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Chaos in Heaven:

On the Calendars of Preclassical China

by
Yinpo Tschang

Victor H. Mair, Editor
Sino-Platonic Papers
Department of East Asian Languages and Civilizations
University of Pennsylvania
Philadelphia, PA 19104-6305 USA
vmair@sas.upenn.edu
www.sino-platonic.org

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Yinpo Tschang

Puutonghuah Pinyin

Puutonghuah Pinyin is an adaptation of Hanyu Pinyin in which all the original rules apply except for the following. The second tone is spelled out by the letter l immediately after the vowel. The third tone is spelled out by a repeated vowel. The fourth tone is spelled out by the letter h immediately after the vowel. In a diphthong, tone modification applies to the trailing vowel. In simpler cases, the light tone is indicated by omitting the vowel. The umlaut ü is spelled yu, where necessary. The astrophe is replaced by the letter x as a concatenation symbol. Thus, 翩 is pian, 駢 pialn, 諞 piaan, 騙 piahn, 哈爾濱片子 Harbin pianz, 西安 Xixan, 先 xian.

Part I
Chaos in Heaven

Section 1. Introduction

Chronology is important to history. The calendar is a historian's tool to process chronology. Existence of a Bronze Age Chinese (BAC) calendar was in evidence in the earliest written records of Shang at Yinxu, as a system to mark months and days.

BAC calendars were once considered a settled subject: "Throughout the thousand-year period under consideration in this volume, time was based in the first place on natural changes: the seasons of the year, the waxing and waning of the moon, and the cycle of days and nights. In addition to these natural periods, there were also divisions based on social changes, the most important of which were the reigns of kings."[1] A normal year was supposed to include twelve months, usually simply numbered with the cardinal numbers. According to tradition, the Xiah, Shang, and Zhou dynasties each had their own calendars, the Xiah year beginning with the second lunar month after the winter solstice, the Shang year beginning with the lunar month after the winter solstice, and the Zhou year beginning with the lunar month that contained the winter solstice. This is known as the theory of sanzheng.

A major effort to update the chronology of BAC history was undertaken not long ago.[2] Rather than improving existing knowledge, the new findings throw more confusion on the subject. As the update did not directly address the calendars of Xiah and Shang, this confusion centers on the Zhou calendar. Instead of a new year falling always on the new moon in the month of the winter solstice, the study suggests some Zhou calendar years began on the new moon following a winter solstice.

At first glance, this update appears to be a regression. To the extent that it casts doubt on sanzheng, however, it is a step in the right direction.[3] Sanzheng is not historical. It is a misguided attempt to interpret BAC calendars.

As summarized by Shaughnessy, sanzheng has four key elements:

(1) Xiah, Shang and Zhou formed three dynasties.
(2) Each dynasty had its own calendar.
(3) Zhouzheng begins one month before Shangzheng.
(4) Shangzheng begins one month before Xiahzheng.

All these four elements are false. These objections have been made elsewhere, and more arguments will be offered in this article.[4] Before addressing the issue of calendars, a few comments on methodology may be in order.

The Group of Experts on Xiah-Shang-Zhou Chronology used the approach of the passive test. They compared model predictions against dates in bronze inscriptions whose year of manufacture could be estimated with reasonable accuracy. Previously, Zhang Peilyul used the same approach to seek a match between model prediction and dates of solar eclipses in *Chunqiu*.[5] In both cases, the search for a perfect match failed.

On solar eclipses in *Chunqiu*, some models would have worked better if some of the data were left out. The same is true in dates in bronze inscription. Many believe some data should be weeded out, except that there is no consensus as to what criteria should be used for this purpose. As far as the passive approach is concerned, the search always comes to a dead end. Calendar experts appear to be at wit's end.

Creative processing of data is the worst kind of scholarship. It seems there is no alternative to chaos in heaven as soon as one embarks on a study of BAC calendars. Since there is no physical evidence for any chaos of the required magnitude, one has to conclude that the passive approach is severely flawed.

Astronomy is an empirical science. When scientists work with empirical data, one key element they have to take into consideration is the quality of the data they use. Experimental physicists are known to go to great lengths to reduce the margin of error they have to deal with, for large margins of errors are known to render many data useless. In fact, quantitative science is exact only in the sense that scientists know exactly how much they do *not* know. The key in BAC calendar study is, therefore, estimating error in available data.

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In other words, by ignoring possible error inherent in their quantitative data, it is impossible for Confucian orthodox or Ruljia zhehngtoong [hereafter RJZT] scholarship to determine what the BAC calendars were. What RJZT did was to abuse a quantitative science. Yet, they were not alone in such abuses.[6]

Section 2. Calendrical Data

1. Solar eclipses in *Chunqiu*

Table 1. Solar eclipses in *Chunqiu*.

2, 22, 720 BCE	0.43	春王二月己巳，日有食之。	
7, 17, 709 BCE	0.98	秋七月壬辰朔，日有食之，既。	★
10, 10, 695 BCE	0.54	冬十月朔，日有食之。	
4, 15, 676 BCE	0.69	春王三月，日有食之。	-1
5, 27, 669 BCE	0.90	六月辛未朔，日有食之，既。鼓，用牲于社。	★
11, 10, 668 BCE	0.75	冬十有二月癸亥朔，日有食之。	+1
8, 28, 664 BCE	0.85	九月庚午朔，日有食之。鼓，用牲于社。	★
8, 19, 655 BCE	0.93	九月戊申朔，日有食之。	★+1
4, 6, 648 BCE	0.28	春王三月庚午，日有食之。	-1
645 BCE		夏五月，日有食之。	
2, 3, 626 BCE	0.79	二月癸亥，日有食之。	
4, 28, 612 BCE	0.87	六月辛丑朔，日有食之。鼓，用牲于社。	★+1
9, 20, 601 BCE	0.88	秋七月甲子，日有食之，既。	★+3
3, 6, 599 BCE	0.55	夏四月丙辰，日有食之。	+1
592 BCE		六月癸卯，日有食之。	
5, 9, 575 BCE	0.94	六月丙寅朔，日有食之。	★+1
10, 22, 574 BCE	0.67	十有二月丁巳朔，日有食之。	+1
1, 14, 559 BCE	0.61	二月乙未朔，日有食之。	+1
5, 31, 558 BCE	0.37	秋八月丁巳，日有食之。	+2
553 BCE		冬十月丙辰朔，日有食之。	
8, 20, 552 BCE	0.70	九月庚戌朔，日有食之。	
552 BCE		冬十月庚辰，日有食之。	
1, 5, 550 BCE	0.87	春王二月癸酉朔，日有食之。	★+1
6, 19, 549 BCE	1.02	秋七月甲子朔，日有食之，既。	★+1
549 BCE		八月癸巳朔，日有食之。	
10, 13, 546 BCE	0.91	冬十有二月，日有食之。	★+2
3, 18, 535 BCE	0.36	夏四月甲辰朔，日有食之。	+1
4, 18, 527 BCE	0.89	六月丁巳朔，日有食之。	★+2
8, 21, 525 BCE	0.85	夏六月甲戌朔，日有食之。	★-3
6, 10, 521 BCE	0.62	秋七月壬午朔，日有食之。	+1
11, 23, 520 BCE	0.59	十有二月癸酉朔，日有食之。	
4, 9, 518 BCE	0.58	夏五月乙未朔，日有食之。	+1
11, 14, 511 BCE	0.58	十又二月辛亥朔，日有食之。	+1
2, 6, 505 BCE	0.40	春三月辛亥朔，日有食之。	+1
9, 22, 498 BCE	0.89	十有一月丙寅朔，日有食之。	★+1
7, 22, 495 BCE	0.52	八月庚辰朔，日有食之。	
4, 19, 481 BCE	0.83	五月庚申朔，日有食之。	+1

In Table 1 are listed 37 records of solar eclipses in *Chunqiu*, an official archive kept by officers of the House of Luu near the end of BAC. Solar eclipses are rare natural events that can be useful in calibration of historical calendars. This has been demonstrated in the study of ancient Babylonian calendars.

Anyone can recreate the Luu calendar with a personal computer loaded with the right software. With the DOS software *Dance of the Planets* by ARC, this author has compiled a *Chunqiu Luulih*.[7] As far as the data are concerned, Table 1 is equivalent to similar tables in the tabulation of Zhang. They differ in that Zhang used traditional month reckoning according to Zhouzheng, while this author used the general month pattern found in *Chunqiu*, at the source of the original eclipse data.

