery of the Mawangdui material, no full set of such photographs of the *Wu xing zhan* material has yet been published. We do however have the benefit of the careful work of Liu Lexian 刘乐贤 2004, who engages with the problems of transcription, editing and restoration in as much detail as is possible with the resources currently available; given the handicaps under which he had to work, his achievement is a considerable one. His is the text adopted for the purposes of the present translation. I have taken the decision to render his simplified characters into full-form characters. It should be noted that Liu Lexian differs from all previous editors (who

follow Anon 1978a) in the way he orders the sections of the text found on the damaged silk fragments: see the justification given for this in Liu Lexian 刘乐贤 2004, 15-16 & 205-210. I have adopted Liu's order for this translation.

The most recent publication known to me that deals with the contents of the *Wu xing zhan* is the discussion of early Chinese ideas of the motion of Venus by Takeda Tokimasa 武田時昌 2010.[52] This introduction is not the place to discuss all the views of this text that have been expressed since its first discovery. Needless to say I have however made frequent use of the work of the scholars listed above in preparing the present study. Since I cannot give detailed citations for every point where I have benefited from their researches, and I hope that this general acknowledgement will serve to express my gratitude.

Structure and content of the text

The following analysis is given for convenience of reference.

A. Prognostics for Jupiter

1: cosmic and cultic correlations of the planet.

2-15: months of apparent morning rising of the planet over a 12 year cycle, together with asterisms with which the planet rises.

16-18: duration of periods of visibility and invisibility; interval between successive apparent morning risings; daily motion.

19-21: position of Jupiter as predictor of fortune for states correlated with regions of the sky in which it is found.

22-29: significance of departures of Jupiter from predicted behaviour, and of types of comet said to result from this.

30-31: significance of conjunction of Jupiter with Venus, Saturn, Mars, Mercury and the Star Great Horn.

32: significance of colours of Jupiter.

33: motion of Jupiter through 12 Jupiter stations correlated with the movement of Great Yin through the 12 year cycle.

B. Prognostics for Mars

34: cosmic and cultic correlations of the planet.

35: lack of regularity in motion of the planet; association with military matters.

36-37: significance of planet appearing in west and east.

38-39: significance of planet remaining in one place for a prolonged period, or moving away quickly.

41: significance of conjunctions with other planets.

42-44: significance of rays emitted by planet; position of planet amongst asterisms; link of planet with music.

---

[52] I am grateful to Daniel Morgan for bringing this study to my attention, and for giving me the opportunity to see his own discussion of the *Wu xing zhan* (in Chinese), forthcoming in 簡帛 *Jian bo* 6.

45: correlation of planet with seasons and days of ten-day cycle; position of Moon; correlation with geographical region.

C. Prognostics for Saturn

46: cosmic and cultic correlations of the planet.

47-50: significance of the name "Garrison Star" given to the planet; position of Saturn as predictor of fortune for states correlated with regions of the sky in which it is found.

51: link planet with ritual; bad consequences of attacking a state correlated with position of Saturn.

52: correlation of planet with seasons and days of ten-day cycle; position of Moon; correlation with geographical region.

D. Prognostics for Mercury

53: cosmic and cultic correlations of the planet.

54-58: Association of the planet with the four seasons, and consequences when the planet does not behave as expected.

59: normal interval between appearance and disappearance.

60-62: significance of conjunctions with other planets, particularly Venus.

63-64: significance of its motion in directional terms, or of the irregularity of that motion.

65: correlation of planet with seasons and days of ten-day cycle; position of Moon; correlation with geographical region.

E. Prognostics for Venus

66: cosmic and cultic correlations of the planet.

67: phenomena controlled by the planet.

68: month of first morning rising of the planet in the initial year of system, and asterisms with which it rises; time elapsed until last morning rising, time elapsed before first evening setting, time elapsed until last evening setting and time elapsed until subsequent first morning rising; five occurrences of morning rising make eight years, after which the planet rises once more with the original asterism.

69-70: significance of planet appearing or disappearing before or after the time expected.

71-79: significance (mostly military) of motions of the planet.

80-85: significance of conjunctions of the planet with Mercury.

86-93: significance of colours and motions of the planet, with additional references to Jupiter, Saturn, Mars and the 'Ploughing Star'.

94: significance of colours and shape (round or horned) of a planet (Venus?).

95-98: significance of motion of the planet upwards or downwards.

99-103: significance of motion of planets in relation to the moon.

104-106: significance of conjunctions of Venus with Jupiter.

107-114: conjunctions of various planets, and the significance.

115-118: significance of the behaviour of Venus on particular days in relation to states correlated with those days.

119-127: rising and setting of Venus in particular directions, correlated with states classified as Yin and Yang; listing of states classified as Yang with respect to certain other states.

128: correlation of planet with seasons and days of ten-day cycle; position of Moon; correlation with geographical region. Effect of planet on 'uncivilised' states.

Table 10: giving asterisms with which Jupiter performs its apparent morning rising, based on a 12 year cycle. Five complete cycles are given, beginning in 246 BCE, together with the first 10 years of the sixth cycle, which ends with the year 177 BCE.

129: Distance moved by Jupiter in one day, 12 days, and one year; interval between the first morning rising and last evening setting; interval between last evening setting and next first morning rising; interval between successive first morning risings; time for planet to make one circuit of the heavens; interval between conjunctions with Venus in a given asterism.

Table 11: giving asterisms with which Saturn performs its apparent morning rising, based on a 30 year cycle. Two complete cycles are given, beginning in 246 BCE, together with the first 10 years of the third cycle, which ends with the year 177 BCE.

130: asterism in which Saturn was found in the first year of the system; distance moved by Saturn in one day, 30 days, and one year; interval between the first morning rising and last evening setting; interval between last evening setting and next first morning rising; interval between successive first morning risings; time for planet to make one circuit of the heavens; interval between conjunctions with Jupiter.

Table 12: giving details of the phases of Venus, based on an eight-year cycle; within each eight-year period there are five complete phase cycles, beginning with a first morning rising; for each phase cycle we are told the month of first morning rising, and the asterism with which Venus rises, the time interval until last morning rising, the month in which this occurs, and the asterism with which Venus then rises, the time interval until the first evening setting, the month in which this occurs and the asterism with which Venus then sets, the time interval until last evening setting, the month in which this occurs and the asterism with which Venus then sets, and the time interval until the next first morning rising. Eight complete eight-year cycles are given, and the first six years of the ninth eight-year cycle, which ends with the year 177 BCE.

131: daily motion of Venus during three different time segments following the first morning rising, total interval between the first morning rising and last morning rising; interval between last morning rising and the first evening setting.

132: daily motion of Venus during three different time segments following the first evening setting, total interval between the first evening setting at the last evening setting.

133: interval between the last evening setting and the next first morning rising; total interval between successive first morning risings; an eight-year cycle contains five cycles of phases.

Notes on the translation

1. In preparing the transcription of the text used here, I have preserved Liu Lexian's editorial markings as far as possible:

[….] indicates a proposal to restore missing text in the MS, and is also used in my translation for an editorial insertion of an English word or a suggestion for the meaning of an obscure term or expression.

□□□ indicates (in this case 3) missing characters that remain unknown;

Characters in round brackets ( ) indicate a suggestion for reading the preceding character.

Characters in angle brackets < > indicates a suggestion for correcting a character in the MS when a scribal error in the original seems likely.

2. Full explanations of the reasons for restorations of lacunae in the text are given by Liu Lexian. In many cases the restoration follows the obvious pattern of the text. In such cases I make no comment. In more significant cases, particularly where the restoration is based on a parallel in another source, I usually add a note summarising the basis of the restoration. Sinological readers may refer to Liu for material justifying some translations of less common usages on which I have not commented explicitly.

3. Abbreviations:

HNZ *Huai nan zi* 淮南子
SJTGS *Shi ji tian guan shu* 史記天官書
HSTWZ *Han shu tian wen zhi* 漢書天文志
JSTWZ *Jin shu tian wen zhi* 晉書天文志
KYZJ *Kai yuan zhan jing* 開元占經

Wu xing zhan 五星占: Prognostics of the Five Planets[53]

Jupiter

1.東方木，其帝大浩 (皞)，其丞句芒 (芒)，其神上為歲星。

The east is Wood. Its Lord is Dahao. Its Assistant is Goumang. Its spirit ascends to become the Year Star.[54]

2.歲處一國，是司歲。

When the Year [Star] dwells in a state, this [state?] is 'controlling the Year'.[55]

3.歲星以正月與營宮晨 [出東方，其名為攝提格。

When the Year Star comes out at dawn in the east with House[56] in the first month, the name is Shetige[57].

4.其明歲以二月與東壁晨出東方，其名] 為單閼。

In the next year, when it comes out at dawn in the East with Eastern Wall[58] in the second month, the name is Dan'e.

5.其明歲以三月與胃晨出東方，其名為執徐。

In the next year, when it comes out at dawn in the East with Stomach[59] in the third month, the name is Zhixu.

6.其明歲以四月與畢晨 [出] 東方，其名為大 亓 (荒) [落。

---

[53] This title and the subtitles in the translation are supplied by me and do not appear in the original text. I have divided the text into what seem to be natural units of meaning and supplied paragraph numbering for convenience of reference and discussion.

[54] Each planet is introduced with a similar statement of its cosmological correlations, and of the divinities associated with it. The latter do not seem to play any role in the divinatory material that follows. *Huai nan zi* and the *Shi ji* both include similar material. Dahao is one of the Lords of the Five Directions, corresponding to the east, also euhemerized as a ruler of high antiquity. Goumang is a lesser deity, also associated with the east.

[55] Jupiter 'dwells in' a state when it is in the region of the sky corresponding to that state. In (24) and elsewhere we see that this situation is generally favourable to the relevant state. What exactly is meant by the three characters 是司歲 is obscure. LLX 30 cites a 甘德 fragment in *Kai yuan zhan jing* that runs 甘氏曰歲星歲處一國是司歲十二名，which seems to indicate that it is the twelve Jupiter year-names that are controlled.

[56] 營宮 is clearly equivalent to the more common 營室. I render conventionally as 'House' for easy comparison with lists of lodges in my essay on this text in Cullen 2011a. David Pankenier (translation and study of SJTGS, forthcoming) has argued that 營 is probably verbal, so that the literal meaning of the name is something like 'Lay out/align the house'.

[57] This is the first of the twelve year-names of the Jupiter cycle; the rest now follow in order.

[58] The lodge, missing in the damaged original, has been restored using the tabulation at the end of the Jupiter section.

[59] The tabulation at the end of the Jupiter section has Harvester as the lodge.

In the next year, when it comes out at dawn in the East with Net in the fourth month, the name is Damangluo.

7.其明歲以五月與東井晨出東方，其名為敦牂。

In the next year, when it comes out at dawn in the East with Eastern Well[60] in the fifth month, the name is Dunzang.

8.其明歲以六月與柳] 晨出東方，其名 為汁給 (協洽)。

In the next year, when it comes out at dawn in the East with Willow in the sixth month, the name is Xieqia.

9.其明歲以七月與張晨出東方，其名為芚 莫(涒灘)。

In the next year, when it comes out at dawn in the East with Spread in the seventh month, the name is Tuntan.

10.其明歲 [以] 八月與軫晨出東方，其 [名為作鄂] 。

In the next year, when it comes out at dawn in the East with Axletree in the eighth month, the name is Zuo'e.

11. [其明歲以九月與亢晨出東方，其名為閹茂] 。

In the next year, when it comes out at dawn in the East with Gullet[61] in the ninth month, the name is Yanmao.

12.其明歲以十月與心晨出 [東方] ，其名為大淵獻。

In the next year, when it comes out at dawn in the East with Heart in the tenth month, the name is Dayuanxian.

13.其明歲以十一月與斗晨出東方，其名為 困 <困>敦。

In the next year, when it comes out at dawn in the East with Dipper in the eleventh month, the name is Kundun.

