

Archaeoastronomy

Number 14

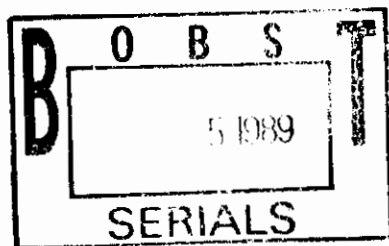
JOURNAL FOR THE HISTORY OF ASTRONOMY

Supplement to Volume 20

1989

CONTENTS

Astronomical Records on the Shang Dynasty Oracle Bones XU ZHENTAO, KEVIN K. C. YAU and F. RICHARD STEPHENSON	S61
Pecked Cross Petroglyphs at Xihuingo A. F. AVENI.....	S73
The Orientations of the Taulas of Menorca (1): The Southern Taulas MICHAEL HOSKIN	S117
The North Mull Project (1): Excavations at Glengorm 1987-88 CLIVE L. N. RUGGLES and ROGER D. MARTLEW	S137
Book Reviews.....	S150
<i>Surveyors of the Ancient Mississippi Valley: Modules and Alignments in Prehistoric Mound Sites</i> , by P. Clay Sherrod and Martha Ann Rolingson (A. F. Aveni); <i>Stonehenge and its Future</i> , by Richard Wort (Aubrey Burl)	
Notes on Contributors.....	S153
Index to <i>Archaeoastronomy</i> , nos. 13 and 14	S154



ASTRONOMICAL RECORDS ON THE SHANG DYNASTY ORACLE BONES

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The 'oracle bones', which have contributed so much to the present-day knowledge of ancient Chinese history, were first discovered at Hsiao-t'un, near Anyang, in Honan Province, China at the end of the last century. These relics of the latter half of the Shang (also known as the Yin) Dynasty (c. 1600–1050 B.C.) consist of animal bones and turtle shells inscribed with a primitive form of Chinese characters. About 160,000 pieces of oracle bones have so far been unearthed since the initial discovery. It seems likely that these bones originally formed part of the royal archives kept at the later Shang capital.¹ The city on the site of Hsiao-t'un was probably the residence of the Shang kings between about 1350 and 1050 B.C. The name 'oracle bones' stems from the nature of the bone and shell inscriptions. In these texts, the queries posed to the ancestral spirits and replies judged to have been received as the result of divination, together with their verified outcomes, were recorded.

The practice of using bone materials for divination probably originated in greater antiquity and may be traced back to the Neolithic period.² This technique was still in vogue during the early part of the Western Chou Dynasty (c. 1050–771 B.C.). The remains from the latter half of the Shang period suggest that by this time the technique of bone divination was already fairly well advanced. This procedure involved first the preparation of the surfaces of bones or turtle plastrons by polishing. Then holes were drilled onto them from the reverse side. By applying a glowing brand into the hole, a series of cracks would appear on the front surface. The result of the divination would then be interpreted from the form of cracks.

The context of each individual oracle inscription generally consisted of four parts: preface, charge, prognostication and verification. The most common 'preface' is of the following form: "The divination on ... [date] was performed by ... [the name of diviner]." The date — when fully preserved — is given jointly in terms of the lunar calendar and a 60-day (or sexagenary) cycle (including a 10-day 'week'). The latter consists of two parts: 10 stems (*t'ien-kan*) and 12 branches (*ti-chih*) respectively. Use of the *kan-chih* cycle is frequently found in bronze inscriptions from both the Shang and Chou dynasties as well as in historical works originating from the Chou and all later dynasties. Analysis of solar eclipses recorded in the *Ch'un-ch'iu* (which covers the period 722 to 481 B.C.) shows that use of the 60-day cycle has continued uninterrupted ever since the Chou Dynasty.³ It seems reasonable to suppose that the cycle has run continuously since Shang times. Whenever the lunar month (in terms of the Shang calendar) is mentioned in an oracle text, it is always placed at the end of