Of the 37 entries, only nine agree with the reconstructed Luu calendar. Two, marked by -1, have the right day except that the month order is behind by one. Sixteen, marked by +1, have the right day except that the month is ahead by one. One, marked by -3, has the right day but the month is behind by three. Three, marked by +2, has the right day except that the month is ahead by two. One, marked by +3, has the right day except the month is ahead by three. Five, marked by a blank magnitude, do not relate to known eclipses for the given year.

2. Other data in *Chunqiu*

In the first six reigns of the House of Luu as recorded in *Chunqiu*, the pattern in Table 2 is observed.[8] In this table, columns headed by A indicate the number of date entries in *Chunqiu* that agree with the reconstructed calendar of Luu, and columns headed by D show the number of date entries that disagree, in each regnal year. It is clear from the data compiled that the Chunqiu period calendar used by the House of Luu had a low quality. That explains why the data on solar eclipses are so bad. To have some idea why the data turned bad, one has to study the physical medium on which the data was carried.

Bundles of inscribed bamboo slips have been unearthed in quantity in recent decades. The archival records of the House of Luu were almost certainly written on bamboo slips, and one problem specific to such texts is that some records could come loose. When *Chunqiu* was redacted, some loose records could have been misplaced, even though the originals were accurate. When such data later were put to use, the margin of error involved might be huge. Errors of years or even decades might obtain.

Rather than simply rejecting such data, a more constructive method is to check the accuracy of each piece of the data that is problematic, and to try to find ways to retrieve as much information from these flawed data as possible. If one has some idea as to how the data went bad, it is possible, under certain circumstances to correct specific flaws.

Table 2. *Pro forma* accuracy test of monthly sequence in *Chunqiu*

reign	Yiin		Hualn		Zhuang		Miin		Xi		Weln	
year	A	D	A	D	A	D	A	D	A	D	A	D
1	0	0	1	0	0	1	1	0	2	1	1	2
2	1	1	1	1	1	0	1	1	0	1	0	4
3	5	0	1	0	0	0			0	0	0	1
4	0	0	0	0	1	0			0	0	1	0
5	1	0	2	0	0	0			0	1	0	2
6	1	0	2	0	0	0			0	0	0	1
7	0	0	1	0	0	1			0	0	1	0
8	0	5	0	2	2	0			0	1	0	3
9	2	0	0	0	2	0			0	4	1	0
10	0	4	2	0	0	0			0	0	0	1
11	2	0	1	0	0	1			0	0	0	1
12			4	1	1	0			1	0	1	1
13			0	1	0	0			0	0	1	1
14			3	0	0	0			1	0	0	3
15			2	0	0	0			2	0	0	2
16			0	0	0	0			0	4	0	2
17			5	1	0	0			0	1	0	2
18			2	1	0	1			1	1	0	2
19					0	0			1	1		
20					0	0			1	0		
21					2	0			1	0		
22					2	0			0	2		
23					0	1			0	1		
24					2	0			0	0		
25					2	0			0	3		
26					0	1			1	0		
27					0	0			0	3		
28					0	2			0	3		
29					0	0			0	0		
30					2	0			0	0		
31					0	0			0	0		
32					2	1			0	2		
33									2	1		
total	12	10	27	7	19	9	2	1	12	30	6	28

3. A common feature of BAC calendars

Date entries can be checked against an exact reconstruction of the Luu calendar. Such a test is not very sensitive. Because the sexagesimal ganzhi ordinals have a range about twice the length of an average (lunar) month, date entries off by an even number of months cannot be detected by a *pro forma* comparison. Data on solar eclipses are much more sensitive. The difference in quality of the data in Tables 1 and 2 is obvious. Both sets of data, however, reveal the same general pattern: BAC calendars are of consistently poor quality. Other than ganzhi ordinals, the dates in *Chunqiu* are generally unreliable.

Chunqiu is the first chronological record available to Chinese history. Because it was in the form of an annal, the accuracy of its dates can be determined reliably. Dates on oracle records of Yinxu and in inscriptions of Shang and Zhou bronzes cannot be studied the same way. They are quite useless when the idea is to find a logical explanation of the poor quality of preclassical calendar data.

4. Primitive calendars

Primitive societies are technologically backward. Preclassical calendars cannot be very good. One needs to know how and why it went wrong. Corrections can be made accordingly. Before looking for why things go wrong, one should see what is right about that primitive technology.

The modern lunar calendar lists both the month and the day numerically, except that the first month is known as zhengyueh instead of month one. Preclassical practice lists the day differently. The day is given by a combination known as ganzhi. Ganzhi is an absolute system of reckoning. It goes in a cycle of sixty. It is an absolute system of reckoning because the ganzhi day is not pegged to any natural event. The modern lunar calendar was a product of Warring States period innovation. With a wealth of accumulated calendar data and driven by the increased productivity of the Iron Age, early classical period astronomers were able to predict the new moon and the winter solstice with reasonable accuracy. That explains why day reckoning was changed from a clumsy absolute system to a simple relative system. The same astronomers were also able to place intercalary months in the middle of the year and discontinued use of the thirteenth month.

The unwieldy absolute system of ganzhi came early. Early astronomers did not use the more intuitive numerical reckoning for a good reason. If the new moon is always a given, e.g., by direct observation or astronomical calculation, the simpler numerical reckoning may be an option. Otherwise, it is not. On the other hand, an absolute system of reckoning such as ganzhi rules out most sources of error. These dates in *Chunqiu* and inscriptions are accurate to the day.

Why is the new moon difficult to pin down? In the real world, the moon is not always directly observable. If it remains obscured by cloud cover for more than a few days, the date of a new moon may be lost permanently. Since astronomical calibration of calendar came after the end of Bronze Age, Luu calendar makers had no choice but to use the absolute system. In their date entries, information on moon phases is almost non-existent. This kind of ambiguity is the consequence of a lack of suitable technology, not a lack

of diligence. On the other hand, most records of solar eclipses did carry a reference to the new moon. In these instances, it can be observed that solar eclipses coincide with new moons, just as lunar eclipses coincide with full moons. Even BAC astronomers should have learned this relationship.

When direct observation was the only way to verify the arrival of a winter solstice, it is a foregone conclusion that winter solstice could not be predicted. Again, it should be stressed that in China, prediction of winter solstice and other elements of the 24 jielqih or nodes of planetary motion of the Earth became possible in the Warring States period.

There are many instances in *Chunqiu* where a new year began early or late. The typical margin of error is one month either way. It can be as long as two months. This is why there were actual references to the fourteenth month. As both the new moon and the winter solstice were often associated with a large margin of error, this result should not surprise anyone.

Section 3. Low-tech Chronology

While the terms for natural cycles of the day and the month are present in the character set of Shang oracle bone script (OBS), there is no similar evidence for the term for a year. OBS nialn is in the form of an uprooted herb, and it refers to hay or specifically, winter fodder. OBS suih is the name of a religious ritual, not an abstract noun for the year. There is no record of calendar dates from which average lengths of a month and a year can be calculated.

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The winter solstice plays a key role in BAC calendars. This is the day when a noon sun casts the longest shadow on the ground in the northern hemisphere. In the low-tech world of BAC, it was relatively easy to find the winter solstice, at least in principle. Under ideal conditions, winter solstice can be determined this way within a margin of error of less than 48 hours. Horses and war chariots were imported by Shang from West Asia. It is highly likely that a calendar based on winter solstice was also an import from Mesopotamia, for that explains the basis of decimal and duodecimal arithmetic of the ganzhi ordinals. The subject of cultural exchanges between East and West Asia is outside the scope of this article.

The Chunqiu period calendar of Luu was reconstructed on the assumption that the 720 BCE solar eclipse at Qufuh was the same solar eclipse recorded in an entry for the third regnal year of Lord Yiin in *Chunqiu*. As the latter placed

the eclipse on the second new moon of that year, it can be ascertained the Luu calendar year started on the first new moon after a winter solstice. This turns out to be the putative Shangzheng, not Zhouzheng.

Given the lack of technological sophistication of BAC, this calendar is going to be taken as the new starting point. From this point onward, the theory of sanzheng will be ignored. The underlying assumption will be that BAC had only one calendar system, the putative Shangzheng, and each locality had its own implementation of the calendar system.