14.其明歲以十二月與虛 [晨出東方，其名為赤奮若。

In the next year, when it comes out at dawn in the East with Barrens[62] in the twelfth month, the name is Chifenruo.

15.其明歲以正月與營宮晨出東方] ，復 為 聶 (攝) 提 [格，

In the next year, when it comes out at dawn in the east with House in the first month, the name is once more Shetige

16.十二歲] 而周。皆出三百六十五日而夕入西方，伏卅日而晨出東方，凡三百九十五日百五分 [日而復出東方] 。

---

[60] In this and the following year, the lodge, missing in the damaged original, has been restored using the tabulation at the end of the Jupiter section.

[61] The lodge, missing in the damaged original, has been restored using the tabulation at the end of the Jupiter section.

[62] The tabulation at the end of the Jupiter section has Woman as the lodge.

It makes a circuit in twelve years. In each case it comes out for 365 days before going in in the west at dusk, and is concealed for 30 days before coming out in the east at dawn. In all it is 395 days and 105 parts of a day before it comes out again in the east.[63]

17.□□□□□□□□□□□□□□□□視下民公□□□羊(祥)，廿五年報(復)昌。

… watching the people below (?) … blessings, in 25 years return of fortune.

18.進退左右之經度。[64]日行廿分，十二日而行一度。

The regular [number of] *du* around which it advances and lags: in a day it moves 20 parts; in 12 days it moves 1 *du*.

19.歲視其色以致其□□□□□□□□□□□□□□□□□□□□□□□□為相星□□列星監正，九州以次，歲十二者，天榦也。

The Year: watch its colour to bring about its … it is the Xiang star[65]… the arrayed stars set the standard, so that the nine provinces are in accordance with their stations; the twelvefold years are the heavenly stems.[66]

20.營室聶 (攝) 提格始昌，歲星所久處者有卿 (慶)。

House is first made resplendent [by Jupiter] in the Shetige [year]; there will be blessings where the Year Star dwells for long.

21. [以正月與營室晨出東方，名曰監德。其狀蒼蒼若有光，其國有][67] 德，黍稷 < 稷 > 之匿；其國無德，兵甲嗇嗇。

When in the first month it comes out at dawn in the east with House, the name is Controlling Virtue. Its appearance is blue and it has radiance. When the state [on which it dwells] has virtue, there will be storing up of glutinous and panicled millet. If the state is without virtue, troops and armour will proliferate.

22.其失次以下一若二若三舍，是胃 (謂) 天維紐 (朐)，其下之 [國有憂、將亡，國傾敗；

If [Jupiter] misses its station and falls short by one, two or three abodes,[68] this is called ‘shortfall of Celestial Bond [sc. ‘Jupiter’?] ‘; the country below it will have sorrow: generals will be lost and the state overturned in defeat.[69]

---

[63] The figures given here are in close agreement with those given at the end of the Jupiter motion table, section 129, except that there we have no fractional part of the interval between one rising in the east and the next. Since that interval depends on the ability of a human observer to see that planet in the steadily brightening east before dawn, it will in fact vary slightly from one rising to the next, depending on the precise astronomical conditions. Over the long term, the mean period of reappearance will tend to be identical to the period with which Jupiter repeats conjunction with the sun, its ‘synodic period’, for which a modern value is 398.88 days. The denominator for the ‘parts’ here is 240 – see section 129.

[64] The significance of these seven characters is not clear; perhaps this is a reference to the actual motion varying from the figures given in the rest of the section.

[65] As suggested by David Pankenier (private communication), the sense of *xiang* 相 here may be ‘minister’.

[66] The reference here is to the twelve cyclical characters.

[67] LLX 35 argues for this restoration on the basis of parallels in SJTGS and a Gan De fragment in KYZJ.

[68] 舍 ‘abode’ functions here as an equivalent of 宿 ‘lodge’; see Cullen 2011b.

23.其失次以上一若二若三舍，是謂天維] 贏，於是歲天下大水，不乃天列(裂)，不乃地動；紐亦同占。

If [Jupiter] misses its station and goes too far by one, two or three abodes, this is called 'overshooting of Celestial Bond [sc. 'Jupiter'?]'; in this year there will be great waters [sc.'floods'] in the empire If not that, there will be rifts in heaven, and if not that there will be earthquakes. The same prognostications apply to 'shortfall'.[70]

24.視其左右以占其夭壽，□□□□□□□□□□□□□□□□□□□□□□□□□□□□用兵，所往之野有卿，受歲之國不可起兵，是胃(謂)伐皇，天光其不從，其陰大凶。

Watch its [movement] to left and right in order to prognosticate about premature death or longevity … use troops, the [state corresponding to] the Field where it goes will have good fortune. A state that receives the Year may have no troops raised [against it]: this [would be] called 'Attacking the Lord'. If the Celestial Radiance [= Jupiter?] is not followed, its Yin is greatly inauspicious.[71]

25.歲星出 [入不當其次，必有天祆見其所當之野，進而東北乃生彗星，進而] 東南乃生天部(棓)，退而西北乃生天鋒(槍)，退而西南乃生天 [欃] ；皆不出三月，見其所當之野，其 [國凶不可舉事用兵，出而易, 所當之國受] 央(殃)，其國必亡。[72]

When the Year Star comes out or goes in and is not in its proper station, there will inevitably be a Celestial Portent[73] appearing in the corresponding Field. If it advances north-east, this will produce a Broom Star; if it advances south-east, this will produce a Celestial Flail; if it retreats north-west, this will produce a Celestial Lance; if it retreats south-west, this will produce a Celestial Point. In each case before three months have passed they will appear in the corresponding Field; the [corresponding] state is

---

[69] Here and in the next section we see the importance of Jupiter *deviating* from its predicted position. The omens given in the preceding section 21 are by contrast derived directly from Jupiter's position as observed. Both types of omens can be found in other early imperial sources such as the *Tian guan* monograph of the *Shi ji*, and in the *Han shu*. Relatively frequent deviations from prediction are of course a natural product of the simpler types of predictive theory. In the context of his discussion of early Mesopotamian celestial divination, David Brown has argued that of producing omens of this kind for diviners to interpret can be seen as in some sense part of the function of early predictive schemes, rather than a defect: see Brown, David 2000.

[70] Lacunae in this and the preceding section are restored by LLX 35-36 on the basis of parallels in SJTGS, HSTWZ, and a fragment of *Jing zhou zhan* 荊州占 in KYZJ 23.

[71] David Pankenier (private communication) suggests that this may be a reference to the *tai yin* 太陰 Great Yin counterpart of Jupiter: see section 33. LLX 36 prefers to interpret *tian guang* 天光 as referring to the sun, but cites no parallels to support this.

[72] LLX 37 restores lacunae principally on the basis of parallels in SJTGS and HSTWZ. The latter cites several fragments from Shi Shen and Gan De. As LLX 40 observes, the sources differ on the directions corresponding to different types of portent.

[73] This appears to be a collective term for the four different kinds of object said in the following text to be produced by excursions of Jupiter in the four different directions named. Although the term 'broom star' is often found in usages that clearly refer to what in modern terms would be seen as a comet, we cannot assume that such an identification will always be appropriate, and the reference of the other three terms is somewhat obscure. For a discussion of this and related issues, including the descriptions and drawings of comet-like objects in a document from the same tomb as the *Wu xing zhan*, see Loewe, M.A.N. 1994. Other early imperial texts connect irregular movement of Jupiter with the appearance of 'portents' in a similar way, although there are some differences of detail.

unfortunate and may not undertake tasks or use troops. If it shifts after coming out, the corresponding state will suffer disaster, and the state will inevitably be destroyed.

26.天部 (棓) 在東南，其來 < 本 > 類星，其來 < 末 > 銳長可四尺，是司雷, 大動，使□毋動，司反□□□□□□□□□□□□□□□□□□□□□□。

The Celestial Flail in the south-east: its root is like a star, and its tip is sharp, about four feet [long]. This controls thunder. When it is greatly active, make … not active. It controls the contrary …

27. 櫢 (彗) 星在東北，其本有(類)星，末類慧 (彗) ，是司失正逆時，土□□者 駕 (加) 之 央 (殃)，其咎大□□□□□□□□□□□□□□□□□□。

The Broom Star in the north-east: its root is like a star, and its tip is like a broom. This is in charge of loss of rectitude and [actions] contrary to the season. [If the] Earth [Star? sc. Saturn] … further disaster, the punishment is great …

28. 天鍌 (槍) 在西北，長可數丈，左右銳，是司殺, 不周者駕 (加) 之央 (殃)，其咎亡主。

The Celestial Flail in the north-west: its length is about several tens of feet. It is sharp to left and right. This is in charge of killing; Buzhou[74] brings further disaster; the punishment is death of the ruler.

29. 天岑 (欃) 在西南，其本類星，末庸銳, 長數丈，是司□□其出而易立 (位)，□□□□ 駕 (加) 之央 (殃)，其咎失立 (位)。

The Celestial Point is in the south-west: its root is like a star, its tip is usually pointed, and its length is several tens of feet. This is in charge of … If it comes out and changes position … adds further disaster: the punishment is loss of the throne.

30. [大白與歲星遇，大白在南，歲星在] 北方，命曰牝牡，年穀 [大熟；大白在北，歲星在南方，年或有或無] 。[75]

When Big White [Venus] meets with the Year Star, with Big White in the south and the Year Star in the north, this is called ‘female and male’. The harvest of grain will ripen greatly. If Big White is in the north, and the Year Star is in the southern direction, sometimes one will have a harvest, and sometimes not.

31.月蝕歲星，不出十三年， [國飢亡；蝕填星，不出] □ 年，其國伐而亡；蝕大白，不出九年，國有亡城，強國戰不勝； [蝕熒惑，其國以亂亡；蝕辰星，不出] 三年，國有亂兵；蝕大角，不三年，天子□□□□[76]

If the moon eclipses the Year Star, in no more than thirteen years the state will suffer loss by starvation. If it eclipses the Garrison Star [Saturn], in no more than ... years the state will be attacked and lost. If it eclipses Big White, in no more than nine years the state will lose walled towns, and a strong state will fight but not win. If it eclipses

[74] A deity associated with the north-west.
[75] LLX 40 restores lacunae from parallels in HSTWJ, JSTWJ, and a Gan De fragment cited in KYZJ 20 .
[76] LLX restores lacunae from parallels in SJTGS, HSTWZ, and a number of fragments in KYZJ 12 and 14.

Dazzling Deluder [Mars], the state will be lost through disorder. If it eclipses the Chronogram Star [Mercury], in no more than three years there will be disorderly troops in the state. If it eclipses Big Horn [Arcturus],[77] it will not be three years [before] the Son of Heaven …

32. 凡占五色：其黑唯水之年，其青乃大飢之年，□□□□□□□□□□□□□□□□□□□□□□□□□□□□。

In general, prognosticating from the five colours: when black, it is a year of waters [sc. 'floods']; when blue it is thereupon a year of great starvation, …

33.歲星與大陰 [相] 應也,

大陰居維辰一，歲星居維宿星二;

大陰居中辰一，歲星居中宿星 [三]; □□□□□□□□□□□□□□□□□□□□□□□□ [歲] 星居尾箕,

大陰左徙，會于陰陽之界，皆十二歲而周于天地。

大陰居十二辰從子□□□□其國□可斂入其 □□其白□□□□□□□□□□□□獄，斬刑無極。不會者駕之央，其咎短命。

The way that the Year Star and the Great Yin answer to each other:[78]

When the Great Yin dwells on one diagonal chronogram, the Year Star dwells on two diagonal lodge stars [sc. 'constellations'],

When the Great Yin dwells on one central chronogram, the Year Star dwells on three central lodge stars.

… the Year Star dwells on [the lodges] Tail and Winnower.