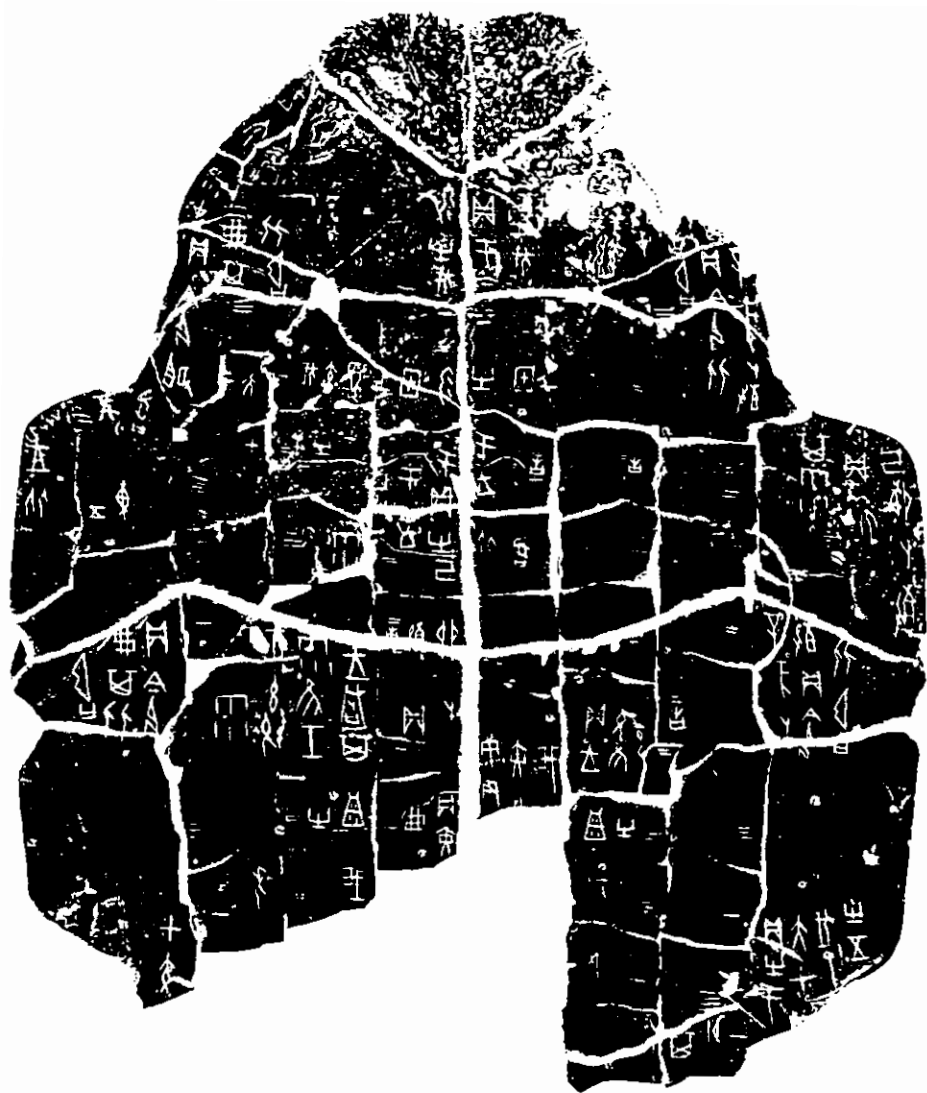


FIG. 1(a). A rubbing of an almost complete inscribed turtle shell (*Ping-pien*, 235).

an entry. Unfortunately, since the year is seldom, if ever, recorded, few texts are accurately datable. The 'charge' consists of queries concerning various aspects of Shang life posed during the divination. The 'prognostication' contains the results of the divination which was obtained from reading the crack forms on the bone or shell. Finally, the 'verification' is a record of what actually occurred following the divination.