Section 4. Data on Solar Eclipses

The best data to study are those entries in Table 1 that are marked by a ★. These are records of solar eclipses of maximum magnitudes close to one. Solar eclipses are rare natural events. Total eclipses are rare among all solar eclipses. If these entries marked by a ★ can be matched with real eclipses, one can be confident the reconstructed Luu calendar is historical.

In practice, it turns out there is no need to single out total or near-total solar eclipses in the data. Although only a minority of the eclipses in Table 1 agrees completely with the reconstructed Luu calendar, one notices that all records of solar eclipses in Table 1 with correct ganzhi days are between +3 and –3 of the right month. If these records are understood to come from those years when the month order was off by 3 at most for that year, there is almost perfect agreement between theory and actual historical data. The five solar eclipses listed in Table 3 are the only ones to be accounted for. In any test of a scientific theory, emphasis in a test is on the exceptions, not on cases where there is explanation.

Table 3. Five exceptional solar eclipses to be accounted for.

645 BCE	夏五月，日有食之。
592 BCE	六月癸卯，日有食之。
553 BCE	冬十月丙辰朔，日有食之。
552 BCE	冬十月庚辰，日有食之。
549 BCE	八月癸巳朔，日有食之。

As it turns out, those eclipses marked by a ★ are important in another way: In these thirteen cases, only one was a total eclipse. In more than half the cases, the maximum magnitude was under 90%. These cases speak volumes about the lack of sophistication in observation technology.

Table 4. Period solar eclipses missing from *Chunqiu*. [All years in BCE.]

A			B		
10, 09, 722	0.18	shihxyueh dingweih	07, 27, 718	0.28	bayueh jiaayiln
06, 06, 716	0.12	liuhyueh jiaaxu	09, 18, 712	0.35	jiuuyueh jiimaoo
03, 26, 685	0.07	sihyueh yiisih	12, 31, 708	0.68	zhengyueh jiaashen
01, 13, 681	0.17	zhengyueh guiichouu	08, 17, 701	0.54	bayueh yiisih
11, 01, 678	0.07	shihyiyueh xinyouu	06, 06, 697	0.49	liuhyueh jiaayiln
04, 15, 657	0.06	sihyueh reincheln	01, 01, 680	0.55	zhengyueh dingweih
04, 05, 656	0.04	sihyueh dinghaih	06, 17, 679	0.60	liuhyueh jiihaih
12, 03, 624	0.15	shihehryueh dingchouu	04, 05, 675	0.68	sihyueh dingweih
06, 18, 614	0.09	liuhyueh xinsih	03, 27, 666	0.71	sihyueh yiiyouu
05, 18, 622	0.23	wuuyueh wuhcheln	10, 21, 658	0.34	shihyiyueh yiiweih
07, 30, 607	0.06	bayueh gengzii	08, 09, 654	0.34	bayueh guiimaoo
11, 22, 604	0.03	shihehryueh xinhaih	02, 02, 653	0.93	ehryueh gengzii
09, 30, 591	0.16	shihxyueh biingyiln	06, 07, 651	0.67	liuhyueh biingcheln
03, 16, 581	0.16	sanxyueh xinchouu	09, 19, 647	0.31	shihxyueh xinyouu
07, 31, 542	0.07	bayueh reinwuu	11, 11, 641	0.51	shihyiyueh biingxu
01, 27, 533	0.04	ehryueh jiaazii	04, 06, 629	0.49	sihyueh gengxu
05, 10, 510	0.04	wuuyueh wuhshen	07, 19, 625	0.67	qiyueh yiimaoo
11, 23, 501	0.25	shihehryueh guiichouu	05, 07, 621	0.33	wuuyueh guiihaih
09, 10, 497	0.20	jiuuyueh gengshen	12, 13, 614	0.94	shihehryueh jiimaoo
02, 06, 496	0.20	ehryueh jiichouu	09, 30, 610	0.67	shihxyueh biingxu
11, 14, 492	0.21	shihyiyueh xinmaoo	07, 19, 606	0.57	qiyueh jiaawuu
03, 09, 488	0.02	sanxyueh reinyiln	12, 03, 605	0.60	shihehryueh dingsih
			05, 18, 603	0.54	wuuyueh wuhshen
			05, 08, 602	0.41	wuuyueh guiimaoo
			09, 10, 600	0.84	jiuuyueh jiiweih
			07, 09, 597	0.33	qiyueh reinshen
			03, 28, 582	0.31	sihyueh dingweih
			03, 07, 572	0.86	sanxyueh jiimaoo
			07, 20, 560	0.37	qiyueh dingyouu
			10, 23, 547	0.37	shihyiyueh gengcheln
			09, 01, 488	0.34	jiuuyueh wuhxu

Attempts have been made to interpret the five records in Table 3. They have been associated with actual solar eclipses detected at locations other than Qufuh. Special conditions were found to reproduce them at Qufuh. Since exact circumstances under which these records found their way into *Chunqiu* is unknown, none of these possibilities can be ruled out. There is a simple way to explain these eclipses, however. These solar eclipses may be recorded on partially damaged bamboo slips that came loose. In other words, they were solar eclipses for a year other than the designated one.

In Table 4 are listed 53 solar eclipses at Qufuh between 722 and 481 BCE missing from the current text of *Chunqiu*. Column A collects all eclipses with a maximum magnitude of less than 0.28. All others are collected under column B.

If one examines the verified instances of solar eclipses in Table 1, it is easy to see that the least significant eclipses recorded had a maximum magnitude of 0.28. Given the difficulty of detection of a minor solar eclipse with the naked eye, it is not surprising that BAC astronomers missed these minor eclipses. If 0.28 is taken as a threshold for detection, all those missing eclipses under column A can be discounted. To look for the missing eclipses of Table 3, one should study column B of Table 4.

1. Missing records

Column B of Table 4 has 31 entries. Table 1 has 32 verifiable entries. *Chunqiu* missed almost as many significant solar eclipses as it recorded. An explanation for these missing records is needed.

Chunqiu covers a historical period from 722 to 481 BCE. A cursory examination of column B of Table 4 reveals that most of the missing eclipses correspond to the earlier period. The record is more complete as the time line approaches early fifth century BCE, the *floruit* of Confucius, putative redactor of *Chunqiu*. This is a highly suggestive evidence for a redaction of *Chunqiu* in the fifth century BCE.

There is reason to believe that *Chunqiu* was a compiled version of the official archive of the House of Luu, with Confucius as its redactor. The original was written on bamboo slips, bundled in chronological order, in volumes corresponding to different reigns. Out-of-date files were probably put away in storage. The earlier records could have been damaged, rendering some irretrievable. Many partially damaged records may have come loose, disrupting their chronological order. Still others may have illegible characters, leading to mistakes in deciphering.

2. The solar eclipse of 549 BCE: bayueh guiisih shuoh

The last entry in Table 3 is about a solar eclipse on a guiisih day that was also the eighth new moon of the year. A relatively intact record should be easier to recover. Yet, there is no record of solar eclipse on a guiisih day in Table 4, whether under column A or under column B. This relatively intact record may be more damaged than it appears, for the reference to guiisih contains at least one transcription error. As the year 549 BCE saw only one solar eclipse in Qufuh and that one is already recorded in *Chunqiu*, placement in that year is also wrong. As most references to the month in *Chunqiu* are unreliable and the day is off, there is nothing to go by in looking for a match between this presumably valid record and one in column B of Table 4, and one has to accept failure.

There is another way to look at this failure. This error-laden record of a solar eclipse can be considered a partial match with many entries under column B. Failure to find a more reasonable match is not the same as total failure for the theory under test. This is really an inconclusive test.

3. The solar eclipse of 552 BCE: dong shilyueh gengcheln

This is an easy case. Under column B of Table 4, on October 23, 547 BCE, a gengcheln and the 11th new moon of the year, there was a solar eclipse of magnitude 0.37 at Qufuh. The year was off by 5. The reign of Lord Xiang remained the same. The month order was off by –1. The day was right. The original bamboo slip could have come loose, but the inscription was properly deciphered.

4. The solar eclipse of 553 BCE: dong shilyueh biingcheln shuoh

There is only one biingcheln under column B of Table 4. On June 7, 651 BCE, a day of biingcheln and the sixth new moon of the year, there was a solar eclipse of magnitude 0.67 at Qufuh. The year was off by almost a century. The reigns were different. The month order was way off. The day was right. The original bamboo slip could be loose.