The Great Yin travels to the left; they meet at the borders of Yin and Yang. In each case they make circuits of heaven and earth[79] in twelve years.

The Great Yin is placed in the twelve chronograms starting from *zi*. … the state .. may be gathered and put in its … its white … prison, executions by decapitation are unending. In cases when they do not meet, it adds further calamity; the punishment is shortening of life.

Mars

34. 南方火，其帝赤帝，其丞祝庸(融)，其神上為 [熒惑] 。

The south is Fire. Its Lord is the Red Lord. Its Assistant is Zhurong. Its spirit ascends to become Dazzling Deluder.[80]

---

[77] Since Arcturus is over 30 degrees from the ecliptic, this is not possible. It seems more likely that the reference is to the Spica (α Virginis), the principal start of the lodge Horn.

[78] In what follows, the writer appears to be thinking of the schematised arrangement found on the *shi* 栻 cosmic model rather than of the considerable inequalities in width of the lodges as seen in the heavens. The 'central chronograms' are the four corresponding to north and south (*zi* 子 and *wu* 午) and east and west (*mao* 卯 and *yu* 酉), while the other eight form four 'diagonal' pairs each on either side of the directions north-east, north-west, south-east and south-west. A scheme along these lines is set out in *Huai nan zi*: see Major 1993, 73. Since each central chronogram is allocated 3 lodges and each diagonal chronogram has two, then as *Huai nan zi* points out the total is as expected 4x3 + 8x2 = 28. The *Wu xing zhan* gives us no explicit statement of what relation between chronograms and lodges lies behind its statement, and it may well have been different from that of the *Huai nan zi*.

[79] The Year Star moves round the heavens, while the Great Yin moves round the horizon on earth.

35. [進退] 無恒,不可為 [極] ，所見之□□兵革出二鄉反復一舍，□□□年。

Its advance and retreat are irregular: it is not possible to make a standard. Where it is seen … arms and armour appear in two regions. It turns back one abode … year. [81]

36.其出西方，是胃 (謂) 反明，天下革王。

When it comes out in the west, this is called 'Reversing Brightness': the empire will change its king.

37.其出東方，反行一舍，所去者吉，所之國受兵□□。

When it comes out in the east, and moves backwards one abode, the place it leaves is fortunate, but the state where it goes to will meet with troops.

38.營或 (熒惑) 絕道，其國分當其野， [受 殃 。

When Dazzling Deluder breaks off its journey, the part of the state corresponding to its Field will meet with disaster.

39.居] 之久， [殃] 大。亟發者，央 (殃) 小；□□□, 央 (殃) 大。溉 (既) 已去之，復環 (還) 居之， 央 (殃)；□其周環繞之，入， 央 (殃) 甚。其赤而角動，央 (殃) 甚。

Where it dwells for long, the disaster is great. If it departs quickly, the disaster is small. … the disaster is great. When it has already left, but it returns to dwell, disaster … . If it circles round, and then goes in, the disaster is extreme. If it is red with moving horns [sc. 'rays'], the disaster is extreme.

40.營或 (熒惑) 所留久者，三年而發。

When Dazzling Deluder remains for a long time, [disasters] begin after three years.

41.其與它星遇而□□□□ [在] 其南、在其北，皆為死亡。

When it meets with another Star [sc. planet], … in the south, or in the north, in each case there will be death and destruction.

---

[80] The Red Lord, Chidi, more commonly known as 炎帝 Yandi 'The Blazing Lord', is the directional deity associated with the south, and Zhurong is an associated lesser deity.

[81] LLX 44 restores lacunae from HNZ 3 which says of Mars that 'Its coming out and going in are irregular' *chu ru wu chang* 出入無常, and a text quoted in KYZJ 30, said to be by Han Yang 韓楊 (fl. 290 CE) which has the phrases 進退無常, 不可為極 "its advances and retardations are irregular, it is not possible to make a standard'. My rendering of 極 follows the suggestion by LLX that it should be glossed as '中，准則'. The text relating to Mars, at least so far as it has been preserved, does not give any quantitative information about the movement of the planet sufficient to enable us to work out an underlying value for (in modern terms) its synodic period. We see the same lack of data for Mars in *Huai nan zi*; the *Tian guan* monograph of the *Shi ji* gives figures in months for some of the phases, together with the number of lodges moved, but no overall period is explicitly given. On the basis of some simplifying assumptions, the *Shi ji* data appear to point to a synodic period of around 790 days; see Teboul, Michel 1983, 152. A modern value is 779.94 days. The statement that the risings and settings of the planet are 'irregular', and that it is 'not possible to make a standard' probably refer to the fact that the motion of Mars is particularly hard to predict on the basis of a simple theory.

42.赤芒，南方之國利之；白芒，西方之國利之；黑芒，北方之國利之；青芒，東方之國利之；黃芒，中國利之。

If there are red rays, the states of the south benefit from it. If there are white rays, the states of the west benefit from it. If there are black rays, the states of the north benefit from it. If there are green rays, the states of the east benefit from it. If there are yellow rays, the states of the centre benefit from it.[82]

43.□□ 營或 (熒惑) 于營室、角、畢、箕。

… when Dazzling Deluder is in House, Horn, Net or Winnower.

44.營或 (熒惑) 主司天樂，淫于正音者□駕 (加) 之央 (殃) □□。其咎

Dazzling Deluder rules over those in charge of celestial music; if they transgress correct notes, there will be further disaster. The punishment …

45. [其時] 夏，其日丙丁，月位隅中，南方國有之。

Its season is summer, its days are *bing*.3 and *ding*.4; when the moon's position is just before the meridian, the states of the south possess it.[83]

Saturn[84]

46.中央 [土] ，其帝黃帝，其丞后土，其神上為填星。

The centre is Earth. Its Lord is the Yellow Lord, its Assistant is Houtu, and its spirit ascends to become the Garrison Star.[85]

47.實(是)填州(周)星，歲 [填一宿。其所居國吉，得地][86] 。

It garrisons the circuit of stars;[87] each year it garrisons one lodge.[88] The state on which it dwells is fortunate, and will obtain land.

---

[82] The colours here are simply those associated with the directions in question in the standard cosmological scheme.

[83] All the planets except Jupiter have a 'cosmological conclusion' of this type at the end of their sections. The correlations with seasons, directions etc. are of a standard type, although the references to the moon are unusual. I follow the suggestion of LLX 48 for interpreting the reference to the moon, but like the related reference in 52, the position may not be directly astronomical, but rather cosmological.

[84] Although, as with Mars, the divinatory material for Saturn gives no quantitative data about its cycle, apart from the claim that it moves one lodge each year, the later table is followed by the statement (section 130) that its apparent morning rising repeats at 377 day intervals, so that it has that synodic period. A modern value is 378.09 days.

[85] The Yellow Lord, Huangdi, is widely known outside his function as the Lord of the Centre. Houtu is a lesser associated deity.

[86] LLX 48-49 restores the lacuna mainly on the basis of a parallel between this section and the next in SJTGS. Further parallels are in HSTWZ and KYZJ, 38, citing a Shi Shen fragment.

[87] I follow the suggestions of LLX 49 to read 實 as 是 and 州 as 周.

[88] This passage apparently explains the name given to Saturn by the fact that it will normally occupy ('garrison') one of the 28 lodges each year. Since however the lodges House and Well are exceptionally wide, they each take two years to cross, so that the complete cycles lasts 30 years.

48.既已處之，有(又) [西] 東去之，其國凶，土地桱 (淫)，不可興事用兵，戰鬥不勝；

When it has been located there, and then departs to the west or east, the state will be unfortunate. Its territory will be invaded; it cannot undertake affairs or use troops, and if it fights it will not win.

49.所往之野吉，得土。

The Field that it goes to is fortunate, and will obtain territory.

50.填之所久處，其國有德，土地,吉。

Where the Garrison [Star] is located for long, the state will possess virtue and territory, and will be fortunate.

51.填星司天體 (禮) □□□□□□隨丘 [不可] 起土攻 (功)。若用兵者，攻伐填之野者，其咎短命亡， 孫子毋處。

The Garrison Star is in charge of the Celestial Ritual … follow the mound.[89] May not undertake earthworks. Should one make use of troops, and attack [a state corresponding to] Garrison Star's Field, the punishments are death and shortening of lifespan, and grandsons and sons will have nowhere to be.

52.中央分土，其日戊己，月立 [位] 正中，中國有之。

The allotment of the centre is Earth, its days are *wu* and *ji*, the position of the moon is on the meridian; the central states have it.

Mercury

53.北方水，其帝端(顓)玉(頊)，其丞玄冥， [其] 神上為晨(辰)星。

The north is Water. Its Lord is Zhuanxu. Its Assistant is Xuanming. Its spirit ascends to become the Chronogram Star.[90]

54.主正四時，春分效婁，夏至 [效東井，秋分] 效亢，冬至效牽牛。一時不出，其時不和；四時 [不出] ，天下大饑。

It rules and corrects the four seasons. At the spring equinox it appears in the lodge Harvester; at the summer solstice it appears in the lodge Eastern Well; at the autumn equinox it appears in the lodge Gullet; at the winter solstice it appears in the lodge Led Ox. If for one season it does not appear, that season will not be harmonious. If it does not appear for four seasons, there will be great famine in the empire.[91]

---

[89] As LLX notes, the two characters after the lacuna do not seem to make much sense.

[90] Zhuanxu, said in euhemerising accounts to have been the grandson of the Yellow Lord, presides over the north, and Xuanming is an associated deity.

[91] The lodges named here are given in *Huai nan zi* 3 as associated with the solar positions in the second, fifth, eighth and eleventh months respectively: these are the months in which the spring equinox, summer solstice, autumn equinox and winter solstice should fall if proper intercalation is keeping the calendar in step with the solar cycle. If Mercury is seen at dawn around those times, it will indeed not be far from those lodges. But that does not mean it will in fact always appear just at the equinoxes and solstices: in fact it is impossible for it to do so on a regular basis. Since a modern value for the synodic period of Mercury is 115.88 days,

55.其出蚤 (早) 于時為月蝕，其出免 (晚) 于時為天夭 [及彗] 星。

If it appears earlier than its season, that makes a lunar eclipse; if it appears later than its season, that makes a Celestial Portent and a Broom Star.

56.其出不當其效，其時當旱反雨，當雨反旱； [當溫反寒，當] 寒反溫。

If it comes out and is not [when it] should appear, then if the season should be dry it will turn to rain; if it should be rainy it will turn to dry; if it should be warm it will turn to cold; if it should be cold it will turn to warm.

57.其出房、心之間，地盼動。

When it comes out between Chamber and Heart, there will be earthquakes.

58.其出四中 (仲)，以正四時，經也；其上出四孟，王者出；其下出四季，大秏 (耗) 敗。

When it comes out at the Four Midpoints [of the seasons], it thereby corrects the four seasons: it is regular. If it comes out earlier at the Four Beginnings, a king will arise; if it comes out later at the Four Ends, there will be great loss and defeat.

59.凡是星出廿日而入，經也。□□廿日不入□□，

In general, when this star comes out for 20 days and then goes in, it is regular.[92] … 20 days and does not go in …

60. [與它] 星 [遇而] 斲(鬥)，天下大亂。

If it meets with other Stars and fights with them, there will be great disorder in the empire.

61.其入大白之中，若麻近繞環之，為大戰，趮勝靜也。

If it enters into the midst of Big White, or rubs against or goes round it, this will make a great battle, in which the moving one will beat the one at rest.[93]

---

observations of its dawn rising will repeat at close to that interval. The equinoxes and solstices are however spaced at intervals close to a quarter of a tropical year, 91 days (I ignore here the fact that the intervals are not precisely equal). Thus, for instance, if Mercury actually did rise about the same time as the lodge Harvester at the spring equinox, its next rising would occur about 116 – 91 = 25 days after the summer solstice, which is more than a month late, then 50 days after the autumn equinox, and 75 days after the winter solstice. Section 58 is obviously intended to deal with the fact that the planet could be seen rising at any time during a season. Given in addition to these date displacements the considerable difficulty in observing Mercury with the naked eye, there will be some seasons in which a rising of Mercury is not observed at all. It is not therefore surprising that the final sentence of section 54 envisages failure of the planet to be visible in a given season, or a sequence of seasons.

