

## NOTES ON TRANSLATIONS OF THE EAST ASIAN RECORDS RELATING TO THE SUPERNOVA OF AD 1054

David W. Pankenier

Department of Modern Languages and Literature, Lehigh University,  
9 West Packer Avenue, Bethlehem, PA 18015, USA.  
E-mail: david.pankenier@lehigh.edu

**Abstract:** The East Asian records of the ‘guest star’ of 1054 that produced the Crab Nebula have been re-evaluated more than once during the past decade. Although some of the apparent inconsistencies in the records have now been addressed, doubts about the reported position of the supernova still persist. The published translations of the records, moreover, are still unsatisfactory in certain respects. Here I offer corrections to the translations of several records, present a previously-unreported contemporaneous account of the guest star, and suggest an explanation of why the Song Dynasty astronomers erroneously placed SN1054 southeast of  $\zeta$  Tau.

**Keywords:** Crab Nebula, supernova, SN1054, East Asia, China, Song Dynasty, history of astronomy

### 1 BACKGROUND

In the book *Historical Supernovae and their Remnants*, Stephenson and Green (2002) provide a thoroughgoing and authoritative study of the East Asian records that report the appearance of a ‘guest star’ in AD 1054. A subsequent paper by Stephenson (2004) adds the results of further study of the technical terminology. A previous re-evaluation of the East Asian and Western reports by Breen and McCarthy (1995) made progress toward dispelling misconceptions and apparent contradictions between the dates of the Japanese and Chinese records. Stephenson and Green’s painstaking analysis has now advanced this project further toward a definitive account. When I was translating the relevant passages some time ago, my curiosity was also piqued by the apparent discrepancies among the surviving accounts, which I thought must have been a consequence of misreading or misdating of the records. Stephenson and Green have now corrected some of these problems, but notably a copyist’s error in the date (*yichou* for *jichou*) in *Xu zizhi tongjian changbian* and Duyvendak’s (1942a) erroneous Julian date for the guest star’s disappearance in 1056. Given the evident contradictions among the records, it is surprising that in the sixty years since Duyvendak’s initial publication no one actually went back to the original sources to re-examine their context until Stephenson and Green (2002) did just this—and to such good effect.

In what follows I propose to comment on the translations of the records. In the process I add a newly-discovered contemporary reference to the guest star from a highly reliable source, and add some thoughts on a lingering problem—the reported location of the guest star southeast of  $\zeta$  Tau in the “Treatise on Astronomy” in the *Song shi*, which is inconsistent with the actual position of SN1054 northwest of that star.

### 2 TRANSLATIONS

For the most part, inaccuracies in the previous translations of some of the records do not materially affect the astronomical import of the texts. Since these records are apt to be frequently quoted in the future, however, perhaps it would be useful to have more precise translations on record, especially for historians of science who might find the astrological implications worthy of study. The best translations to date are those offered by Stephenson and Green (2002; 2004), so I

will take these as the basis for my comments. Let me begin with their translation of the record from the *Song huiyao* (2002: 120; modified 2004: 96).

#### 2.1 *Song huiyao* (Composition of Essential Documents of the Song Dynasty)

Zhihe reign period, first year, seventh lunar month, 22<sup>nd</sup> day [= 27 April 1054] ... Yang Weide said, ‘I humbly observe that a guest star has appeared; above the star in question there is a faint glow, yellow in colour. If one carefully examines the divinations concerning the emperor (i.e. Renzong), the interpretation is as follows: The fact that the guest star does not invade (fan) Bi and its brightness is full means that there is a person of great worth ...’

Yang Weide’s language follows the normal linguistic conventions when submitting an opinion to the Throne. That being the case, it is inconceivable that he would have addressed Emperor Renzong directly using the term *huangdi* (皇, ‘Emperor’). The required form of indirect address would be *bixia* (陛下). The string that contains the word *huangdi* (*Huangdi zhangwo zhan*) reads very much like the title of a book or compendium of divinations, of which there are many examples on record ending with *zhan* (or ‘prognostication’). The title of the work might therefore be rendered *Prognostications in Respect of the Emperor*, from which Yang then quotes, signaled by *yun* (云). Since Yang’s prognostication does, indeed, refer to the person of the Emperor, he certainly would have cited precedent, rather than ‘going out on a limb’ by proffering an unsupported personal opinion. To my knowledge, no book entitled *Huangdi zhangwo zhan* has survived, but this is hardly surprising as it would certainly have been closely held at Court and, consequently, lost in the conflagration when the Dynasty fell. Therefore, I suggest that Stephenson and Green’s, “If one carefully examines the prognostications concerning the Emperor (i.e. Renzong), the interpretation is as follows ...”, should be emended to: “I respectfully submit that the *Prognostications in Respect of the Emperor* says ...” Similarly, the text that immediately follows, which Stephenson and Green (2002: 120) render as “The fact that the guest star does not invade (fan) Bi and its brightness is full means that there is a person of great worth ...” should actually be “... if the guest star does not trespass on Bi [LM #17], an Abundantly Enlightened One is ruler, and the State has Great Worthies [in office].”