5. The solar eclipse of 592 BCE: liuhyueh guiimaoo

There are two guiimaoos under column B of Table 4. On August 9, 654 BCE, a day of guiimaoo and the 8th new moon of the year, there was a solar eclipse of magnitude 0.34 at Qufuh. On May 8, 602 BCE, a day of guiimaoo and the 5th new moon of the year, there was a solar eclipse of magnitude 0.41 at Qufuh. 654 BCE was in the reign of Lord Xi. 602 and 592 BCE were in the reign of Lord Xuan. The later solar eclipse is a better match.

6. The solar eclipse of 645 BCE: xiah wuuyueh

This is another hard case. Since a reference to the month is unreliable, this can be a match for almost all the entries under column B of Table 4. Though an imperfect match can easily be found, there is no real match. The test result in this case is again inconclusive.

Section 5. Conclusion

In principle, all 37 records of solar eclipses in *Chunqiu* can be brought into agreement with scientifically recreated data for period solar eclipses at Qufuh. In this total, 35 cases of agreement can be identified with specific eclipses. Only two are generic cases where agreement is qualitative but not specific. This is no mean feat for such a simple hypothesis. It looks especially good relative to determinations made in RJZT scholarship.

Since OBS and BIS data on dates are qualitatively inferior to data in *Chunqiu*, it is not possible to improve upon the conclusion based on the solar eclipse data in *Chunqiu*. The conclusion can be generalized to include all date data in OBS and BIS. OBS and BIS date data are important in attempts to accurately calibrate the calendars of Shang and Zhou. This has been achieved in the case of the Shang calendar. Judging by the work of the expert group, considerable progress has been made in the case of the Zhou calendar.

It is important to note that here the conclusion is one of compatibility, not one of exclusivity. In other words, we have proved the theory of a single calendar for all of BAC is compatible with all the evidence at hand, but we have not proved that this is the only theory that is compatible with the same set of data.

The strength of this low-tech calendar is that it is compatible with the complete set of evidence, including date records from the eras of Shang and Zhou, as well as the Chunqiu period. One may suspect that it would be difficult to conceive an alternative that can cover the same range of data. It is much better than the theory of sanzheng. On the other hand, it is entirely possible that individual elements in this large body of data can be interpreted differently. In this work, no attempt has been made to study any specific data element exhaustively. It is naturally not in a position to comment on how individual data elements can or should be treated.

The two-millennium gridlock that has blocked any advance on our knowledge of preclassical China was the handiwork of RJZT. RJZT is a branch of metaphysics whose *raison d'être* has everything to do with a static governing ideology and absolutely nothing to do with the pursuit of knowledge. If archaeology of the Middle East and biblical studies are distinct fields of study, there is no reason why RJZT and the history of ancient China should be mixed up as one. To a careful observer, such a division of labor is emerging in China. There is little reason for historians to stay the course to commit intellectual suicide. RJZT is to knowledge as chaos is to order.[9]

In the period commonly known as the Zhou era, there was a calendar. It was no different from the calendar for the Shang era. It was also the same calen-

dar used by the House of Luu in the Chunqiu period. In the socioeconomic background of a myriad of independent city-states not unlike those of pre-classical Greece, each ruling house had its own implementation of the common calendar system. That accounts for apparent differences in date reck oning. Implementations were often different, because weather conditions, a critical element for empirical determination of the winter solstice, were often different from one location to another. Since there is systematic variation in the accuracy of Luu month order in *Chunqiu*, one can even surmise not every person in charge of setting the calendar could see distant objects equally well. For example, Lord Hualn or his calendar officer could have 20/20 vision, while Lord Weln or his man could be quite myopic.

This author has argued elsewhere that the kings of Shang were nomads.[10] With its calendar year anchored by the winter solstice, the Shang calendar was useful in keeping herders mindful of the need to collect winter fodder for their animals. BAC cereal farming was at a rudimentary level. The need for a more refined calendar was not obvious. With the coming of the Iron Age, cereal farming received a boost, leading to larger populations and the intensive mode of operation. Reform of calendars came in the early Iron Age, both in East Asia and in the eastern Mediterranean, for a reason.

As history proves repeatedly, technology is driven by demand. There is no reason to believe there was a diversity of calendar systems before the end of the Chunqiu period. Rapid development was witnessed in the years immediately after that period, leading to not only the introduction of 24 nodes corresponding to the planetary motion of the earth, but also the use of ganzhi in keeping track of the year. The putative Xiah calendar is a pseudo-solar calendar, for two consecutive nodes form an almost exact counterpart of the solar month. Ganzhi, an absolute sequence, was no longer needed in the new calendar in day reckoning. Instead, it was used in year reckoning, an improve ment over the chaotic change of regnal titles used in the earlier period. In the Mediterranean, the Christian church adopted an absolute system of year count by relating the year to the birth of a putative Jesus Christ. Since ganzhi is cyclic, as a tool in year count it is not as useful as the numerical Christian system. This is so in spite of the fact that the former represents a conscious attempt at an absolute reckoning, while the latter represents an earlier tradition of relative reckoning in regnal years.

Part II
Chaos under Heaven

Section 1. Introduction

Part I deals with BAC calendars and their relationship with RJZT. The issues of month and day reckoning are studied. Zhoulih, long familiar to historians in China and abroad, turns out to be a classical period forgery. Xiahlih was not a calendar of the Xiah dynasty, because the rule of China under a dynast began with Qilnshiihualng, and because the more sophisticated Xiahlih was invented in the Warring States period. The subject of seasons has been left out, for it requires full, independent treatment where a range of different issues are involved. Part II deals with the issue of four seasons. Again, gross mistakes are found in RJZT scholarship.

Chunqiu is the only credible BAC text with direct references to *four* seasons. The year was previously divided into two seasons for almost the entirety of BAC. They were chun and qiu, title of the chronicle of Luu. While there is no consensus among paleographers on the interpretation of either chun or qiu, they agree preclassical chun/qiu did not refer to spring/autumn.[11]

RJZT leaves no doubt as to where it stands on this issue. Chun refers to the spring, qiu to the autumn. That is the case since day one and it will remain an immutable reality. This would be nice had it not been two minor details. First, modern linguistics sees constant evolution and mutations in all languages. The only languages that remain static are dead. It is hardly conceivable that a large language family such as Hahn Chinese that is spoken by almost one quarter of humanity should be considered dead. Second, credible data in the received literature strongly suggest the RJZT view is untenable. As in the case of the calendars, the best source of information on this subject is *Chunqiu*. If one takes a closer look at the evidence available in *Chunqiu*, the inevitable conclusion is that the classical interpretation of chun-xiah-qiu-dong is wrong.

The first three months in the calendar of Luu are collectively known as the season of chun. Since the Luu calendar year begins with the first new moon after a winter solstice, it is clear that preclassical chun refers to the winter. There is no other way to understand it. It requires little intellectual effort to identify the sequence chun-xiah-qiu-dong with winter-spring-summer-autumn. This also turns out to be the way nature operates, at least in the northern hemisphere of planet Earth.

Since the orbital motion of our planet does not leave us with any other option, and since the essential features of the calendar of Luu have been known since the early classical period, there is no excuse for RJZT to have missed this fact. Not only did RJZT do that, it applies its normative power to enforce it. In the Chinese political tradition, dissent in matters of knowledge is yihduan xielshuo; it can be equated with dahnih buhdaoh and is punishable by death.

異端邪說，大逆不道

It is easy to see that RJZT made a mistake. It is not difficult to agree as to what preclassical chun-xiah-qiu-dong should be. To be fully convincing, however, one has to examine all the evidence that is available, and to determine what it was that has caused the apparent discontinuity in Chinese civilization. This is what Part II intends to do; the best place to start is again *Chunqiu*.

Section 2. What Else Does *Chunqiu* Say?

Provided one is looking for it, *Chunqiu* offers a wealth of information about preclassical seasons. The information can be organized into a number of categories.