[92] The same 20-day duration of visibility is also given in *Huai nan zi*, 3 and *Shi ji,* 27, 3030. Such a figure can only be a very crude guide, since conditions will vary from one rising to the next. It is not however an unreasonable indication of how long the planet might be visible. Using default settings on Noel Swerdlow's 'Planetary Lunar and Solar Visibility' software suggests that (for instance) in 200 BC the planet's morning visibility in summer lasted from August 13 to September 5, an interval of 24 days. The next summer it lasted from July 28 to August 19, or 23 days. Shorter periods of visibility are interpreted as omens in section 63.

[93] Mercury may perhaps be seen 'rubbing' against Venus in the sense used here, when around December 15, 200 BCE it approaches Venus to within a little over half a degree and then recedes.

62.辰星厠 (側) 而逆(迎)之，利； 厠 (側) 而倍 (背) 之，不利；曰大鎣，是一陰一陽，與□□□□□□□□□□□□□候王正卿必見血兵，唯過章章。

If the Chronogram Star moves sideways to welcome it [i.e. Venus], it is advantageous. If it moves sideways and retreats from it, it is disadvantageous. It is called Great Burnisher, this is one yin and one yang, with … lords, kings and ministers in office will see blood and troops, and their faults will be obvious.

63.其行必不至巳，而反入于東方。其見而速入，亦不為羊 (祥)，其所之，候王用昌。其陰而出于西方，唯□□□□□□□□□□唯過彭彭，其行不至未，而反入西方，其見而速入，亦不為羊 (祥)，其所之, 候王用昌。

If its motion will definitely not reach to *si*, but it turns back and goes in in the east, then its appearing and swiftly going in is not a good omen. Where it goes, lords and kings will flourish. If it is yin and comes out in the west, it is … their faults will be frequent. If its motion will not reach to *wei* but it turns back and goes in in the west, then its appearing and swiftly going in is not a good omen. Where it goes, lords and kings will flourish.[94]

64.曰失匿之行，壹進退，無有畛極，唯其所在之國□□□□□□□□甲其長。

It is said: irregular or hidden motion, or advancing and retreating, without any limits, means that in the state where it is situated … armour will increase.

65.其時冬，其日壬癸，月立 [位] 西方，北方國有之。主司天德，不順者……

Its season is winter. Its days are *ren* and *gui*. The moon's position is in the west. The states of the north have it. It rules and is in charge of celestial virtue. Those who do not conform to …

Venus

66.西方金，其帝少浩(皞)，其丞蓐收，其神上為大白。

The west is Metal. Its Lord is Shaohao. Its Assistant is Rushou. Its spirit ascends to become Big White.[95]

67. 是司月行、 櫹 (彗)星、天夭、甲兵、水旱、死喪、□□□□道，以治□□□矦(侯)王正卿之吉凶。將出發□□□。

This is in charge of the motion of the moon, of Broom Stars, Celestial Portents, armour and troops, waters and drought, death and mourning[96] … the Way, to govern …

---

[94] *Si* and *wei* here evidently refer to the use of these two of the twelve chronograms to indicate ranges of direction on the horizon, extending 30 degrees southwards from south-east and south-west respectively.

[95] As well as being referred to as 'Big White' *da bai* 大白, Venus is also referred to as *tai bai* 太白, which I differentiate by translating as 'Great White'.

[96] The existence of this passage confirms as genuine a parallel passage in *Shi Ji* 27, 1322, that modern editors had suspected was not genuine: see Liu Lexian 刘乐贤 2004, 58. Clearly writers on such topics in the early imperial age drew on a common stock of texts, although they by no means agreed on all topics.

the good or bad fortune of lords, kings and ministers in office. [When] generals set forth …

68. [其紀上元、攝] 提格以正月與營宮晨出東方，二百廿四日晨入東方；浸行百廿日； [夕] 出 [西方，二百廿四日夕入] 西方；伏十六日九十六分日，晨出東方。五出，為日八歲，而復與營宮晨出東方。[97]

The sequence is that at High Origin, a *shetige* [year], it comes out with House in the east at dawn in the first month, and goes in in the east at dawn after 224 days. It moves immersed for 120 days. It comes out in the west at dusk, and goes in in the west at dusk [after] 224 days. It is hidden for 16 days and 96 parts of a day, [and then] comes out in the east at dawn. After five comings out, which in days make eight years, it comes out again with House in the east at dawn.[98]

69.大白先其時出為月食，後其時出為天夭及 櫧 (彗) 星。

If Big White comes out before its time, that makes a lunar eclipse. If it comes out after its time that makes a Celestial Portent or a Broom Star.

70.末 [宜出而出，未宜入而入，命曰失舍，天] 下興兵，所當之國亡。宜出而不出，命曰須謀。宜入而不入，天下偃兵，野有兵講，所當之國大凶。[99]

If it comes out when it should not yet come out, or goes in when it should not yet go in, this is called ‘missing its lodge’. Troops will rise up in the empire, and the corresponding country will be lost. If it does not come out when it should come out, that is called ‘waiting to plot’. If it does not go in when it should go in, the empire will rest its troops, and in the fields there will be troops making peace. The corresponding state will be greatly unfortunate.

71.其出東方為德，與(舉)事，左之迎之，吉；右之倍之， [凶] 。 [出] 于 [西方為刑] ， 與(舉)事，右之倍之，吉；左之迎之，凶。

---

[97] Here and elsewhere in the material on Venus, LLX 58-59 is able to draw on significant parallels in other ancient literature to restore lacunae. These include HNZ 3, SJTGS, and KYZJ 45, which cites substantial fragments ascribed to Shi Shen and Gan De.

[98] The total length of the cycle from one dawn rising to the next is thus 584 days and 96 parts. Since 1 part is 1/240 day, this amounts to 584.4 days. A modern value for this synodic period is 583.92 days. The value given is clearly a consequence of the decision that five Venus synodic periods were exactly equal to eight years of 365 ¼ days: 8*(365 ¼ days)/5 = 584 96/240. Two other ancient sources not far in date from the *Wu xing zhan*, the *Huai nan zi* and *Shi ji*, give different durations for the successive phases of the planet’s visibility, implying values for the synodic period of 635 and 626 days (the second of these being deduced on the basis that the durations of morning and evening appearance are equal, only the first being given explicitly). The Shi Shen material in KYZZ 45 implies a period of 624 days, and the Gan De material implies 630 days. It cannot be assumed that the ‘better’ value implied in the *Wu xing zhan* is a simple consequence of more accurate or more copious observations of Venus. We cannot rule out the possibility that the desire to construct a simple predictive scheme led to the adoption of a ‘rounded-off’ rule of 5 Venus cycles in 8 years, which was subsequently found to work well in the long run. The *San tong li* gives data equivalent to a synodic period of 584.13 days.

[99] LLX 60-61 restores lacunae from parallels in SJTGS, HNZ 3, and fragments by Shi Shen and Gan De in KYZJ 46, as well as a citation from *Yi si zhan* 乙巳占 by Li Chunfeng 李淳風 (602 - 670 CE). As LLX points out, though textual structures and content have strong resemblances, these sources contain contradictory prognostications at some points.

When it comes out in the east, it is Virtue. In beginning affairs, what goes to the left welcomes it: fortunate. What goes to the right turns its back on it: unfortunate. When it comes out in the west it is Punishment. In beginning affairs, what goes to the right turns its back on it: fortunate. What goes to the left welcomes it: unfortunate.

72.凡是星不敢經天；經天，天下大亂，革王。

In general this Star does not dare to cross heaven; should it cross heaven, there will be great disorder in the empire, and one will change the king.[100]

73.其出上遝午, 有王國，過未及午, 有霸國。從西方來，陰國有之；從東方來，陽國有 [之] 。□□毋張軍。

If it comes out and reaches *wu*, there will be a state with a [true] king. If it goes past *wei* and reaches *wu*, there will be a state with a hegemon.[101] If it comes from the west, the yin state has it; if it comes from the east, the yang state has it.[102] … do not range an army.

74.有小星見太白之陰,四寸以入，諸侯 (侯) 有陰親者；見其陽, 三寸以入，有小兵。兩而俱見，四寸 [以入] ，諸侯 (候) 遇。在其南，在其北，四寸以入，諸候縱。在其東， [在其] 西，四寸以入，諸 侯 (候) 衡。

If there are small stars visible on the yin [side] of Great White, within four inches [of it],[103] then there are those who are making secret agreements amongst the feudal lords. If they are visible on its yang [side], within three inches of it, there will be a small number of troops. If there are two visible together, within four inches, the feudal lords will have a meeting. If [one] is to the south of it and [one] is to the north of it, within four inches, the feudal lords will [make a] vertical alliance. If [one] is to the east of it and [one] is to the west of it, within four inches, the feudal lords will [make a] horizontal alliance.[104]

75.太白晨入東方，浸行百廿日，其六十日為陽，其六十日為陰。出陰，陰伐利，戰勝。其入西方伏廿日，其旬為陰，其旬為陽。出陽，陽伐利，戰勝。

---

[100] The expression *jing tian* 經天, here interpreted as meaning 'cross heaven' is explained in *Song shu* 24, 701: 晝而星見午上者為經天, 其占為不臣, 為更王 "when the star [sc. planet] is seen in daytime on the meridian, that is *jing tian*, and the prognostication is failure to act as a minister [should] , or a change of king.

[101] As before, *wu* and *wei* appear to refer to a twelve-fold division of the horizon, to which rising and setting positions of the planet are referred.

[102] Yin and yang are here relational rather than absolute properties of states: a state may be yang with respect to one state, and yin with respect to another. See the listing given in section 126.

[103] The 'inch' *cun* 寸 was the normal linear measure, with ten *cun* to the 'foot' *chi* 尺. At about 23 mm the *cun* was a little less than a modern British inch of 25.4 mm. As for the use of such measures for astronomical purposes, a search of the *Han shu* monograph on celestial omens for instances where *cun* or *chi* are used for verifiable measurements such as the distances of planets from one another or from nearby stars on known dates suggests strongly that 1 *chi* was equivalent to one degree, and one *cun* was as expected equivalent to 1/10 degree, making 5 *cun* about a moon-width. We have no idea whether such measurements were estimated visually around the time of the *Wu xing zhan*, or whether some kind of sighting aid was used.

[104] A 'vertical alliance' in the Warring States period was a north-south alliance, commonly directed against the state of Qin in the west. A 'horizontal' (east-west) alliance might be directed against the great southern state of Chu. Such expressions were clearly inappropriate in the early imperial age, but they were nevertheless repeated.

When Great White goes in at dawn in the east, and moves immersed for 120 days, 60 days of it are yang, and 60 days of it are yin. When it comes out of yin, it is favourable for the yin [state] to attack, and it will win in battle. When it goes in in the west and is hidden for 20 days,[105] a decade of it is yin and a decade of it is yang. When it comes out of yang, it is favourable for the yang [state] to attack, and it will win in battle.

76.□□未出, 兵靜者吉，急者凶。先興兵者殘， [後興兵] 者有央(殃)。得地復歸之。

… not yet come out, the troops that are at rest are fortunate, and those that are hurried are unfortunate. He who raises troops first will be damaged; he who raises troops later will suffer disaster. If one gains territory, it will be given back.

77.將軍在野，必視明星之所在，明星前，與之前；後，與之後。兵有大□，明星左，與之左； [右, 與之右] 。

When a general is in the field, he must watch to see where the Bright Star[106] is situated. If the Bright Star is ahead, go ahead with it. If the Bright Star is to the rear, go to the rear with it. The troops have great … If the Bright Star is to the left, go left with it. [If right, go right with it.]