Figure 1(a) shows an example of a turtle shell in which a complete divination

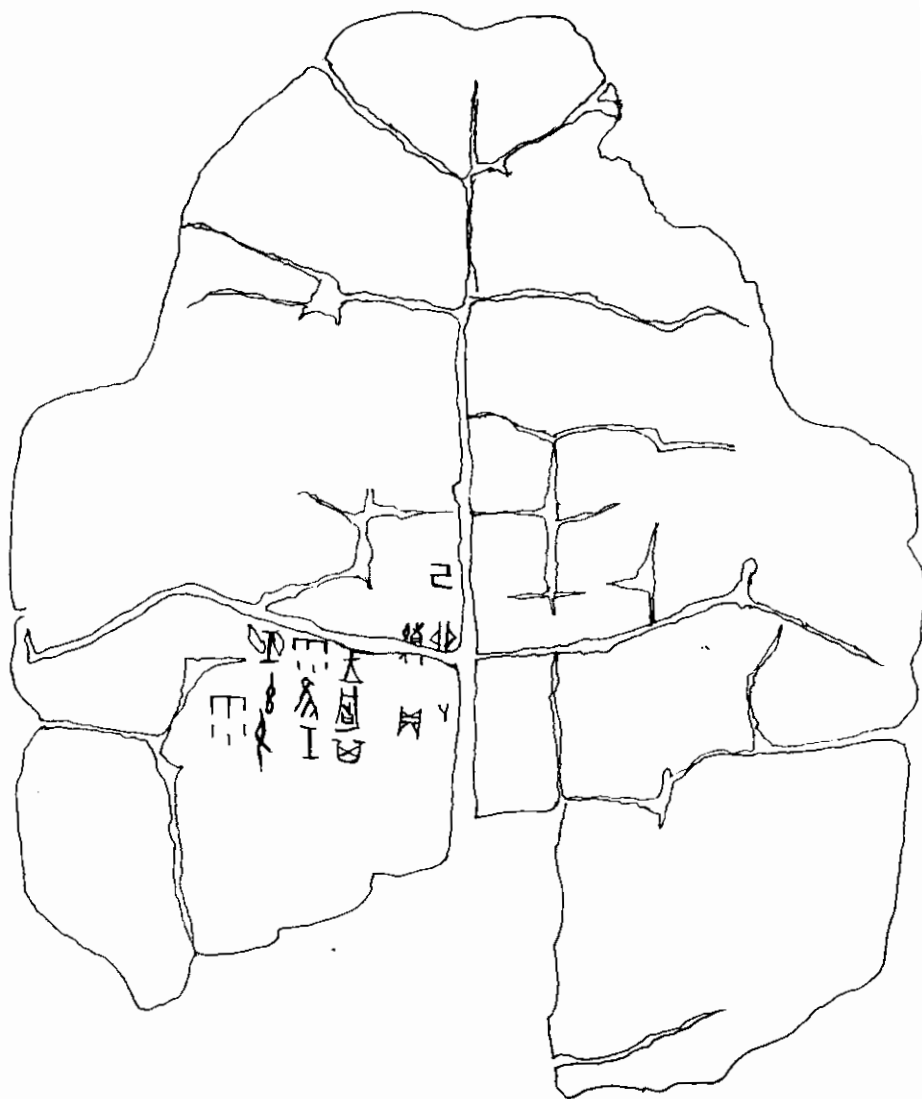


FIG. 1(b). Outline drawing of the turtle shell in Figure 1(a). A complete divination record is highlighted.

record is inscribed. A translation of the record (highlighted in Figure 1(b)) is as follows: "The divination on day *chi-mao* [16] was performed by Kuo. The King after examining the crack forms commented that it would rain on day *jen* [19]. On day *jen-wu* [19] indeed it did rain." Note that the number which we have given in brackets following the name of each day is its equivalent day number in the sexagenary cycle.

It is unfortunate that only a few such records, complete with all four parts of the divination process, are extant. Most surviving texts consist of small broken fragments inscribed with only a few characters. Poor preservation and difficulties in deciphering the primitive characters, many of which are still not understood, have hindered a fuller interpretation of numerous records. At this early period in Chinese history, there was no standardized script; the same character could appear in different forms (for example, *hsing* ('star') — see Appendix 1). Not until the Ch'in Dynasty (221–206 B.C.) was Chinese writing finally standardized.

The contents of the oracle inscriptions are immensely rich. Some texts are devoted to religious ritual and sacrifice; others relate to warfare or hunting; still others are concerned with journeys made by the kings and the welfare of the royal family, even down to minor ailments. In addition, natural occurrences, such as rain and snow, and unusual phenomena in the sky were recorded. Attempts to predict such events were often made, based purely on queries put to the oracle — as in the above example. Despite their rather specialized nature, the oracle bone records have enabled a direct insight to be obtained into social life during the Shang period, from first-hand materials. Previously, it had been necessary to rely on secondary writings of later date such as the *Shu-ching* (*Book of history*) from the subsequent Chou Dynasty and the *Shih-chi* (*Historical records*), compiled around 100 B.C.