Floods

Qiu, dahshuii.	Hualn 1
Xiah, dahshuii.	Hualn 13
Qiu, dahshuii, wul maihmiaol.	Zhuang 7
Qiu, Sohng dahshuii.	Zhuang 11
Bayueh, dahshuii.	Zhuang 24
Qiu, dahshuii, guu, yohng sheng yul sheh, yul meln.	Zhuang 25
Qiu, dahshuii.	Xuan 10
Qiu dahshuii.	Chelng 5

Eight records of flooding can be found in *Chunqiu*. Seven floods occurred in qiu, and one in xiah. As Shandong is in the monsoon zone of East Asia, precipitation is typically concentrated in the spring and summer. Other than occasional typhoons, the eastern seaboard of China is usually dry in the fall. The classical saying qiugao qihshuaang describes such a season.

秋高氣爽

If preclassical xiah is understood as spring and preclassical qiu as summer, the timing of natual floods agrees with the historical record. If the RJZT exegesis is upheld, either there is great chaos under the sun, or *Chunqiu* should be treated as a bogus historical record of the House of Luu.

Droughts

大雩、不雨、大旱

Qiu, dahyul.	Hualn 5
Dong, buhyuu.	Zhuang 31
Dong shilxyueh, buhyuu.	Xi 2
Chun walng zhengyueh, buhyuu. Xiah sihyueh, buhyuu.	Xi 3
Qiu bayueh, dahyul.	Xi 11
Qiu jiuuyueh, dahyul.	Xi 13
Xiah, dahhahn.	Xi 21
Zih shilyouuehryueh, buhyuu. Zhihyul qiu qiyueh.	Weln 2
Zih zhengyueh buhyuu. Zhihyul qiu qiyueh.	Weln 10
Zih zhengyueh buhyuu. Zhihyul qiu qiyueh.	Weln 13
Qiu, dahhahn.	Xuan 7
Qiu, dahyul.	Chelng 3
Qiu, dahyul.	Xiang 5
Qiu jiuuyueh, dahyul.	Xiang 8
Qiu, dahyul.	Xiang 16
Jiuuyueh, dahyul.	Xiang 17
Qiu bayueh, dahyul.	Xiang 28
Bayueh, dahyul.	Xiang 28
Bayueh, dahyul.	Zhao 3
Qiu jiuuyueh, dahyul.	Zhao 6
Qiu, dahyul.	Zhao 8
Jiuuyueh, dahyul.	Zhao 16
Qiu bayueh, dahyul.	Zhao 24
Qiu qiyueh shahngxin, dahyul. Jihxin, youh yul.	Zhao 25
Jiuuyueh, dahyul.	Dihng 1
Qiu, dahyul. Jiuuyueh, dahyul.	Dihng 7
Qiu, dahyul.	Dihng 12
Qiu bayueh, dahyul.	Ai 15

Chunqiu has 28 entries on drought or yul, the rain dance. While droughts can hit any time in a year, farmers need rain badly only in the growing season of their crops. In 20 records on yul, 19 took place in qiu, and one in dong. This means qiu is in the middle of the growing season, or summer. With the reference to buhyuu, it is not clear whether rain was desired or not. When formulated in the statement, "From the first to the seventh month, there was no rain," it is easy to see that the record was about an impending disaster. Taken together, these records show a strong correlation between qiu and summer.

舞雩臺

Dahyul probably refers to a rain dance lasting several days. Immediate to the south of the Chunqiu period site of Qufuh was a location known as Wuuyultail. The rain dance of yul was apparently conducted there in the preclassical period.

Pests

螟、螽、蜮、蜚、蝝

Jiuuyueh, milng.	Yiin 5
Qiu, zhong.	Hualn 5
Qiu, youu yuh.	Zhuang 18
Qiu, youu feii.	Zhuang 29
Bayueh, zhong.	Xi 15
Qiu, yuu zhong yul Sohng.	Weln 3
Qiu bayueh, zhong.	Xuan 6
Qiu, zhong.	Xuan 13
Qiu, zhong.	Xuan 15
Dong yualn sheng.	Xuan 15
Bayueh zhong.	Xiang 7
Dong shilyouuehryueh, zhong.	Ai 12
Jiuuyueh zhong.	Ai 13
Shilyouuehryueh zhong.	Ai 13

Chunqiu has 14 references to pest attacks. While it is not clear exactly what fei, yualn and yuh were, there is little doubt they were pests. Farmers are not known to be overly interested in the general population of fauna and flora in their farms. They pay special attention to pests. Zhong is indeed a reference to the locust, active in summer and autumn. Milng is a larva that attacks the stem of a plant. In autumn, it turns into a moth. Pest activity is a highly reliable indicator of seasonal changes. Since 11 out of 14 had to do with qiu, one can be certain pest data also linked qiu with summer instead of autumn. The other three records related to dong, a time when pests began to die off.

Unusual occurrences

There are 15 entries in *Chunqiu* on unusual occurrences.

觀漁、無冰、大雨震電、大雨雪

Chun, Gong guan yul yul Talng.	Yiin 5

The first relates to a winter so cold that the rivers and lakes near Talng froze. Lord Yiin went there to watch ice fishing.

Chun ehryueh, wul bing.	Chelng 1
Chun, wul bing.	Xiang 28

The second and the third are about two warm winters.

Sanxyueh guiiyouu, dahyuu zhehn diahn. Gengcheln, dah yuu xuee.	Yiin 9

The fourth was about a northeaster: a rainstorm followed by a snowstorm.

Dong shilxyueh, yuu xuee. Hualn 8
Dong, dah yuu xuee. Xi 10

The fifth and sixth are about early autumn snowstorms.

Qiu, dah yuu baol. Xi 29

The seventh refers to a summer hailstorm.

Dong shilehryueh, yuun shuang, buh sha caoo.
Lii-meil shil. Xi 33

The eighth refers an early frost in the autumn.

大雨雹、隕霜、不殺草、李梅實、殺菽、多麋、觀社、無麥禾、告糴、鴝鵒來朝

Dong, dah yuu baol. Zhao 3

The ninth refers to an autumn hailstorm.

Chun walng zhengyueh, dah yuu baol. Zhao 4

The tenth refers to a winter hailstorm.

Dong shilxyueh, yuun shuang, sha shu. Dihng 1

The eleventh refers to an early autumn frost. The first eleven are about unusual weather patterns.

Dong, duo mil. Zhuang 17

The twelfth is about an unusually large herd of deer in the autumn.

Xiah, Gong rul Qil guan Sheh. Zhuang 23

The thirteenth is about a fertility ritual in the spring.

Dong, dah wul maih hel.
Zangsun Cheln gaoh dil yul Qil. Zhuang 28

The fourteenth is about a poor harvest in the autumn.

Xiah, youu qulyuh lail chaol. Zhao 25

The fifteenth is about the nesting of migratory birds in spring. The last three are about extraordinary animal and human events. If seasonal references are understood in the RJZT version, these events cease to make any sense.

In all 65 cases, the seasons cannot be moved forward or backward without violating the rhythm of nature. *Chunqiu* was written in the preclassical language of late BAC. It cannot and should not be understood in the classical language of China.

Section 3. Paleography of Seasons

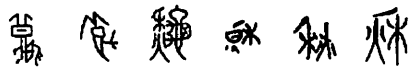
In addition to preclassical usage found in *Chunqiu*, paleography also offers powerful arguments against RJZT. OBS is the earliest known script system in China. It was the invention of Shang era zhenreln or royal scribes. The earliest Chinese texts known to archaeology are records of oracle queries carved on tortoise shells and animal bones, as well as inscriptions on ritual bronzes.

Chun 

OBS chun is a character with three components known as determinatives: the herb, the sun, and tuln.[12] Traditional paleographers cannot agree on what the root sense of chun is, because they have no idea what preclassical tuln is.

Preclassical tuln has two forms. On the righthand side of the two examples on the left, shown above, it is the side view. In the middle of the other three, the frontal view is shown. Taking both views into consideration, tuln is in the shape of a fork. The fork is not an implement of the cereal farmer. It is an essential tool for the herder, e.g., to handle hay and build haystacks. Shang kings were nomadic herders.[4] Cattle were the sacrificial animals of their choice. They collected hay and build haystacks to allow their animals to survive the winters of North China. The modern term tulnji still refers to hoarding or stockpiling for future need. Chun was the season when the sun sinks low on the horizon and herders apply their forks to herbs to build their haystacks, according to OBS chun.