78.□□將軍必斗， 均 (苟) 在西，西軍勝；在東，東軍勝； 均 (苟) 在北，北軍勝；在南，南軍勝。 均 (苟) 一閘，夭 < 夾 > 如銚，其下被甲而朝。 均 (苟) 二閘，夾如鉈，其下流血。 [苟 三] 閘，夾如參 (鏒)，當者 □□□□□□□□□□□奮其厠 (側)，勝而受福；不能者, 正當其前，被將血食。

... the general must fight. If it is in the west, the western army wins; in the east, the eastern army wins. If it is in the north, the northern army wins; in the south, the southern army wins. If there is one fortification[107], it will be pressed as if by long spears; below it armour will be worn to court. If there are two fortifications, they will be pressed as if by short spears; below it there will be flowing blood. If there are three fortifications, they will be pressed as if by iron hoes; corresponding to it … if one attacks the flank, one will win and obtain blessings; if one is unable to, face directly to the front, and the general will make a blood sacrifice. [108]

79.大白小而動，兵起。

When Big White is small and moves about, troops will arise.

80.小白從其下，上抵之，不入大白，軍急。小白 [在] 大白前後左右，□干□□□□□，□□□□□大白未至，去之甚亟，則軍相去也。

When Little White [sc. ‘Mercury’] comes from below or from above and approaches it, but does not enter into Big White, the army will be hurried. When Little

---

[105] This figure for the shorter period of visibility of the planet differs from the value of 16 days and 96 parts of a day given a little earlier in the text. The passages may represent different traditions on which the *Wu xing zhan* compiler drew.
[106] This is another name for Venus, as noted in the list of thirteen such terms in *Shi Ji* 27,1327.
[107] AS LLX 66 notes, the significance of this character is not obvious.
[108] As LLX 66 notes, the meaning of the characters 被將血食 is obscure, and the text may be in error.

White is before or behind Big White, or to its left or right, ... shields … Big White has not arrived, or leaves it very quickly, then the armies will depart from one another.

81.小白出大白 [之左] ，或出其右，去參尺，軍小戰。小白麻大白，有數萬人之戰，主人吏死。

When Little White comes out at the left of Big White, or comes out at its right, distant 3 feet from it, the army will have a small battle. If Little White rubs against Big White, there will be a battle with several myriads of men, and officers of the 'host' will die.[109]

82.小白入大白 [中，五日乃出，及] 其入大白，上出，破軍殺將，客勝；其下出，亡地三百 [里] 。[110]

When Little White enters into Big White, and comes out after five days, or when it enters Big White, and comes out upwards, the army will be smashed and the general killed, and the 'guest' will win. If it comes out downwards, 300 *li* of territory will be lost.

83.小 [白] 來抵大白，不去，將軍死；大白期 (旗) 出，破軍殺將，視 期 (旗) 所鄉(向)，以命破軍。

If Little White comes and approaches Big White, and does not leave, the general will die; If Big White's 'banner'[111] comes forth, the army will be smashed and the general killed. Watch the direction in which the 'banner' is directed, in order to decide which army will be smashed.

84.小白□ [大] 白，兵是□□ [其] 趮而能去就者，客也；其靜而不能去就者，[主也] 。

Little White ... Big White, troops ... these. The active one that is able to go and come is the guest; the quiescent one that is not able to go and come is the host.

85.凡小白、大白兩星偕出，用兵者象小白，若大白獨出，用兵者象效大白。

In general when the two stars Little White and Big White come out together, the one who is using troops is the counterpart of Little White. If Big White comes out on its own, the one who is using troops is the counterpart of Big White.

86.大白干□亢動兵□□□ [色] 黃而員(圓)，兵不用。 □□□□□□

Big White shield ... [the lodge?] Gullet. Moving troops … coloured yellow and round, troops will not be used … .

87.凡戰,必擊 期 (旗) 所指，乃有功。迎 [之左之] 者敗。

In general, when in battle, one must strike where the banner points, then one will have achievements. One who welcomes it [sc. Venus] or has it on the left will be defeated.

---

[109] Here the 'host' is the side on whose territory the conflict occurs; the 'guest' in the next section is the invader.

[110] LLX 68 gives parallels from SJTGS, HSTWZ, and a Shi Shen fragment in KYZJ 22. The second and third of these enable the 6 character lacuna to be restored.

[111] 'Banner' here seems to refer to rays apparently emitted by the planet.

88.已張軍, 所以智(知)客，主人勝者: 客星白澤；黃澤，客勝。青黑萃，客所謂□□□□□□□□曰耕星 □□□。歲星、填星，其色如客星□□也，主人勝。

When armies have been deployed, to know whether guest or host will win: if the guest's star is white and brilliant, or yellow and brilliant, the guest will win. If blue and black are mixed, the guest is what is called … called the Ploughing Star [112]…. The Year Star, and the Garrison Star: if their colour is like the guest's star, the host will win.

89.太白、 營或 (熒惑) 、耕星赤而角，利以伐人, 客勝; 客不 [勝] ，以為主人，主人勝。

If Great White, Dazzling Deluder or the Ploughing Star are red with horns, it is advantageous to attack others, and the guest will win. If the guest does not win, it is because it is acting as the host, and the host will win.

90.大白稿□□□□□□或當其 □□□□將歸，益主益尊。

When Big White is straw[113] … or it is on its … it is about to return, and lordship and honour will be increased.

91.大白贏數(縮) 弗去，其兵強。

When Big White advances or retards but does not leave [a location] , the troops will be strong.

92.星趫趯，一上一下，其下也耀貴

If the star jumps about, going up and going down, below it prices will increase.

93.星如郝(孛)，□□□軍死其下，半郝(孛)十萬□□□□□□□□□□□其下千里條。

The Star is like a comet (?)… the army will die beneath it, half the comet (?) ten myriads … below it a length of 1000 *li*.[114]

94.凡觀五色，其黃而員 (圓) 則贏；青而員 (圓) 則憂, 凶央 (殃) 之白迫；赤而員 (圓) 則中不平；白而員 (圓) 則福祿是聽；黑 [而員 (圓) 則] □□□□□□□□□□。 [黃] 而角則地之爭；青而角則國家懼；赤而角則犯伐 < 我 > 城；白而角則得其眾，四角有功，五角取國，七角伐 [王] ；黑而 [角則] □□□□□□。

In general, when observing the five colours:
If yellow and round, then excess;
If blue and round then sorrow, and misfortune and disaster hurrying on.
Red and round, then the centre is not peaceful;
White and round, then you will hear of blessing and reward.
Black and round then …
Yellow and horned [sc. 'with rays emanating from it'], then struggle for territory;

---

[112] This term does not occur in any other ancient source known to me. As LLX suggests, it is probably an alternative name for a planet, and since in the next section it is named together with Venus and Mars it is likely to be one of Mercury, Jupiter or Saturn.

[113] LLX 72 offers no suggestion for restoring or making sense of this passage. Perhaps 稿 should be emended to 高, so that the section begins 'When Big White is high …'?

[114] LLX 94 notes the emendation suggested, but as he points out the passage still does not make any much sense.

Blue and horned, then the country will be afraid;
Red and horned, then our cities are encroached on;
White and horned, then one obtains the population.
Four horns: have success; five horns: take over the state; seven horns: attack the king.
Black and horned, then …

95. [大白其出東方] 為折陰，卑、高以平明度；其出西方為折陽，卑、高以昏度。

When Big White comes out in the east, it is the breaking of yin, and its lowness or highness are measured at first light. When it comes out in the west, it is the breaking of yang, and its highness or lowness are measured at dusk.

96.其始出, 行南，兵南；北，兵北；其反亦然。其方上□□□□□□□□□□□□□

When it first comes out, if it moves south, troops in the south; if north, troops in the north. If it turns back, it is also thus. When it is about to go up …

97. [星高, 用] 兵入人地深；星卑，用兵淺, 其反為主人; 以起兵不能入人地。

When the star is high, troops may enter deeply into the territory of others; when the star is low, use troops shallowly, and go back to being the host; when raising troops one is unable to enter the territory of others.

98.其方上，利起兵。其道留，留所不利，以陽□□□□□□□□□□□□□□□□□者在一方，所在當利，少者空者不利。

When it is about to go up, it is advantageous to raise troops. When its path is delayed, the place it delays in is not advantageous. By the yang … positioned in one direction, then where it is positioned corresponds to advantage, but the lesser or more empty is not advantageous.

99.月與星相過也，月出大白南，陽國受兵；月出其北，陰國受兵。

When the moon goes past the star, if the moon goes out to the south of Big White, yang states will suffer from troops; if the moon goes out to the north, yin states will suffer from troops.

100.□□□□□□□□□□□□□□□□扶,有張軍; 三指, 有憂城; 二指, 有□□著,扁將戰; 並光, 大戰

… a hand-span, there will be ranging of armies; three fingers, there will be distress of cities; two fingers,[115] there will be … hard pressed, and an assistant general will give battle; if their radiance joins together, a great battle.

101.月啗大白，有 [亡] 國； 營或(熒惑), [以亂] ，陰國可伐也。[116]

---

[115] Clearly ‘the hand-span’ and ‘finger’ are used here to represent angular distances; they are not commonly found in ancient Chinese sources in this sense.
[116] LLX 76 restores lacunae from parallels in HSTWZ and SJTGS.

If the moon eats Big White, there will be states that are lost; if it is Dazzling Deluder, [loss] through disorder, and yin states may be attacked.

102.月□□□□□□弱，其行也，主人疾急。合□惡不明，□敗

The moon … weak. In its motion, the host is distressed and anxious. It joins with … evil not clear … defeat.

103.其色□而角, 客勝.大白猶是也。

If its colour is ... and horned, the guest will win. Big White is similar to this.

104.殷為客，相為主人，將相禺（ 遇 ），未至四、五尺，其色美，孰能怒，怒者勝。

The Yin [Star, = Venus] is for the guest, the Xiang [Star, = Jupiter] is for the host. When they are about to meet together, within four or five feet, and their colour is beautiful, either of them may become 'enraged' [i.e. emit bright rays], and the enraged one will win.

105.□□□□殷出□相□殷□□□左，□定者勝。殷出相之北，客利；相出殷之北，主人利。兼出東方，利以西伐。

… the Yin [Star] comes out … the Xiang [Star] ... Yin [Star] … left … the fixed one will win. If the Yin [Star] goes out to the north of the Xiang [Star], the guest is advantageous. If the Xiang [Star] goes out to the north of the Yin [Star], the host is advantageous. If they come out together in the east, it is advantageous to attack westwards.

106.殷與相遇，未至一舍，殷從之却，客疾，守人急。□□□□□高□必□□□□□□□□主人急，客窘急。

If the Yin [Star] meets the Xiang [Star], without yet coming within one abode of it, and the Yin [Star] follows it back, the guest will be rapid, and the person defending will be hurried. … high …must …the host will be anxious, and the guest will be hard-pressed.

107.凡五星五歲而一合，三歲而遇。其遇也美，則白衣之遇也；其遇惡，則下□□□□□□□□□□□□□□毋兵不吉。

In general, [amongst] the Five Stars every five years there is a joining,[117] and every three years there is an encounter. If the encounter is beautiful then there will be an assembly of those in white garments [sc. 'commoners' or 'mourners']; if the encounter is ugly, then below … without troops is unlucky.

108.視其相犯也：相者木也，殷者金，金與木相正 (征)，故相與殷相犯，天下必遇兵。

Watch when they encroach on each other: the Xiang [Star] is Wood, and the Yin [Star] is Metal. Metal and Wood attack each other, so when Xiang and Yin encroach on each other, the empire will encounter troops.

---

[117] That is, they are in the same lodge.