Some of the most important of the oracle bone inscriptions relate to astronomical events. Records of both solar and lunar eclipses found on the oracle bones have already been published in Western literature.⁴ However, references to stars, planets, comets and so on, contained in the oracle texts are less well known to scholars in the West, even though many of these have already been published in Chinese. For instance, a total of more than 120 entries appeared in Wen and Yuan.⁵ However, this number may be misleading as a fair proportion of the entries concerned trivial events like 'sacrifice to sunrise or sunset'. The specific aim of the present paper is to give an introduction to, and a brief summary of, astronomical records found on the oracle bone texts. In selecting the examples under each category it has been necessary for us to confine attention to those which we judge to be reliable representatives of the group. It has to be emphasized also that we have omitted all entries relating to calendrical matters.

Explanation of Terms

Before we give translations of these records, we give a brief explanation of the various technical terms (the Wade-Giles system of romanization is followed).

(i) In Shang descriptions of eclipses of the Sun and Moon, the character *shih*^a is systematically used. In normal terminology, this character has the literal meaning 'to eat'. However, when it refers to the Sun or Moon, an eclipse is implied. The same term was consistently employed to describe eclipses in all later dynasties, and is still in use today. Evidently, the Shang people thought

that the circular indentations in the edge of the Sun or Moon were caused by some creature devouring the luminary, but it is not known what was held to be responsible.

(ii) The character *chih*^b — which can relate to either the Sun or the Moon — is so far an unknown term; its astronomical meaning is still being debated. Some researchers are of the opinion that the character could have meant an eclipse.⁶ Others believe that when referring to the Sun this meant a black spot, and hence it could mean a sunspot.⁷ However, in this case there would be no obvious counterpart for the Moon. From the literal meaning of the character ('to blaze') it seems more likely that *chih* was a description of an atmospheric reddening of the Sun and Moon, for example due to a dust storm.

(iii) For solar haloes, the terms *yun*^c and *chi*^d are employed as in later ages. These are two of the ten standard terms used for describing haloes in medieval times.⁸

(iv) Several references to stars and star groups are found on the oracle bones. Most of these can be identified in terms of asterisms known throughout subsequent Chinese history, from the Chou Dynasty onwards. Two of these are identifiable with Lunar Mansions, but it is not known whether the concept of Lunar Mansions had already been formulated at these early times. From the various texts it is clear that sacrifices were frequently offered to at least the brighter asterisms. (*Pei-tou*^e (the 'Northern Dipper' or Plough) is readily identified; the same term is still in use today. The name *Huo*^f ('Fire Star') probably refers to Antares; this descriptive expression is often used even in relatively recent texts. *Hsin*^g ('Heart Star') is identifiable with one of the Lunar Mansions of the same name; this includes the star Antares. *Niao-hsing*^h ('Bird Star') is possibly a reference to the southern region of the five Chinese celestial divisions known as the 'Red Bird'. Finally, according to the *Shuo-wen Chieh-tzu* (*Analytical dictionary of Chinese characters*) by Hsu Shen (A.D. 121), *Shang-hsing*ⁱ ('Shang Star') can be equated with *Shen* Lunar Mansion (in the constellation Orion).

(v) Among the five naked-eye planets only Jupiter has so far been identified. The term *Sui*^j is used for Jupiter as in later periods. However, in later texts that mention this planet the term *Sui* is usually coupled with the character *hsing* ('star').

(vi) The term *hsin-hsing*^k carries the literal meaning of 'new star'. It was used for temporary stars (e.g. novae) until the middle of the Western Han Dynasty (206 B.C.—A.D. 9), when it was replaced by the more commonly known term *k'o-hsing* ('guest star').⁹

(vii) The character *hui*^l used for a comet looks like a picture of a comet with two tails. It closely resembles the cometary drawings contained in the silk book of

Ma-wang-tui (unearthed from a Han tomb of 168 B.C.).¹⁰ The literal meaning of *hui* is 'a broom'.

