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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 aurochs 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 were used by a high priest at the royal palace. The city of 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. The 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 tortoise plastrons by polishing. Then the 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 form of the following text: "The divination on ... [date] was performed by ... [name of diviner]." The date—when fully preserved—is given jointly in terms of the lunar calendar and a 60-day cycle (including a 10-day cycle). The latter consists of two parts: 10 stems and 12 branches, respectively. Use of the lunisolar cycle is frequently found in the inscriptions from both the Shang and Chou dynasties as well as in historical works originating from the Chou and later dynasties. Analysis of solar eclipses recorded in the Ch'iu-chhi (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. 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...
Figure 1(a). A rubbing of an almost complete inscribed turtle shell (Ping, 215).

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 lines 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
A translation of the record (highlighted in Figure 1(b)) is as follows: "The divination on day chu-lin-16 was performed by K'oo. The King after examining the crack forms concluded 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 sexagesimal 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, ring (‘star’)—see Appendix 1). Not until the Chi’m 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. 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. 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 *si* 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 — 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. Others believe that when referring to the Sun this meant a black spot, and hence it could mean a "wisp." However, in this case there would be no obvious counterpart for the Moon. From the literal meaning of the character ("to blaze") it seems most 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 yao and chih are employed as in later ages. These are two of the ten standard terms used for describing haloes in medieval times.

(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 areidentifiable 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. (Pleiades) (the 'Northern Dipper' or Rough) is readily identified; the same term is still in use today. The name pao ("Fire Star") probably refers to Antares; this descriptive expression is often used even in relatively recent texts. Hsin ("Heart Star") is identifiable with one of the Lunar Mansions of the same name; this includes the star Antares. Niao-hsing ("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 Shou-wen Ch'ih-chu (Analytical dictionary of Chinese characters) by Hsu Shen (a.d. 121), Shang-hsing ("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 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 kung ("star").

(vi) The term hsien-hsing 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'iu-hsing ("guest star").

(vii) The character hs'ü 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.): 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-kuo, 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)?" (Chang-chiu, 3965; Ho-chi, 33695)

3. It was inquired: "The Sun was eclipsed ... " (Koko, 1. 9. 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-kuo, 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.

Lunar Eclipses

5. The divination on day kuei-wei [20] was performed by Cheng: "Next day, chia-ne [21], will change to sunny." That night [89], the Moon was eclipsed. The next day was foggy; it did not rain. (Ping-kuo, 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-kuo, 1289 + 1749; Ho-chi, 11485)

7. The divination on day kuei-chua [50] inquired: "Will there be no disaster in the next ten days?" On the 7th day, kuei-wei [56], at night, there was i-yu. On the next day, kuei-wei [57], the Moon was eclipsed. (Ko-fang, 1955 + Chi-kuo, 594). [Note that the meaning of the character iu 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-chao [9], at night, the Moon was eclipsed. (Pui-kuo, i, 2; Ho-chi, 11442)

9. On the 6th day, chia-wu [31], at night, the Moon was eclipsed. (Pui-kuo, 57; Ho-chi, 11484)

10. On the 3rd day, i-yu [22], at night, an eclipse of the Moon was reported. (Pai-tsu, 632; Ho-chi, 11486)

Eclipses of either Sun or Moon

11. The divination was on day chia-yu [51]: "There was another eclipse; should it be reported to ...?" (Chia-kuo, 465)

12. In the 11th month, there was an eclipse. (Ko-fang, 2.149; Ho-chi, 11483)
Solar Phenomena

13. The divination was on day Jen-tzu [49]. There was a chih of the Sun on day Chia-yin [31]. (Yi-ts'ui, 384)

14. On day Kong-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 Pu-ting at ? (an unrecognized character)?" On day Kong-ch'en [17] it was inquired: "There has been a chih of the Sun; should this be reported to Ho?" On day Kong-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-ch'i, 33908)

15. The divination on day Kuei-tzu [30] inquired: "Will there be a disaster today?" On day Chia-wa [31], there was a halo [sun]. (Pai-ken, 2)

16. The divination on day Kuei-tzu [30] was performed by Chen; "If the Sun confirmed its halo [ch], will it bring a disaster this year?" In the 3rd month. (Ch'en-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'ain-nun, 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-tzu [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-shing] (Yi-pien, 664; Ho-ch'i, 11497)

19. An offering was made to the 'Bird (Star)' [Niao-shihing] by Tzu. (Ching-chin, 2494)

20. ... coloured clouds from the north, ... [?] Shang Star [Shang-kung]. In the 3rd month (Ch'en-pien, 7.26.3; Ho-ch'i, 11501)