109. [殷] 者金也，故殷 [與] □ [星遇，興兵舉] 事大敗，□ [春] 必甲戌，夏必丙戌，秋必庚戌，冬必壬戌。

Yin is Metal, so when Yin meets with the ... Star, in raising troops or beginning affairs there will be a great defeat. ... in spring it will be [day] *jiawu*, in summer it will be *bingwu*, in autumn it will be *gengwu*, and in winter it will be *renwu*.

110.大白與營或(熒惑) 遇，金、火也，命曰樂 (鑠)，不可用兵。

When Big White meets with Dazzling Deluder, it is Metal and Fire. This is named 'melting'. Troops may not be used.

111.營或 (熒惑) 與辰星遇，水、火 [也，命曰焠，不可用兵舉] 事; 大敗。

If Dazzling Deluder meets with the Chronogram Star, it is Water and Fire. This is named 'quenching'. One cannot use troops or begin affairs; there will be great defeat.

112. [歲] 與大 < 小 > 白斲 (鬥)，殺大將; 用之, 搏之, 貫之，殺扁 (偏) 將。

When the Year [Star] fights with Little White, the great general will be killed; if it goes through it, or knocks against it, or pierces it, the assistant general will be killed.

113.營或 (熒惑) 從大白，軍憂；離之，軍 [却] ；出其陰，有分軍；出其陽，有 [偏將之戰] 。 [當其] 行，大白逕之， [破軍殺] 將。[118]

When Dazzling Deluder goes with Big White, the army will be distressed. If it leaves it, the army will retreat; if it goes out on the yin [side] , there will be division of the army; if it goes out on the yang [side] , there will be a battle with the assistant general. If in its motion Big White reaches it, the army will be smashed and the general killed.

114.凡大星趨相犯也，必戰。

In general, if the Big Stars[119] hurry to encroach on each other, a battle is inevitable.

115.太白始出，以其國日觀其色，色美者勝。

When Great White first comes out, observe its colour on the day of the state [in question];[120] when the colour is beautiful, there is victory.

116.當其國日獨不見，其兵弱。三有此，其國 [可擊，必得其將] 。

When it is only not visible on the day of that state, its troops are weak. If it is like this three times, the state can be attacked, and its general will inevitably be captured.

117.不滿其數而入，入而 [復出] ，□□其入日者國兵死：入一日，其兵死十日，入十日，其兵死百日。

If it goes in before fulfilling the [correct] count, or if it goes in and then comes out again .. the troops of the state corresponding to the day when it goes in will die: if it

---

[118] LLX 81 restores the lacunae on the basis of parallels in SJTGS, KYZJ 21, and HSTWZ.
[119] As LLX 81 suggests, this term probably refers to the planets.
[120] As noted above, the days of the ten and twelve day cycles were correlated with particular states.

goes in for one day, the troops will die in ten days; if it goes in for ten days, the troops will die in a hundred days.

118.當其日而大。以其大日利；當其日而小，以小之 [日不利] 。 [當其] 日而陽，以其陽之日利。當其日而陰，以陰日不利。上旬為陽國，中旬為中國，下旬為陰國。審陰陽，占其國兵.

If it becomes big on the day [corresponding to a given state] , then the day on which it becomes big is advantageous [for that state] ; if it becomes small on the day [corresponding to a given state] , then the day on which it becomes small is disadvantageous [for that state] . If it is a yang [period] on the day [corresponding to a given state] , then the yang days are advantageous [for that state] . If it is a yin [period] on the day [corresponding to a given state] , then the yin days are disadvantageous [for that state] . The first decade [of a month] is for yang states, the middle decade is for central states, and the last decade is for yin states. Examine the yin and yang, and divine for the troops of that state.

119.大白出辰，陽國傷； [出巳，亡偏地；出東南維，在日月] 之陽，陽國之將傷，在其陰 [利。] [121]

If Big White comes out in *chen*, yang states will be harmed. If it comes out in *si*, border territory will be lost; if it comes out on the south-east diagonal [between *chen* and *si*] , and is on the yang of sun and moon, the general of a yang state will be harmed. If it is on the yin, it is advantageous.[122]

120.大白 [出戌入未] ，是胃(謂)犯地刑，絕天維；行過，為圍小，[123]有暴兵將多。

If Big White comes out in *xu* and goes in in *wei* , this is called ‘encroaching on the warp of earth and breaking the diagonal cords of heaven’; if its motion goes too far, it will make the state small; there will be fierce troops and generals will be many.

121.大白出于未，陽國傷； [出申，亡偏地；出西] 南維，在日月之陽，陽國之將傷，在其陰 [利。

If Big White comes out in *wei*, yang states will be harmed. If it comes out in *shen*, border territory will be lost; if it comes out on the south-west diagonal [between *wei* and *shen*] and is on the yang of sun and moon, the general of a yang state will be harmed. If it is on the yin, it is advantageous.

122.大白] 出于戌，陰國傷；出亥，亡扁(偏)地；出西北維，在日月之陰，陰國之將傷，在其陽利。

If Big White comes out in *xu*, yin states will be harmed. If it comes out in *hai*, border territory will be lost; if it comes out on the north-west diagonal [between *xu* and

---

[121] In restoring lacunae in sections 119-124, LLX 83-85 draws some support from partial parallels in KYZZ 46, citing fragments of *Jing zhou zhan* and by Xi Meng 郗萌, and 45, again citing *Jing zhou zhan*.

[122] The writer here and in subsequent sections is almost certainly thinking in terms of the *shi* 栻 cosmic board (see above) rather than in terms of horizon directions.

[123] I follow here the suggestion of LLX 83 to read 刑 as 經,and 圍 as 國.

hai] and is on the yin of sun and moon, the general of a yin state will be harmed. If it is on the yang, it is advantageous.

123. [出辰入丑] □□□；大白出于丑，亡扁(偏)地；出東北維，在日月之陰，陰 [國之] 將傷，在其陽利；出寅，陰國傷。

If it comes out in *chen* and goes in in *chou* … If Big White comes out in *chou*, border territory will be lost; if it comes out on the north-east diagonal [between *chou* and *yin*] and is on the yin of sun and moon, the general of a yin state will be harmed. If it is on the yang, it is advantageous. If it comes out in *yin*, yin states will be harmed.

124.大白出于酉入卯，而兵□□□□在從之南， [陽國勝；在從] 之北，陰國傷。

When Big White comes out in *you* and goes in in *mao*, and troops … on the south of the accompanying (?) … , the yang state will win; on the north of the accompanying, the yin state will win.

125.日冬至， [大白] 在日北，至日夜分，陽國勝；春分在日南，陽國勝；夏分 < 至 > 在日南，至日夜分，陰國勝；秋分在日 [北] ，陰國勝。

On the day of winter solstice, if Big White is to the north of the sun, up to the division of day and night [sc. '[spring] equinox'], the yang state will win.

If at spring equinox it is to the south of the sun, the yang state will win.

If at summer solstice it is to the south of the sun, up to the equinox, the yin state will win.

If at autumn equinox it is to the north of the sun, the yin state will win.

126.越、齊 [韓、趙、魏者] ，荊、秦之腸也；齊者，燕、趙、巍 (魏) 之陽也；巍 (魏) 者，韓、趙之陽也；韓者，秦、趙之陽也；秦者，翟之陽也，以南北進退占之。

[The states of] Yue, Qi, Hann. Zhao and Wei, are yang for Jing and Qin; Qi is yang for Yan, Zhao and Wei; Wei is yang for Hann and Zhao; Hann is yang for Qin and Zhao; Qin is yang for the Di [tribes]. Prognosticate it by north and south, advance and retreat.

127.大白出恒以 [辰戌，入以丑未] ，候之不失。

Big White normally comes out in *chen* and *xu*, and goes in in *chou* and *wei*. Observe it and it does not miss.

128.其時秋，其日庚辛，月立 [位] 失(昳)，西方國有之。司天獻, 不教之國駕 (加) 之央 (殃)，其咎亡師。

Its season is autumn. Its days are *geng* and *xin*. The place of the moon is inclined to the west. The states of the west have it. It is in charge of celestial righteousness.[124] It brings further disaster to uncivilised states. The punishment is loss of the army.

---

[124] I follow the suggestion for the significance of 獻 in LLX 87. Kawahara Hideki 川原秀城 and Miyajima Kazuhiko 宮島一彦 1985 suggest 獻 may be an error for 獄 'prison'.

1. 相與營室晨出東方 The Xiang [Star] comes out with House in the east at dawn	秦始皇帝 元 246 BCE	三 234 BCE	五 222 BCE	七 210 BCE	九 198 BCE	[二] 186 BCE
2. 與東辟 (壁) 晨出東方 Comes out with Eastern Wall in the east at dawn	二 245 BCE	四 233 BCE	六 221 BCE	[八] 209 BCE	[十] 197 BCE	[三] 185 BCE
3. 與婁晨出東方 Comes out with Harvester in the east at dawn	三 244 BCE	五 232 BCE	七 220 BCE	[九] 208 BCE	[一] 196 BCE	[四] 184 BCE
4. 與畢晨出東方 Comes out with Net in the east at dawn	四 243 BCE	六 231 BCE	八 219 BCE	[卅] 207 BCE	[二] 195 BCE	[五] 183 BCE
5. 與東井晨出東方 Comes out with Eastern Well in the east at dawn	五 242 BCE	七 230 BCE	九 218 BCE	漢元 206 BCE	孝惠 [元] 194 BCE	[六] 182 BCE
6. 與柳晨出東方 Comes out with Willow in the east at dawn	六 241 BCE	八 229 BCE	卅 217 BCE	二 205 BCE	二 193 BCE	[七] 181 BCE
7. 與張晨出東方 Comes out with Spread in the east at dawn	七 240 BCE	九 228 BCE	一 216 BCE	[三] 204 BCE	[三] 192 BCE	[八] 180 BCE
8. 與軫晨出東方 Comes out with Axletree in the east at dawn	八 239 BCE	廿 227 BCE	二 215 BCE	[四] 203 BCE	四 191 BCE	[元] 179 BCE
9. 與亢晨出東方 Comes out with Gullet in the east at dawn	九 238 BCE	一 226 BCE	三 214 BCE	五 202 BCE	五 190 BCE	二 178 BCE
10. 與心晨出東方 Comes out with Heart in the east at dawn.	十 237 BCE	二 225 BCE	四 213 BCE	六 201 BCE	六 189 BCE	三 177 BCE
11. 與斗晨出東方 Comes out with Dipper in the east at dawn.	一 236 BCE	三 224 BCE	五 212 BCE	七 200 BCE	七 188 BCE	
12. 與婺女晨出東方 Comes out with Woman in the east at dawn.	二 235 BCE	四 223 BCE	六 211 BCE	八 199 BCE	代皇 187 BCE	

Table 10: Jupiter Apparent Morning Risings[125]

129.秦始皇帝元年正月，歲星日行廿分，十二日而行一度，終 [歲行卅] 度百五分，見三 [百六十五日而夕入西方,] 伏 卅日，三百九十五日而復出東方。 [十二] 歲一周天，廿四歲一與大 [白] 合營室。

In the first month of the first year of the First Sovereign Lord of Qin, the Year Star moved 20 parts in a day, so that it moved 1 *du* in 12 days, and after the conclusion of a year had moved 30 *du* and 105 parts. After being visible for 365 days it went in at dusk

[125] The original years in this table, which are specified as regnal years, have been transformed into proleptic Julian years (the Julian calendar projected backwards), which are commonly used for purposes of astronomical reference. Note that a Chinese regnal year at the period in question will begin towards the end of the Julian year preceding the one chosen for tabulation.

in the west, remained hidden for 30 days, [so that] after 395 days it came out once more in the east. It circuits heaven once in 12 years, and in 24 years it meets once with Big White in [the lodge] House.[126]