屯
積

Qiu 

OBS qiu has two basic forms. In one, a tortoise is shown under an herb. In the other, an herb is shown next to a fire.[13] A tortoise may be a slowpoke as land animals go, but if a plant grows as fast as a tortoise moves, that is wildly robust growth. Fire and heat are inherently linked. For herbs, the hot season is one of rapid growth. In both forms, the meaning is clearly the same. While farmers like the summer, the same is true of herders.

Paleographers such as Yaol Xiaohsuih and others were wrong when they identified qiu with the locust, even though the locust is also a summer pest.

A year can be divided into a growing season and an idle season. This division in two is natural. No reference to the transitional seasons of spring and autumn is known to exist in the Shang OBS character set. In the Zhou BIS character set, the same is true. The etymology of preclassical xiah and dong are more complex because neither began as references to a season.

Xiah 

No trace of preclassical xiah is found in the OBS character set. In BIS, xiah is in the form of an insect being cupped in one or both hands. The determinative for insect is not self-evident. One makes the identification by comparing the BIS for xiah and you. In the latter case, the character actually shows a bug gnawing at a heart![14]

憂

Two insects were domesticated early in human history. The silkworm was domesticated in East Asia. The honeybee was domesticated in Europe. In all likelihood, the root sense of BIS xiah is the silkworm, a spring bug that must be carefully protected against chill. The human hand under the silkworm implies tender loving care. Before the spring is over, a silkworm makes a cocoon, starting its metamorphosis into a moth. Xiah is not used as a seasonal reference in BIS literature. It was first attested to as such in *Chunqiu*.

度, a cognate of xiah, is not in the character set of OBS and BIS. In its root sense of a multistory building, it could not have an origin in BAC. When such structures became a reality early in the classical period, xiah could have been used as a phonetic element for the character.

Dong 

OBS dong comes in two forms. The first is the shape of a boxlahngguu, a toy noisemaker formerly used by street peddlers. The second is the shape of a gong. Dong is the sound made by a boxlahngguu or a gong. The consensus among paleographers is that dong is often used in the sense of zhong, referring to the last in a sequence. Autumn is the last season of a year. In the calendar of Luu, dong lasts from three to four months, making it the longest season among the four. Unlike the spring, it is hard to find anything to exactly match this extended transitional season.

終

Though many paleographers disagree, this author believes paleography offers a lot of support to a set of conclusions based on common sense, the records in *Chunqiu*, and planetary astronomy. There is overwhelming evidence against the RJZT theory of four seasons. The more primitive society in China divided a year into two seasons: the growing seasons and the idle season. Increasing sophistication led to a year of four seasons, approximately three months long for each, following the natural cycle. It takes a great deal of willpower to distort the natural sequence into an artificial one in which spring comes in the beginning.

Section 4. Evidence in Received Literature

Not much in the received literature can be reliably dated to BAC. Only a few cases are found in which xiah is used in its proper preclassical context. These cases will be studied in detail in the following.

1. Xiahwu and Dahxiah

"Qualnyul" is a poem in *Shijing* that describes a woman in a dysfunctional marriage. During her better days, she had been treated to fancy meals. Later, she had barely enough for survival. A key phrase in the verse is xiahwu. According to classicists, xiahwu refers to a big house, as an entry in "Yuehjih" of *Lijjih* defines xiah as big. The standard exegesis is untenable. "Yuehjih" is a treatise on the theory of music, not a lexicographic work. "Xiah" was the name of a preclassical dance, presumably lost by the time "Yuehjih" was written. When "Yuehjih" says "Xiah, dah yee," it is really saying that "Xiah" was also known as "Dahxiah," presumably in some early literature. While careless transcription through many generations has been known to introduce errors in many early texts, paleographers have found the repetition symbol = the one most often left out. The original in "Yuehjih" should be "Xiah=, dah yee" and it is supposed to read, with all punctuation marks built in and the repeat symbol applied, as "'Xiah," "Dahxiah" yee.'

In xiahwu qulqul, qulqul refers to the large size of xiahwu. The standard exegesis of xiah introduces an element of tautology that is unbecoming. Besides, with all three other elements used to bring out the contrast being food items, a big house serves little literary purpose. The owners of large mansions may have plain dietary habits. Or they may not treat all their family members equally well. Xiahwu has to be a food item in order for the verse to make sense. If preclassical xiah refers to the silkworm, xiahwu is the cocoon of a silkworm. Indeed silkworm pupae are considered a delicacy in many

于我乎，夏屋渠渠，今也每食無餘。于嗟乎，不承權輿。 于我乎，每食四簋。今也每食不飽。于嗟乎，不承權輿。 《詩經·秦風·權輿》

夏，大也。 《禮記·樂記》

parts of China. They are expensive because the entire cocoon, with its silk content, has to be destroyed in the cooking process.

If preclassical xiah refers to the silkworm, the ancient dance of "Dahxiah" may not have been lost after all. "Dahxiah" should be the "Silk Ribbon Dance" or "Holngchoulwuu," standard fare in the repertoire of modern Chinese folk dance. How can one be so certain? Before the advent of synthetic fiber, no other textile was as light or had as fine a texture as silk to bring out the airiness and forcefulness in the "Silk Ribbon Dance." The art probably was not lost. The problem was that even when the dance was performed in their presence, RJZT scholars did not recognize it as the renowned "Dahxiah." The famous dances from Central Asia collectively known as "Feitian" or "skywalking," imported in the Talng dynasty, were probably no more than a re-import with fresh touches in choreography.

飛天

2. Xiah as an industrial product

In volume 8 of *Zhoulii*, the profession of a preclassical dyer is described. In the spring, his job was to place raw silk under the sun to dry. In the summer, he used smoke to dry silk dyed black. In the autumn, he dyed a product known as xiah. In the winter, a whole year's output was delivered to the royal house. This short passage is extremely interesting. First, the classical sense of xiah, in the sense of summer, was used in a reference to the season. Second, the preclassical sense of xiah was used in a reference to a silk product. The two usages are found in the same sentence.

凡染，春暴練，夏熏玄，秋染夏，冬獻功。

It is not difficult to figure out what the dyer's product, xiah, is. It is not raw silk, for that was taken care of in the spring. It is not blackened silk, for that was done in the summer. Xiah has to be colored silk by a simple process of elimination. Why was the actual dyeing done only in the autumn? In most parts of China, autumn is a season of low humidity. As preclassical dyeing agents are not of high quality in terms of color fastness and brilliance, dyers learned long ago that the quality of color silk can be enhanced by repeatedly boiling the silk in pigment solutions after each drying. Since repeated drying is called for, there is no better season to do it in autumn, when little or no rain is expected.

What did traditional scholarship have to say about this passage in *Zhoulii*? In the industrial context, they said, xiah refers to the dye or pigment. The use of a dye is implied in the verb raan in qiu raan xiah. Since a substrate is required in any process of dyeing, the standard exegesis makes absolutely no sense. It is both a tautology and an impossible feat. No dyer could, or would want to, add color to a coloring agent. Even if there were such a crazy dyer, he or she

would never find employment in a royal house or anywhere else. One feature of RJZT scholarship is that it keeps a safe distance between the real world and itself.

In some contexts, xiah refers to red silk specifically. This is so because when a color is mentioned describing accouterments awarded by the king of Zhou in the BIS literature, it is almost always chih or red.[15]

Kaoogongjih was an encyclopedia of preclassical handicrafts in China. It was compiled during the transitional period between BAC and Iron Age China (IAC), not long after the redaction of *Chunqiu* by Confucius. How can anyone be so certain about the sequence of events that transpired so long ago? It is possible because we can date the events accurately by the language from different periods. *Chunqiu* has the names of four seasons, all in their preclassical usage. This passage in *Zhoulii* came from *Kaoogongjih*. The seasonal references are used in their classical sense. That means *Kaoogongjih* was compiled later. Yet, it was early enough so that the preclassical link of xiah with silk comes through unambiguously in the passage. Later in the classical period, e.g., by the time of Xuu Shehn, the preclassical language is almost completely lost. *Zhoulii* was composed sometime between the composition of *Kaoogongjih* and *Shuoweln*, by RJZT ideologues as the blueprint for a future feudal empire. The redactor of *Zhoulii* took *Kaoogongjih* apart and sprinkled bits and pieces of it throughout the new work, though the title *Kaoogongjih* was still used as the heading of one of its fascicles. The sheer scale of *Zhoulii* implies its late provenance.