21. The divination on day Ping-shen [3] was performed by Kou. A sacrifice was made to the 'Fire Star' [Hue]. (Chia-pien, 3083)

22. There was a divination. An offering was made to the 'Fire Star' [Hue]. 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-shu [23] was performed by Cheng. The king made a sacrifice to the 'Heart Star' [Hsin]. (Yi-pien, 5323)

25. The divination on day Chi-hai [36]. In the night of day Keng [37], a sacrifice was made to the 'Northern Dipper' [Pe-chou]. "Will it rain
continuously?" The divination was on day kee-kai [37]. In the night of day huai [38], a sacrifice was made to the 'Northern Dipper'. The divination was on day chi-su [46]. In the night of day keng [47], a sacrifice was made to the 'Northern Dipper'. The divination was on day keng-hua [47]. In the night of day huai [48], a sacrifice was made to the 'Northern Dipper'. [Chu-ho, 362]

26. Day huai-hua [60]. In the night of day mci [7], a sacrifice was made to the 'Northern Dipper' [Pei-ko]. [Yi-pien, 134]

References to Planets

27. The divination on day kieu-mao [28] was performed by Chi: "The King is to make a sacrifice to Jupiter [Su]. Will it not rain?" (Hou-pien, 1, 27; 13; Hsich, 251; 48)

28. The divination on day chi-wel [38] was performed by Hsing: "The King is to make a sacrifice to Jupiter [Su]. Will the offering of two oxen be sufficient to stop the disaster?" (Wen-hu, 456)

Possible Sightings of New Stars

29. On the day kie-hao [8], there was a sacrifice to the new star [kieu-keng]. (Yi-cha, 1182)

30. On the 7th day, chi-wel [6], at night, a into sacrifice was made. There was a large new star [kieu-chung] together with the 'Fire Star' [Hu]. (Hou-pien, ii, 91; Hsich, 12; 501) [Note that some authors prefer to translate kieu-tung as 'a sacrifice to the great fire star'.]

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, 75)

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-hu, 794, 795)

33. The divination on day wa-hao [35] inquired: "Is the shape of the strange comet [hui] has changed? Will it bring darkness upon us?" It was fine day. (Nao-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. Keightley 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 inscribed title of a king, the 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. 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 probably have been able to recognize at least the brightest 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 same 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

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REFERENCES

2. D. N. Kangley, Sources of Shang History: The oracle-bone inscriptions of Bronze Age China (Berkeley and Los Angeles, 1978), 3.
5. Wen Shouling and Yuans Tingdong, Fung-hsi t'ung-shu fen-jui fen-pao (Chengdu, 1984), 1, 66.
6. Yu Mo-p'ei, T'ou-k'ou t'ieh y'ao (Tokyo, 1927), 55; Zhang Liang, "About the oracle bone inscription of chu yao chieh inscribed recently", in Nanping, ed. by Zhang Yufan (1984), 120-5.

ORACLE BONES SOURCES CITED

Chao-p'ing Lo Chen-yu, T'ung-chiao chu ch'ien-pien (1945), reprint, Shanghai, 1972.
Ch'iu-chung Fang Fu-han, Chu-chia Shih-kuo t'ou-k'ou hsin-chi (Shanghai, 1954).
Ch'ien-ho Chii Jia-ying, Yeh Yung-k'ang and Li Hsia-chu, Yieh-huang wu-ch'i chi-ho (Peking, 1955).
Chung-ting Waih Hsing, Fu-p'ei T'ou-k'ou hsiao-chen (Tientsin, 1935).
Chih-heng Li Chih-ya, T'ou-k'ou chu-hsi hsi ch'ien (Shanghai, 1956).
APPENDIX 1

<table>
<thead>
<tr>
<th>Reference letter</th>
<th>Oracle script</th>
<th>Modern script</th>
<th>Trans-literation</th>
<th>Literal meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>肖</td>
<td>xiao</td>
<td>to eat</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>木</td>
<td>mu</td>
<td>to burn</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>草</td>
<td>cao</td>
<td>huo</td>
<td></td>
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<td>d.</td>
<td>水</td>
<td>shui</td>
<td>sam</td>
<td></td>
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<tr>
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<td>火</td>
<td>huo</td>
<td>vaporous huo</td>
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<td>tu</td>
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<td>xin</td>
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</tr>
<tr>
<td>h.</td>
<td>鸟</td>
<td>niao</td>
<td>Niao-hsing</td>
<td>Bird star</td>
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<tr>
<td>i.</td>
<td>星</td>
<td>xing</td>
<td>Shang-hsing</td>
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APPENDIX 2: ORACLE BONE RECORDS CITED

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