1. [填] 與營室晨出東方 The Garrison [Star] comes out with House in the east at dawn.	元秦始皇 246 BCE	一 216 BCE	二 186 BCE
2. 與營室晨出東方 Comes out with House in the east at dawn.	二 245 BCE	二 215 BCE	三 185 BCE
3. 與東辟 (壁) 晨出東方 Comes out with Eastern Wall in the east at dawn.	三 244 BCE	三 214 BCE	四 184 BCE
4. 與畦 (奎) 晨 [出] 東方 Comes out with Straddler in the east at dawn.	四 243 BCE	四 213 BCE	五 183 BCE
5. 與婁晨出東方 Comes out with Harvester in the east at dawn.	五 242 BCE	五 212 BCE	六 182 BCE
6. 與胃晨出東方 Comes out with Stomach in the east at dawn.	六 241 BCE	六 211 BCE	七 181 BCE
7. 與茅 (昴) 晨出東方 Comes out with Mane in the east at dawn.	七 240 BCE	七 210 BCE	八 180 BCE
8. 與畢晨出東方 Comes out with Net in the east at dawn.	八 239 BCE	八張楚 209 BCE	元 179 BCE
9. 與嶵 (觜) 晨出東方 Comes out with Beak in the east at dawn.	九 238 BCE	九 208 BCE	二 178 BCE
10. 與伐晨出東方 Comes out with Triaster in the east at dawn.	十 237 BCE	卌 207 BCE	三 177 BCE
11. 與東井晨出東方 Comes out with Eastern Well in the east at dawn.	一 236 BCE	漢元 206 BCE	
12. [與東] 井晨出東方 Comes out with Eastern Well in the east at dawn.	二 235 BCE	二 205 BCE	
13. 與與 (輿) 鬼晨出東方 Comes out with Ghost in the east at dawn.	三 234 BCE	三 204 BCE	
14. 與柳晨出東方 Comes out with Willow in the east at dawn.	四 233 BCE	四 203 BCE	
15. 與七星晨出東方 Comes out with Stars in the east at dawn.	五 232 BCE	五 202 BCE	
16. 與張晨出東方 Comes out with Spread in the east at dawn.	六 231 BCE	六 201 BCE	
17. 與翼晨出東方 Comes out with Wings in the east at dawn.	七 230 BCE	七 200 BCE	
18. 與軫晨出東方 Comes out with Axletree in the east at dawn.	八 229 BCE	八 199 BCE	
19. 與角晨出東方 Comes out with Horn in the east at dawn.	九 228 BCE	九 198 BCE	
20. 與亢晨出東方 Comes out with Gullet in the east at dawn.	廿 227 BCE	十 197 BCE	
21. 與氐晨出東方 Comes out with Base in the east at dawn.	一 226 BCE	一] 196 BCE	

[126] This is because Venus repeats its dawn rising pattern at eight-year intervals, and 24 years is the smallest common multiple of eight years and the twelve-year period of Jupiter.

22. 與房晨出東方 Comes out with Chamber in the east at dawn.	二 225 BCE	二 195 BCE	
23. [與] 心晨出東方 Comes out with Heart in the east at dawn.	三 224 BCE	孝惠元 194 BCE	
24. [與] 尾晨出東方 Comes out with Tail in the east at dawn.	四 223 BCE	二 193 BCE	
25. 與箕晨出東方 Comes out with Winnower in the east at dawn.	五 222 BCE	三 192 BCE	
26. 與斗晨出東方 Comes out with Dipper in the east at dawn.	六 221 BCE	四 191 BCE	
27. 與牽牛晨出東方 Comes out with Ox in the east at dawn.	七 220 BCE	五 190 BCE	
28. 與婺女晨出東方 Comes out with Woman in the east at dawn.	八 219 BCE	六 189 BCE	
29. 與虛晨出東方 Comes out with Barrens in the east at dawn.	九 218 BCE	七 188 BCE	
30. 與危晨出東方 Comes out with Rooftop in the east at dawn.	卅 217 BCE	高皇后元 187 BCE	

Table 11: Saturn Apparent Morning Risings

130.秦始皇帝元年正月，填星在營室，日行八分，卅日而行一度，終歲行[十二度卅二分。見三百四十五] 日，伏卅二日，凡見三百七十七日而復出東方。卅歲一周于天，廿歲與歲星合為大陰之紀.

In the first month of the first year of the First Sovereign Lord of Qin, the Garrison Star was in House. In a day it moved 8 parts, so that in 30 days it moved one *du*, and after the conclusion of a year it had moved 12 *du* and 42 parts. It was visible for 345 days, and was hidden for 32 days. In all it was 377 days before it came out once more in the east. It circuits heaven once in 30 years, and in 20 years it meets once with the Year Star to make the period of the Great Yin.[127]

[127] In one year, Jupiter moves 30 *du* and 105 parts, and Saturn moves 12 *du* and 42 parts. Hence in 20 years the distances moved are: Jupiter: 600 du + 2100 parts = 608 du + 180 parts; Saturn: 240 du + 840 parts = 243 du + 120 parts. So the extra distance moved by Jupiter is 365 du and 60 parts – a complete circuit, and the planets meet once more.

1.正月與營室晨出東方二百廿四日，以八月與角晨入東方。 In the first month it comes out at dawn in the east with House for 224 days, then in the 8th month it goes in at dawn in the east with Horn.	[秦元] 246 BCE	[九] 238 BCE	[七] 230 BCE	五 222 BCE	三 214 BCE	漢元 206 BCE	九 198 BCE	五 190 BCE	六 182 BCE
2. 浸行百廿日，以十二月與虛夕出西方，取廿一于下。 It moves immersed for 120 days, then in the 12th month it comes out at dusk in the west with Barrens, taking 21 [days] back from the following [year]. [128]									
3. 與虛夕出西方二百廿四日，以八月與翼夕入西方。It comes out at dusk in the west with Barrens for 224 days, then in the 8th month it goes in at dusk in the west with Wings.	[二] 245 BCE	[十] 237 BCE	[八] 229 BCE	六 221 BCE	四 213 BCE	二 205 BCE	十 197 BCE	六 189 BCE	七 181 BCE
4. 伏十六日九十六分，與軫晨出東方。 It is hidden for 16 days and 96 parts, then comes out at dawn in the east with Axletree.									
5. 以八月與軫晨出東方二百廿四日以三月與茅晨入東方，餘七十八。 In the 8th month it comes out at dawn in the east with Axletree for 224 days, then in the 3rd month it goes in at dawn in the east with Mane, with an over-run of 78 [days into the next year]. [129]									
6. 浸行百廿日，以九<七>月與 [翼夕] 出西方 It moves immersed for 120 days, then in the 7th month it comes out at dusk in the west with Wings.	三 244 BCE	[一] 236 BCE	九 228 BCE	七 220 BCE	五 212 BCE	三 204 BCE	一 196 BCE	七 188 BCE	八 180 BCE
7. 以八<七>月與翼夕出西方，二百廿四日，以二月與婁夕入西方，餘五十七。 In the 7th month it comes out at dusk in the west with Wings for 224 days, then in the 2nd month it goes in at dusk in the west with Harvester, with an over-run of 57 [days into the next year]. [130]									
8. 伏十六日九十 [六] 分，以三月與茅晨出東方。 It is hidden for 16 days and 96 parts, then in the 3rd month it comes out at dawn in the east with Mane.	四 243 BCE	[二] 235 BCE	廿 227 BCE	八 219 BCE	六 211 BCE	四 203 BCE	二 195 BCE	[高] 皇后 187 BCE	元 179 BCE
9. 以三月與茅晨出東方,二百廿四日，以十一月與箕晨 [入東] 方。 In the 3rd month it comes out at dawn in the east with Mane for 224 days, then in the 11th month it goes in at dawn in the east with Winnower.									
10. 浸行百廿日，以三月與婁夕出西方，餘五十二。 It moves immersed for 120 days, then in the 3rd month it comes out at dusk in the west with Harvester, with an over-run of 52 [days into the next year]. [131]									

[128] There are notes similar to the final phrase attached to an event near the end of each year of the first seven years of the eight-year cycle, which contains exactly five synodic cycles of Venus. In each case we are told, to the nearest whole day, how far the event chosen falls after or before the end of the year, each year apparently being reckoned as 365 days. Similarly the days elapsed in the Venus cycle are calculated without taking account of fractional parts of days. The object seems to be to track how far the Venus cycle and the cycle of the year are out of phase before they fall back into exact phase again at the end of the eight years. In this case the total number of days to the event since the start of the tabulation is 344 (ignoring 16 parts), which is indeed 21 days less than one year.

[129] The total number of days elapsed is now 808 days 96 parts. Ignoring parts, this is 78 days more than 730 = 2 x 365.

[130] The total number of days elapsed is now 1152 days 96 parts. Ignoring parts, this is 57 days more than 1095 = 3 x 365.

[131] The total number of days elapsed is now 1512 days 96 parts. Ignoring parts, this is 52 days more than 1460 = 4 x 365.

11. [以三] 月與婁夕出西方,二百廿四日，以十月與心夕入西方。 In the 3rd month it comes out at dusk in the west with Harvester, for 224 days, then in the 10th month it goes in at dusk in the west with Heart.	五 242 BCE	[三] 234 BCE	[一] 226 BCE	九 218 BCE	七 210 BCE	五 202 BCE	惠元 194 BCE	二 186 BCE	二 178 BCE
12. [伏] 十六日九十六分，以十一月與箕晨出東方，取七十三下。 It is hidden for 16 days and 96 parts, then in the 11th month it comes out at dawn in the east with Winnower, taking 73 [days] back from the following [year].[132]									
13. 以十一月與箕晨出東方,二百廿四日，以六月與柳晨入東方。 In the 11th month it comes out at dawn in the east with Winnower, for 224 days, then in the 6th month it goes in at dawn in the east with Willow.	六 241 BCE	[四] 233 BCE	[二] 225 BCE	[卅] 217 BCE	[八] 209 BCE	六 201 BCE	二 193 BCE	三 185 BCE	三 177 BCE
14. 浸行百廿日，以九月與心夕出西方，取九十四下。 It moves immersed for 120 days, then in the 9th month it comes out at dusk in the west with Heart, taking 94 [days] back from the following [year].[133]									
15. 以九月與心夕出西方,二百廿四日，以五月與東井夕入西方。 In the 9th month it comes out at dusk in the west with Heart, for 224 days, then in the 5th month it goes in at dusk in the west with Eastern Well	七 240 BCE	[五] 232 BCE	[三] 224 BCE	[一] 216 BCE	[九] 208 BCE	[七] 200 BCE	三 192 BCE	四 184 BCE	
16. 伏十六日九十六分，以九<六>月與輿鬼晨出東方。 It is hidden for 16 days and 96 parts, then in the 6th month it comes out at dawn in the east with Ghost.									
17. 以六月與輿鬼晨出東方,二百廿四日，以正月與西辟(壁)晨入東方，餘五。 In the 6th month it comes out at dawn in the east with Ghost, for 224 days, then in the first month it goes in in the east at dawn with Western Wall, with an over-run of 5 [days into the next year].[134]									
18. 浸行百廿日，以五月與東井夕出西方。 It moves immersed for 120 days, then in the 5th month it comes out in the west at dusk with Eastern Well.	八 239 BCE	[六] 231 BCE	[四] 223 BCE	[二] 215 BCE	[卌] 207 BCE	[八] 199 BCE	四 191 BCE	五 183 BCE	
19. 以五月與東井夕出西方,二百廿四日，以十二月與虛夕入西方。 In the 5th month it comes out in the west at dusk with Eastern Well, for 224 days, then in the 11th month it goes in in the west at dusk with Barrens.									
20. [伏十] 六日九十六分，以正月與東辟(壁)晨出東方。 It is hidden for 16 days and 96 parts, then in the first month it comes out at dawn in the east with Eastern Wall.[135]									

Table 12:Venus First and Last Morning Risings, and First and Last Evening Settings

[132] The total number of days elapsed is now 1752 days 288 parts. Ignoring parts, this is 73 days less than 1825 = 5 x 365.
[133] The total number of days elapsed is now 2096 days 288 parts. Ignoring parts, this is 94 days less than 2190 = 6 x 365.
[134] The total number of days elapsed is now 2560 days 384 parts. Ignoring parts, this is 5 days more than 2555 = 7 x 365.
[135] No note is appended to this event. But the total number of days elapsed is now 2920 and 480 parts, or 2922 days since 480 parts = 2 days. This is precisely 8 x 365 ¼ days. Since 2920 = 8 x 365, the rounded calculation also suggests that the cycles are in phase again.