Translations of Oracle Bone Records

Solar Eclipses

1. On day *kuei-yu* [10] it was inquired: "The Sun was eclipsed in the evening; is it good?" On day *kuei-yu* [10] it was inquired: "The Sun was eclipsed in the evening; is it bad?" (*Yi-ts'un*, 374; *Ho-chi*, 33694)
2. On day *kuei-yu* [10] it was inquired: "The Sun was eclipsed in the evening; should it be reported to Shang-chia [the earliest of the known Shang ancestors]?" (*Ching-chin*, 3965; *Ho-chi*, 33695)
3. It was inquired: "The Sun was eclipsed ..." (*Kikko*, 1.10.5; *Ho-chi*, 11480)
4. From day *i-mao* [52] to the next day was foggy; three flames ate the Sun and there were big stars. (*Yi-pien*, 6386; *Ho-chi*, 11506). Note that this record has been linked to a total eclipse, in which the corona and stars and planets visible during totality were observed.¹¹

Lunar Eclipses

5. The divination on day *kuei-wei* [20] was performed by Cheng: "Next day, *chia-shen* [21], will change to sunny." That night [*hsi*], the Moon was eclipsed. The next day was foggy; it did not rain. (*Ping-pien*, 59; *Ho-chi*, 11483)
6. The divination on day *kuei-wei* [20] was performed by Cheng: "Will there be no disaster in the next ten days?" On the 3rd day, *i-yu* [22], at night, an eclipse of the Moon was reported. In the 8th month. (*Chia-pien*, 1289 + 1749; *Ho-chi*, 11485)
7. The divination on day *kuei-chou* [50] inquired: "Will there be no disaster in the next ten days?" On the 7th day, *chi-wei* [56], at night, there was *t'ou*. On the next day, *keng-shen* [57], the Moon was eclipsed. (*K'u-fang*, 1595 + *Chin-chang*, 594). [Note that the meaning of the character *t'ou* is not yet established. The character looks like a picture of a ceremonial vessel and it is likely that it represented a type of sacrificial ceremony.]
8. Day *jen-shen* [9], at night, the Moon was eclipsed. (*Fu-yin*, i, 2; *Ho-chi*, 11482)
9. On the 6th day, *chia-wu* [31], at night, the Moon was eclipsed. (*Ping-pien*, 57; *Ho-chi*, 11484)
10. On the 3rd day, *i-yu* [22], at night, an eclipse of the Moon was reported. (*Pu-tz'u*, 632; *Ho-chi*, 11486)

Eclipses of either Sun or Moon

11. The divination was on day *chia-yin* [51]: "There was another eclipse; should it be reported to ... ?" (*Chui-ho*, 465)
12. In the 11th month, there was an eclipse. (*Hsu-ts'un*, 2.149; *Ho-chi*, 11481)

Solar Phenomena

13. The divination was on day *jen-tzu* [49]. There was a *chih* of the Sun on day *chia-yin* [51]. (*Yi-ts'un*, 384)
14. On day *keng-ch'en* [17] it was inquired: "There has been another *chih* of the Sun and a sacrifice of nine oxen was made. Should this be reported to King Fu-ting at ? [an unrecognised character]?" On day *keng-ch'en* [17] it was inquired: "There has been a *chih* of the Sun; should this be reported to Ho?" On day *keng-ch'en* [17] it was inquired: "There has been another *chih* of the Sun. Will it be a good omen and bring no disaster?" (*Ts'ui-pien*, 55; *Ho-chi*, 33698)
15. The divination on day *kuei-szu* [30] inquired: "Will there be a disaster today?" On day *chia-wu* [31], there was a halo [*yun*]. (*Pai-ken*, 2)
16. The divination on day *kuei-szu* [30] was performed by Cheng: "If the Sun continued its halo [*chi*], will it bring a disaster this year?" In the 3rd month. (*Ch'ien-pien*, 5.17.3)

Lunar Phenomena

17. On day *jen-yin* [39] it was inquired: "There has been another *chih* of the Moon. A sacrifice is to be made to Earth; should a burnt offering of cattle be made?" On day *jen-yin* [39] it was inquired: "There has been another *chih* of the Moon." The King did not want the disaster to befall on one person. Yet again, there is a disaster. (*T'un-nan*, 726)