3. *Zhuangz*

"Qiushuii" in *Zhuangz* has an interesting reference to qiu. It refers to a natural phenomenon familiar to people who lived in the Yellow River Basin: the river was filled with seasonal floodwater from hundreds of tributaries. The issue is: what seasonal floodwater? In the classical sense, qiushuii refers to autumn precipitation. In the preclassical sense, it refers to summer rains. In the reality of the temperate zone of continental East Asia, it is summer rains. The story was cast in the preclassical language if the precipitation indeed came on cue. This story in *Zhuangz* has a surprisingly early origin.

秋水時至，百川灌河。春蒐夏苗秋獮冬狩。

4. *Zuoozhuahn*

A brief sentence in the chapter for the fifth regnal year of Lord Yiin in *Zuoo-zhuahn* has the names of all four seasons: Chun sou, xiah miaol, qiu xiaan, dong shouh. It purports to describe a single main activity for each season of the

year. Understood in the classical sense, the sentence is obviously wrong. On the one hand, xiah miaol or planting seeds in the summer is too late. On the other hand, sou-xiaan-souh can all be understood as references to hunting. A farmer is supposed to sow the seeds in spring, and work the field for two seasons without interruption. The sentence makes perfect sense as a preclassical statement: In winter, the field was cleared for planting. In spring, the field was planted. In summer, pests were to be removed. In autumn, it was time for hunting.

This use of language proves that the author of *Zuoozhuahn* had access to genuine preclassical documents. Elsewhere in *Zuoozhuahn*, its author made it clear that he did not understand the languages of BAC. The strange mix of languages, plus other factors, leads this author to believe Liul Xin was the author of *Zuoozhuahn*, for as the chief of the Imperial Library in Chalngxan, he had the opportunity, the means, and the motivation to falsify history.

Section 5. Ramifications and Conclusions

Living languages evolve over time and space. There is no reason to believe the Chinese language is an exception.[16] The unstated RJZT assumption of an unchanging linguistic tradition is naturally suspect, and it turns out to be easily refuted by hard evidence. Though the central focus of this part is a set of four seasonal names, the scope of application for which is limited, the insight gained in this process has wide and unexpected applications.

1. Methodology

Early in the 20th century, a School of Skeptics appeared in China that clamored for a thorough re-examination of early Chinese history. Guh Jielgang was widely known as the leader of this group.[17] The SOS movement is a natural outcome of the impact of Western science. The movement was an admirable attempt that failed for lack of tools. Since there are important differences between the written languages of preclassical and classical China, the date of any passage in the received literature can be reasonably well determined by its content. With this new linguistic tool, the time to revive SOS has come.

As an example of this new approach, scholars should now interpret all passages where the seasonal references are used in the classical sense to be composed in the classical period. When the full spectrum of differences between the written language of BAC and IAC are taken into account,

paleography can serve as a highly sensitive tool for SOS scholars, producing internal evidence on the period of composition for each article of the received literature.

2. What about Hualxiah?

Hualxiah is the endonym of a people whose material culture has been associated with what archaeologists refer to as Yaangshaol and Lolngshan cultures. Since evidence for the existence of a silk industry is first associated with Yaangshaol, discovery of preclassical xiah represents a quantum leap in our understanding of this important group in early China.[18] If hual is the preclassical and early classical term for flower and xiah refers to red silk, it may not be an exaggeration to say that Hualxiah potentates could have considered themselves the dandies of antiquity. Seen in this light, the self-portrait of yiguan welnmilng also begins to make some sense.

衣冠文明，絲

From a paleographic angle, the Chinese name for silk has an interesting history. The term si is in the character set of OBS and BIS.[19] Xiah, as already noted, is in the character set of BIS but not in the character set of OBS. If Simaa Qian's account of the origin of Shang is to be believed, i.e., that Shang was native to East China, there is no reason why xiah as the word for silkworm and silk is missing in the character set of OBS. It is easy to understand why the character is missing if Shang were a nomadic group that had traveled the length of the Eurasian Steppes to come close to the source of silk. The name of the commodity is si, which also happens to be the native term for silk in IAC, when the root sense of xiah was lost. As the invasion of Shang brought to East Asia armed long-distance caravan traders, there is reason to believe early trade in silk attracted the Shang nomadic groups to the east. Search for sources of key commodities has prompted explorations and large-scale migrations throughout human history. The Eurasian Steppes are a land bridge between East and West Asia. There is no reason to believe the Silk Road started as late as the early classical period. In all likelihood, it started much earlier and actually led to the beginning of history in East Asia by the introduction of a script system modeled after the Mesopotamian cuneiform.

According to Walng Lih, the preclassical phonetic value of xiah is hea.[20] As it stands, this statement cannot be valid. There were many languages in BAC, hea cannot be the phonetic value of this character in all these languages. The statement is less objectionable if the phonetic value of hea is linked to a BAC Hualxiah language. In modern Hahn languages such as Yuehyuu (Cantonese) and Wulyuu (the language of a wide area surrounding Shanghai), 夏 has a

similar phonetic value. The root word for silk in modern Arabic and Persian has the phonetic value *har*. For Russian and Hungarian, it is *sho*. In Latin and other languages of Western and Southern Europe, it is *si*. Judging by phonetic value alone, it appears the early civilizations of West Asia were aware of the early phonetic value of xiah, and slightly later civilizations of Eastern Europe north of the Eurasian Steppes were aware of later phonetic values of xiah. The rest of Europe knew silk as si, a term used in the classical period of China.

The Greek term for silk is μεταξα. This word can be divided into two parts. Meta is a combinatory form that is extensively used in the Greek language. Ξα can be phonetically linked to xiah. Together the Greek word refers to a substance produced by the silkworm, or silk. If the origin of this Greek term is not previously understood, the issue can be settled now. One of the Greek names for China is Seres. Since this root word is also linked to silk, it may be based on si. Seres, presumably, refers only to Hualxiah, not all of China.

3. Liibeng yuehhuaih

Linguistic evolution is usually a gradual process of change. The transition from the preclassical to the classical sense in the case of chun-xiah-qiu-dong cannot be part of any evolution. It was a mutation. It happened in the span of decades, instead of centuries.

Chunqiu and *Kaoogongjih* were compiled in the transition period between the Chunqiu and Warring States periods. Confucius was said to have referred to it as a time of liibeng yuehhuaih. In the recorded history of China, this brief transitional period of close to one century stands out as one in which historical records abruptly fell silent. Judging by the language of *Chunqiu* and *Kaoogongjih*, there is reason to believe that both were compiled in this period. Yet, the meaning of the seasonal references had shifted. This was not a slow process. It practically happened overnight. Liibeng yuehhuaih should be a catastrophic event in which a society was destroyed and then regenerated. A sea change in language can be understood only in terms of the disappearance of a social stratum where knowledge was anchored, and the appearance of a new class of social elites. In the history of China, liibeng yuehhuaih coincided with the transition from BAC to IAC, and the transition from a society in which the building blocks were clans to a society of individuals.[21] There is reason to believe a change in the technological foundation led to the social upheaval and that in turn produced a series of changes that have not been repeated in the long history of China.[22]

There was a similar catastrophe in the eastern Mediterranean in the transition from its Bronze Age to its Iron Age. There is reason to believe Bronze Age Greece and BAC have much in common. Only Mesopotamia and Egypt appeared to have escaped a great upheaval between the Bronze Age and the Iron Age, probably because the social transition from clans to individuals took place much earlier in these two cradles of civilization.

Appendix
The Regnal Years of Lord Xuan of Zhou

The 2003 discovery of bronzes at Yangjiacun in Meixian, Shaanxi, has renewed interest in the chronology of Lord Xuan of Zhou; relevant dates in this particular reign in the Zhou era can serve as an illustration of the method introduced in Part I.[23]

眉縣楊家村

Table 5. Putative dates in the reign of Xuanwang found in bronze inscription.[11]

(a)	三年五月既死霸甲戌	*Sohng Diing*
(b)	五年三月既死霸庚寅	*Xijiaa Pan*
(c)	十又七年十又二月既生霸乙卯	*Cii Diing*
(d)	十又八年十又三月既生霸丙戌	*Wuhuu Diing*
(e)	十又九年四月既望辛卯	*Maa Diing*
(f)	廿又八年五月既望庚寅	*Huain Pain*
(g)	卅又二年五月既生霸乙卯	*Xihehmiain Wuiail Diing*
(h)	卅又三年六月既生霸丁亥	*Xihsanniain Wuiail Diing*

Working with the main table in reference 6, with corrected month order, entry (a) in Table 5 is actually a reference to day 27 of the fourth month, which is a jiaaxu, in the year 825 BCE or the third regnal year of Lord Xuan. A series of events led to an error in the month order. The winter solstice of 827 BCE fell within two or three days of the nearest new moon. The window of opportunity to tell this sequence of events apart is too short, resulting in a high probability of starting the second year in the reign of Lord Xuan one month early. Even though the corresponding window for observing the winter solstice of 826 BCE is longer, it is still possible for this error to carry into 825 BCE as the result of adverse weather conditions. This can explain why the fourth month was misidentified as the fifth. This date is otherwise in order.