131.秦始皇帝元年正月，大白出東方， [日] 行百廿分，百日
有益 [疾] [日行一度] , [六] 十日 行 有 (又) [益] 疾，日行一度百八十七半以從日，六十四日而復逕日， 晨入東方，凡二百廿四日。浸行百廿日，夕出西方。

In the first year of the First Sovereign Lord of Qin, the first month, Big White came out in the east, and moved 120 parts in a day. After 100 days, it increased speed, and moved 1 *du* in a day, and after 60 days its motion further increased its speed, and moved 1 *du* and 187 ½ parts in a day, so that in 64 days it reached the sun, and went in in the east at dawn. That is 224 days in all. It moved immersed for 120 days, and came out at dusk in the west.[136]

132.太白出西 [方] [日行一度百八十七分] ， [百日]
行益徐，日行一度以侍(待)之六十日；行有(又)益徐，日行
卅分，六十四日而入西方，凡二百廿四日 。

When Great White comes out in the west, it moves 1 du and 187 parts in a day. After 100 days its motion becomes slower, and in a day [it moves] 1 *du* so as to wait for it for 60 days. Then its motion becomes slower still, so that in a day it moves 40 parts, and in 64 days it goes in in the west. That is 224 days in all.[137]

133.伏十六日九十六分。 [太白一復] 為日五 [百八十四日九十六分日。凡出入東西各五，復] 與營室晨出東方，為八歲。

It is hidden for 16 days and 96 parts. One return of Great White in days is 584 days 96 parts of a day; its comings out and goings in east and west are 5 each, and it returns to coming out at dawn in the east with House, making 8 years.

---

[136] The total eastwards displacement of the planet from appearance to disappearance is thus
100*120 + 60*240 + 64 * (240 +187 ½) parts = 224 *du*, since that 1 *du* = 240 parts.
Since the total days elapsed are (100+60+64) days= 224 days, the sun has also moved 224 *du* eastwards in this time, and the distance of Venus from the sun is thus the same at disappearance as it was when it appeared, as expected.
Another implication of these figures is that during the first 100 days the elongation of the planet from the sun increases by 100x120 parts = 50 *du*, since the sun is moving eastwards at 240 *du* per day. Since Venus must already be of the order of 10 *du* from the sun when it becomes visible, and the maximum total elongation of Venus is about 45 to 47 *du*, this is an over-estimate.

[137] The movements stated here present major problems. To a close approximation, the motion of Venus relative to the sun is symmetrical on either side of conjunction, so this section should have read something like this in translation:
'When Great White came out in the west, it moved 1 *du* and 187 ½ parts in a day. After 64 days, it decreased speed, and moved 1 *du* in a day, and after 60 days its motion further decreased its speed, and moved 120 parts in a day, so that in 100 days it reached the sun and went in in the west at dusk. That is 224 days in all.'
The text restoration by LLX differs somewhat from that of his predecessors, but the text as we have it is too far from what we might have expected for minor emendations to solve the problem. It may be that the original writer was himself confused or that a copyist has garbled the text to a major extent.

References

Anon. ‘Wu xing zhan fubiao shiwen «五星占»附表释文 (Transcription of tables appended to the Wu xing zhan)’, Wenwu (1974), 37-39.

———. ‘Mawangdui hanmu boshu «wu xing zhan» shiwen 马王堆汉墓帛书«五星占»释文 (Transcription of the silk document ‘Wu xing zhan’ from a Han tomb at Mawangdui)’, in Zhongguo tianwenxue shi wenji 中国天文学史文集, Beijing, 1978a.

———, Zhongguo tianwenxue shi wenji 中国天文学史文集 (Collected articles on the history of Chinese astronomy), Beijing, 1978b.

———, Zhongguo gudai tianwen wenwu lunji 中国古代天文文无论集 (Collected articles on cultural relics relating to ancient Chinese astronomy), Beijing, 1989.

David Brown, Mesopotamian planetary astronomy-astrology, Groningen, 2000.

Chen Jiujin 陳久金. ‘Cong Mawangdui boshu ‘Wu xing zhan’ de chutu shitan woguode suixing jinian wenti 从马王堆帛书’«五星占»的出土试探我国古代的岁星纪年问题 (An examination of the problem of our country’s Jupiter year sequencing system on the basis of the excavation of the Mawangdui silk manuscript ‘Prognostics of the Five Planets’)’, in *Zhongguo tianwenxue shi wenji 中国天文学史文集* (ed. Anon), Beijing, 1978.

———, Boshu ji gudian tianwen shiliao zhuxi yu yanjiu 帛書及古典天文史料注析與研究 (Analyses and researches on historical astronomical materials from silk documents and classical literature), Taibei, 2002.

Anthony E. Clark, *Ban Gu’s history of early China*, Amherst, NY, 2008.

Christopher Cullen. ‘Some further points on the shih’, *Early China* (1981), 6, 31-46.

———. ‘The Suàn shù shū (筭數書) ‘Writings on reckoning’: Rewriting the history of early Chinese mathematics in the light of an excavated manuscript’, *Historia Mathematica* (2007), 34, 10-44.

———. ‘Understanding the Planets in Ancient China: Prediction and Divination in the Wu xing zhan’, *Early science and medicine* (2011a), 16, 218-251.

———. ‘Translating 宿 *sukh/xiu and 舍 *lhah/she: ‘lunar lodges’, or just plain ‘lodges’?’, *East Asian Science, Technology and Medicine* (2011b), 80-92.

James Evans, The history and practice of ancient astronomy, Oxford ; New York, 1998.

Han shu 漢書 (History of Western Han dynasty), Ban Gu 班固 (32-92 CE), Zhonghua, Beijing, probably completed in present form c.110 CE, punctuated edition of 1962.

Donald John Harper, Early Chinese medical literature : the Mawangdui medical manuscripts, London, 1998.

———. ‘Warring States Natural Philosophy and Occult Thought’, in *The Cambridge history of ancient China : from the origins of civilization to 221 B.C* (eds. Michael Loewe and Edward L. Shaughnessy), Cambridge, UK ; New York, 1999.

T. L. Heath, *A history of Greek mathematics. 2v.*, New York, 1921 repr. 1981.

Kawahara Hideki 川原秀城, and Miyajima Kazuhiko 宮島一彦. 'Gosei sen 五星占 (The Wu xing zhan)', in Shin hatsugen Chūgoku kagakushi shiryō no kenkyū 新発現中国科学史資料の研究 (Researches on newly discovered materials for the history of Chinese science) (ed. Yamada Keiji 山田慶兒), Kyoto, 1985.

Hou Han shu 後漢書 (History of Eastern Han dynasty), Fan Ye 范曄 (398-445 CE), Zhonghua, Beijing, Main text completed c. 450 CE, monographs by Sima Biao 司馬彪 (c. 240 - c. 306 CE) added later. Punctuated edition of 1963.

John Lagerwey, and Marc Kalinowski, *Early Chinese religion*, Leiden ; Boston, 2009.

Liu Lexian 刘乐贤, Mawangdui tianwen shu kaoshi 马王堆天文书考释 (Investigation and transcription of the Mawangdui astronomical documents) Guangzhou, 2004.

Liu Yunyou 刘云友 (pseudonym for Xi Zezong). 'Zhonguo tianwenshi shang de yige zhongyao faxian - Mawangdui hanmu boshu zhong de 'Wu xing zhan' 中国天文史上的一个重要发现 - 马王堆汉墓帛书中的«五星占» (An important discovery in the history of Chinese astronomy - the 'Wu xing zhan' in the silk documents from the Mawangdui Han tomb)', *Wenwu* (1974), 28-36.

M.A.N. Loewe. 'The Han view of comets', in *Divination, mythology and monarchy in Han China*, Cambridge ; New York, NY, 1994.

M.A.N. (ed.) Loewe, Early Chinese texts: a bibliographical guide, Cambridge, 1993.

John S. Major, with an appendix by Christopher Cullen, Heaven and earth in early Han thought : chapters three, four and five of the Huainanzi Albany, 1993.

M. Robinson. 'Ardua et Astra: On the Calculation of the Dates of the Rising and Setting of Stars', *Classical Philology* (2009), 104, 354-375.

Harold David Roth, *The textual history of the Huai-nan tzu*, Ann Arbor, Mich., 1992.

Shi ji 史記 'Records of the Historian' 史記, Sima Qian 司馬遷 (c. 145-86 BCE), Zhonghua, Beijing, completed c. 90 BCE, punctuated edition 1959.

Nathan Sivin, Granting the Seasons : the Chinese astronomical reform of 1280, with a study of its many dimensions and a translation of its records, New York, 2009.

Song shu 宋書 *(History of Liu Song dynasty, 420-479 CE)*, Shen Yue 沈約 (441–513 CE), Zhonghua, Beijing, 488 CE (monographs added after 500) punctuated edition of 1974.

Xiaochun Sun, and Jacob Kistemaker, The Chinese sky during the Han : constellating stars and society, Leiden ; New York, 1997.

Takeda Tokimasa 武田時昌. 'Taihaku kōdo kō - Chūgoku kodai no wakusei undō ron 太白行度考--中国古代の惑星運動論(一) (A mathematical analysis of the theory of Venus' motion in ancient China:1)', *Toho Gakuho 東方學報* (2010), 85, 1-44.

Michel Teboul, Les premières théories planétaires chinoises, Paris, 1983.

G. J. Toomer, *Ptolemy's Almagest*, Princeton, N.J., 1998.

Wang Jianmin 王健民, and Liu Jinyi 刘金沂. 'Xi Han Ruyin hou mu chutu yuanpan shang ershiba xiu gu judu de yanjiu 西汉汝阴侯墓出土圆盘二十八宿古距度的研究 (Researches on the old du widths of the 28 lodges on the basis of the disc excavated from the Western Han tomb of the Marquis of Ruyin)', in *Zhongguo gudai tianwen wenwu lunji*, Beijing, 1989.

Xi Zezong 席泽宗. 'Zhonguo tianwenshi shang de yige zhongyao faxian - Mawangdui hanmu boshu zhong de 'Wu xing zhan' 中国天文史上的一个重要发现 - 马王堆汉墓帛书中的«五星占» (An important discovery in the history of Chinese

astronomy - the 'Wu xing zhan' in the silk documents from the Mawangdui Han tomb)', in *Zhongguo tianwenxue shi wenji 中国天文学史文集* (ed. Anon), Beijing, 1978.

———. 'Mawangdui Han mu boshu zhong de «Wu xing zhan» 马王堆汉墓帛书中的«五星占» (The 'Wu xing zhan' in the silk documents from the Mawangdui Han tomb) ', in *Zhongguo gudai tianwen wenwu lunji 中国古代天文文无论集* (ed. Anon), Beijing, 1989.

Yabuuti Kiyosi 薮内清. 'Guanyu mawangdui sanhao hanmu chutu de wuxingzhan 关于马王堆三号汉墓出土的五星占 (On the 'Wu xing zhan' excavated from Han tomb 3 at Mawangdui) ', *Kexueshi yicong 科学史译丛* (1984), 54-59.

Zheng Huisheng 鄭慧生, Gudai tianwen lifa yanjiu 古代天文曆法研究 (Researches on ancient systems of calendrical astronomy) Kaifeng, 1995.

(Received: April 6, 2011)

(Revised: November 29, 2011)