References to Stars

18. The divination on day *ping-shen* [33] was performed by Kou: "An offering of wine was made on day *i-szu* [42]. Will it rain tomorrow?" When a sacrifice was performed, the rain would stop. When a sacrifice was withheld, it would rain again. An offering was made to the 'Bird Star' [*Niao-hsing*]. (*Yi-pien*, 6664; *Ho-chi*, 11497)
19. An offering was made to the 'Bird (Star)' [*Niao-(hsing)*] by Tzu. (*Ching-chin*, 2494)
20. ... coloured clouds from the north, ... [?] Shang Star [*Shang-hsing*]. In the 3rd month. (*Ch'ien-pien*, 7.26.3; *Ho-chi*, 11501)
21. The divination on day *ping-yin* [3] was performed by Kou. A sacrifice was made to the 'Fire Star' [*Huo*]. (*Chia-pien*, 3083)
22. There was a divination. An offering was made to the 'Fire Star' [*Huo*]. In the 5th month. (*Hou-pien*, ii, 37.4)
23. It was inquired: "The King is to make a sacrifice to the 'Heart Star' [*Hsin*]. Will the omen be abnormal?" (*Yi-pien*, 3204)
24. The divination on day *ping-hsu* [23] was performed by Cheng. The king made a sacrifice to the 'Heart Star' [*Hsin*]. (*Yi-pien*, 5323)
25. The divination was on day *chi-hai* [36]. In the night of day *keng* [37], a sacrifice was made to the 'Northern Dipper' [(*Pei-tou*)]. "Will it rain

continuously?" The divination was on day *keng-tzu* [37]. In the night of day *hsin* [38], a sacrifice was made to the 'Northern Dipper'. The divination was on day *chi-yu* [46]. In the night of day *keng* [47], a sacrifice was made to the 'Northern Dipper'. The divination was on day *keng-hsu* [47]. In the night of day *hsin* [48], a sacrifice was made to the 'Northern Dipper'. (*Chui-ho*, 362)

26. Day *kuei-hai* [60]. In the night of day *chia* [1], a sacrifice was made to the 'Northern Dipper' [(*Pei-tou*). (*Yi-pien*, 134)]

References to Planets

27. The divination on day *hsin-mao* [28] was performed by Chi: "The King is to make a sacrifice to Jupiter [*Sui*]. Will it not rain." (*Hou-pien*, i, 27.13; *Ho-chi*, 25148)
28. The divination on day *chi-wei* [56] was performed by Hsing: "The King is to make a sacrifice to Jupiter [*Sui*]. Will the offering of two oxen be sufficient to stop the disaster?" (*Wen-lu*, 456)

Possible Sightings of New Stars

29. On the day *hsin-wei* [8], there was a sacrifice to the new star [*hsin-hsing*]. (*Yi-chu*, 1182)
30. On the 7th day, *chi-szu* [6], at night, a *t'ou* sacrifice was made. There was a large new star [*hsin ta-hsing*] together with the 'Fire Star' [*Huo*]. (*Hou-pien*, ii, 9.1; *Ho-chi*, 11503). [Note that some authors prefer to translate *hsin ta-hsing* as 'a sacrifice to the great fire star'.¹²]

Observations of Comets

31. A sacrifice was made to (the spirit of) Pi-keng [the queen of King Shih-jen]. A comet [*hui*] was seen. "By making a sacrifice to Pi-keng, will the comet disappear?" (*Yi-pien*, 751)
32. The divination on day *chi-mao* [16] inquired: "Should Hsiao-tzu make a sacrifice to the comet [*hui*] tonight?" It was also inquired: "Should Hsiao-tzu make a sacrifice to the comet again on the next day, *keng-ch'en* [17]?" In the 5th month. (*Wen-lu*, 794, 795)
33. The divination on day *wu-hsu* [35] inquired: "The shape of the strange comet [*hui*] has changed. Will it bring darkness upon us?" It was a fine day. (*Nan-pei*, 418)

Problems of Dating

It can be seen from the above records that no absolute date is ever given. It is common to find only the *day* given, in terms of the 60-day cycle. Occasionally, the month is mentioned. However, apart from a few references to the king who was on the throne, there is no mention of the year. This is true for all the Shang oracle records. To obtain an exact and unambiguous date for any of these

records is a problem that still remains to be overcome. The absence of fully reported dates has compelled researchers to employ various different approaches. Keightley¹³ has discussed in some detail the problems associated with the various dating schemes which have been proposed.