Entry (b) is similarly off by one month. Day 24 of the second month of 823 BCE was gengyiin. This may be the result of another narrow window: the winter solstice of 824 BCE came within five days following the nearest new moon.

Entry (c) is fine as it stands. Day 3 of the twelfth month of 811 BCE was yiimaoo.

Entry (d) is fine as it stands. Day 10 of the thirteenth month of 810 BCE was biingxu.

Entry (e) is fine as it stands. Day 18 of the fourth month of 809 BCE was xinmaoo.

Entry (f) is problematic. Day 9 of the fifth month of 800 BCE was gengyiln. Day 9 of the lunar month has the moon phase of jihshengbah. In entry (f) the moon phase is jihwahng, or a few nights past full moon. There were no gengyiln in the previous or following month. In fact, there was no gengyiln in that entire year with the moon phase jihwahng.

Entry (g) has a problem similar to entry (f). Day 25 of the fifth month of 786 BCE was yiimaoo. This day had the moon phase jihsiibah instead of jihshengbah.

Entry (h) is fine as it stands. Day 4 of the sixth month of 785 BCE was dinghaih.

Of the eight dates, six are found to be in the reign of Lord Xuan in the Zhou calendar as it is worked out in this article. Two cases are found to be problematic, where more scrutiny is called for.

Entry (g) is a relatively simple case. This date came from the inscription on a bronze found at Yaingjiacun in 2003. According to initial coverage, there is consensus that the reigning king mentioned in *Xiyouhehmialn Wullail Diing* was Lord Xuan. Three out of four elements in this date record are consistent with the date of 786 BCE. The error in moon phase, where the character sheng should be replaced by sii, may be a typographical error, which is known to exist in both oracle records of Shang and bronze inscriptions of Zhou.

Entry (f) is quite different. *Hualn Diing* and *Hualn Paln*, with similar inscriptions, are usually treated as bronzes produced in the reign of Lord Lih. Lii Xuelqiln and others believed it was a product of the later reign because *Hualn Paln* and *Wullail Diing* both referred to a Shiiyuh. The idea is that if the king in *Hualn Paln* were Lord Lih, and the king in *Wullail Diing* was Lord Xuan, Shiiyuh would have an incredibly long span of service at the House of Zhou. Dating of Zhou bronzes is determined by a large number of factors. Changing dates around based on the single element of personal longevity is quite unusual.

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In this particular case, there is reason to believe Lii Xuelqiln and others were wrong on Shiiyuh. Preclassical shii, shih and lih are the same character. They are the equivalent of Shang-era xiaoocheln. They are also known as zuohceh, the equivalent of Shang-era zhenreln. Almost without exception, they were known only by their clan names. In other words, Shiiyuh is a generic name for all royal servants recruited from the clan of Yuh. As such, longevity of a single individual is a factor that cannot and should not influence the dating of *Hualn Paln* and *Hualn Diing*. The reason to change their date is unsound. It would be best to leave the date in the reign of Lord Lih.

Zhang Chalngshouh was observant when he noted that the difficulty in traditional calendar reckoning is systemic.[11] He saw the futility of moving individual dates around to accommodate difficulties that appear to crop up everywhere. This short article may be the systemic answer to the question Zhang has addressed.

Notes

[1] Edward L. Shaughnessy, "Calendar and Chronology," *The Cambridge History of Ancient China*, Cambridge University Press, 1999, p. 19.

[2] Group of Experts on Xiah-Shang-Zhou Chronology, Progress Report for 1996-2000, *Welnwuh*, 2000, 12, 49.

[3] For example, Zhang Chalngshouh, "Jinweln Lihpuu hel Xizhou Walngnialn," *Kaooguu*, 2002, 9, 80.

[4] Y. Tschang, "Shih and Zong," *Sino-Platonic Papers*, 140 (June, 2004), 1-28.

[5] Zhang Peilyul, *Zhongguol Xianqilnshii Lihbiaoo*, Qilluu Shusheh, 1987, appendix 4.

[6] The notion of margin of error is abandoned in quantum physics. In a series of articles in the journal *Physics Essays*, this author has argued quantum physics is a fatally flawed theory based on abuse of mathematical tools.

[7] Y. Tschang, *Chunqiu Luulih*, TDCS, NY, 1996.

[8] Y. Tschang, *Chunqiu Zuoozhuahn Pilngzhuh*, TDCS, NY, 2004. For a free digital copy, contact tdcs@mac.com.

[9] The mission statement for RJZT is to promote the meritocracy of Yaol-Shuhn and to emulate the rule of Weinwalng and Wuuwalng, 祖述堯舜，憲章文武. Ideologues and clerics are more interested in what should be and should have happened, rather than what did happen.

[10] Y. Tschang, "On Proto-Shang," *Sino-Platonic Papers*, 128 (November, 2003), 1-18.

[11] Yul Xiingwul and Yaol Xiaohsuih, ed., *Jiaaguu Weinzih Guuliln*, Beiijing: Zhonghual Shujul, 1996, entries 1436 and 1881.

[12] Yul Xiingwul and Yaol Xiaohsuih, *ibid.*, entry 1436.

[13] Yul Xiingwul and Yaol Xiaohsuih, *ibid.*, entry 1881.

[14] Xul Zhongshu, *Hahnxyuu Guuweinzih Zihxilngbiaoo*, Sihchuan Reinmiln Chubaansheh, 1981, p. 208.

[15] The red background in the Chinese flag today came from the West as the color of a social class. That class never existed in China in sufficient numbers to qualify itself as a major social class. Color red may be more appropriate as a symbol of Hualxiah

dominance in the Chinese civilization because of this link with Zhou tradition. However, ethnic domination will never work in a multiethnic country like China. No matter how one looks at it, there is something distasteful in the color red as a national symbol.

[16] To the best of our knowledge, there is only one script tradition in BAC, and the same tradition is continued to this day. One cannot speak of the written language of China in the plural. With the spoken language, RJZT is obviously wrong in its implicit assumption that linguistic variation is the result of localization. Even though Chinese linguists use the term "dialect" to describe local tongues in Hahn China, all Western linguists refer to them as languages. This author would go further to stipulate that there are several language families in Hahn China, under the umbrella of Sinitic.

[17] Guh Jielgang, *Guushiibiahn*, reissue of Shahnghaii Guujil Chubaansheh, 1982.

[18] According to Jiaang Youlloing, silk fabric dating to about 3000 BCE was discovered in 1984 at a Yaangshaoi site at Qingtail, Yiingyaing, Heinain. The original report was not cited in *Zhongguoi Sichouishii*, edited by Zhu Xinyuu.

[19] Yui Xiingwui and Yaoi Xiaohsuih, *ibid.*, article 3193; Roing Geng, *Jinweinbian*, Beiijing: Zhonghuai Shujui, 1985, p. 873.

[20] Waing Lih, *Toingyuain Zihdiaan*, Beiijing: Shangwuh Yihnshuguaan, 1982, p. 144.

[21] Many choose to refer to this as the society of families. The two terms are equivalent in a historical sense. A more accurate term is danxganghuh, an accounting unit for individuals. Individual accounting units were sometimes camouflaged by the classical practice of treating some employees as members of the extended family of their lifetime employers.

[22] *Chunqiu* and *Zuoozhuahn* are especially significant because they contain the only known account of the transition from a society of clans to a society of individuals, which in the classical context is generally known as a society of families.

[23] Shaanxi Institute of Archaeology, *et al.*, "Meiixiahn Yaingjiacun Xizhou Qingtoingqih Jiaohcaing Fajuei Jiaanbaoh," *Weinwuh*, 2003, 6, 4, and accompanying articles in the same issue.

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