In general, the *relative* period of a particular record can be determined from three considerations: inscriptional, physical and archaeological. The *inscriptional* criteria assign a period to an oracle bone recorded by the information derived from the ancestral title of a king, name of the diviner, calligraphy, epigraphy, position of characters on the shells or bones, and usage of particular characters. In addition, the number of cracks, crack notations, topics and idioms need to be considered. *Physical* criteria can be used to determine the period of some of the bones or shells from the way the surface was initially prepared, the shapes of hollows, and the sizes and positions of burn marks. In cases where a particular oracle record was properly excavated, *archaeological* criteria may be considered. These involve examining pit provenance and excavation reports.

In cases of bones inscribed with astronomical records, one would have hoped that eclipses of both the Sun and Moon would help establish a reliable absolute date. However, the information given in the records is often too scanty for the purpose. The main problem is insufficient information regarding the year and month. Nevertheless, in almost every record, the day of the sexagenary cycle is explicitly mentioned. Although not proven, it seems highly likely that the sexagenary cycle ran continuously throughout the Shang and Chou dynasties and thence down to modern times, as noted above. It is possible that the cyclical day might enable some of the eclipse records to be dated, as has been attempted by a number of authors.¹⁴ As to the other astronomical phenomena, the probability of these being dated is very small. For example, there seems little likelihood of identifying records of Halley's Comet on the oracle texts.

Discussion and Conclusions

The present list is by no means complete. For example, we have omitted all those records which, although seeming to pertain to astronomy, are still being debated among researchers; these will have to wait for further confirmation. The list of examples given in the present paper covers a fair variety of aspects of naked-eye astronomy. It can be seen from these observational records that the Shang people already had attained a fair level of basic astronomical knowledge. As to the observation of planets and stars, they would probably have been able to recognise at least the bright constellations and planets. Apart from those specifically mentioned above, it is possible that bright objects like Venus, Mars and Sirius were observed, but so far the characters for these have not been deciphered in the oracle bone inscriptions.

One important conclusion is that the omen value of celestial phenomena was already fairly well established in the Shang Dynasty. This tradition of using unusual sky phenomena to foretell the destiny of kings and empires was further developed in later dynasties. Without the development of *astrology*, many of the

observations might never have been made or recorded — which would have been a great loss to present-day science. Finally, it is worth noting that the Shang oracle bones contain some of the earliest known references to such diverse entities as constellations, comets and the planet Jupiter in any civilization.

Acknowledgements

We would like to thank Dr C. Cullen for reading the draft and offering his valuable advice. One of us (XZ) gratefully acknowledges the financial support of the Rollo Foundation.

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APPENDIX I

Reference letter	Oracle script	Modern script	Transliteration	Literal meaning
a.	食	食	shih	to eat
b.	𠂔	戠	chih	to blaze
c.	囧	暈	yun	halo
d.	𠂔	騰	chi	vaporous halo
e.	斗	斗	tou	dipper
f.	火	火	hou	fire
g.	心	心	hsin	heart
h.	鳥星	鳥星	Niao-hsing	Bird star
i.	商星	商星	Shang-hsing	Shang star
j.	歲	歲	Sui	Jupiter
k.	新星	新星	hsin-hsing	new star
l.	彗	彗	hui	broom

APPENDIX 2: ORACLE BONE RECORDS CITED

- 癸酉貞，日夕有食，唯若？癸酉貞，日夕有食，匪若？
- 癸酉貞，日夕有食，上甲。
- 貞，日有食？
- 乙卯于明，霧，三留食日，大星。
- 癸未卜，爭貞，翌甲申易日？茲夕月有食，甲霧，不雨。
- 癸未卜，爭貞，旬亡禍？三日乙酉，夕月有食，聞，八月。
- 癸丑卜，貞，旬亡禍？七日己未，夕並，月有食。