In Stephenson and Green's translation the same *Song huiyao* record concludes:

First year of the Jiayou reign period, third lunar month, the Director of the Astronomical Bureau said: 'The guest star has vanished, which is a portent of the departure of the guest'. Earlier, during the first year of the Zhihe reign period, fifth lunar month, it appeared at daybreak at the eastern direction, guarding (shou) Tianguan. It was seen in the daytime, like Venus. It had pointed rays in all directions and its colour was pale red. In total it was seen (in daylight) for 23 days.

The first of the astrological pronouncements in *Song huiyao* is attributed to Yang Weide by name. Yang was the most experienced senior official in charge of the Directorate of Astronomy and the Calendar at the time. That prognostication dates from the seventh month (27 August 1054), by which time the guest star was no longer seen in daylight, although it had been for nearly half the time since it first appeared on 4 July, seven weeks earlier. One can only speculate about the reasons for Yang's delaying until late August to report his astrological interpretation, although the stylistically very similar report of SN1006 a half-century earlier was also delayed by a month, and as Stephenson and Green suggest (2002: 152), "... evidently there was much deliberation before a report and prognostication could be released." The most likely explanation is that the responsible officials prudently awaited further developments before committing themselves to an interpretation. No doubt they would have wanted to confirm whether the object was a guest star or a comet (i.e. whether it moved), whether it would soon disappear, and so on, before offering an interpretation.

The second astrological pronouncement in the text follows the disappearance of the anomaly some twenty-one months later and is attributed to the Director of Astronomy (*sitianjian*), which was Yang Weide's official title. Its purpose was to bring satisfactory closure to the event. Yang, who was the senior official authorized to make such reports to the Court, quotes from the original observation the interesting facts that the guest star first appeared at dawn in the east and was visible in daylight for twenty-three days. Why this daylight appearance is mentioned here and not elsewhere is unclear, but it is likely that it had to do with the fact that the star had initially appeared reddish-white (presumably due to its low altitude), before it assumed a yellowish cast. The latter coloration is almost certainly due to the yellowing of the summer sky in North China by the fine loess dust blown in from the northwest by seasonal winds, a phenomenon observable to this day.<sup>1</sup> Yellow being the Imperial color, the star's apparent shifting coloration may have been an important astrological consideration. It is perhaps also worth noting here that the subsequent change of reign title, from *Zhihe* ('Attained Harmony') to *Jiayou* ('Auspicious Aid'), from the ninth month of 1056, may well have been intended to commemorate the appearance (and disappearance) of the supposedly 'auspicious' astral omen (but see below).

## 2.2 *Qidan guo zhi* (History of the Qidan Kingdom)

The report in the *Qidan guo zhi* is translated by Stephenson and Green (2002: 124) as follows:

Year yiwei [32]; Chongxi reign period of (King Xingzong), 23<sup>rd</sup> year, eighth lunar month, the ruler of the kingdom died, having reigned for 25 years; Song dynasty, Zhihe reign period, second year ... Previously there had been a solar eclipse at midday (*zhengyang*), and a guest star had appeared at Mao. The Deputy Officer in the Bureau of Historiography, Liu Yishou [sic] said: 'These are omens that Xingzong will die'. The prediction indeed came true.

The style of this record parallels that of the *Song huiyao* passage above in combining brief reference to the astral anomalies with astrological prognostication. Here again, this represents a summing up of the significance of, in this case, what are taken to be inauspicious astral omens. Stephenson (2004: 97) corrects the discrepancy in the Song date, showing that "... Zhihe reign period, second year..." is an obvious mistake for 'first year' (although his discussion mistakenly states "... the 23<sup>rd</sup> year of the Zhihe reign period was A.D. 1055-1056 ...", when he meant to say "... the 23<sup>rd</sup> year of the Chongxi reign period was A.D. 1055-1056 ..."). Liu Yisou's title, *zhuzuo zuolang*, is better rendered, "[Palace Library] Assistant Editorial Director" (Hucker: 1978). Liu Yisou's remark, *Xingzong qi si hu* (興宗其死乎, or "might Xingzong die?"), is a hypothetical and is best rendered that way. Stephenson attributes only the first comment to Liu; however, it is equally plausible that the last two sentences are also Liu's, recalling his earlier prediction after the fact, especially since the King is being referred to by his posthumous title, *Xingzong*. Therefore, an alternative translation would be: "[Palace Library] Assistant Editorial Director, Liu Yisou said, '[were they signs that] Xingzong might die? Now what was anticipated has come to pass'."

The timing of the eclipse is said to be *rishi zhengyang* (日食正陽). Duyvendak (1942a: 177) originally misread the text and punctuated between *rishi* (eclipse) and *zhengyang*, leading him to mistranslate *zhengyang* as 'first month' and attach it to the following "... a guest star appeared." Breen and McCarthy (1995: 367) follow Duyvendak. Ho et al. (1970: 4) follow Duyvendak in punctuating after *rishi*, but offer 'at midday' for *zhengyang* instead. Stephenson and Green (2002: 124) follow Ho in translating *zhengyang* 'at midday' and put forward the novel suggestion that the reference is to the partial solar eclipse (maximum 0.53 at 14.2h) on 13 November 1053. This seems only a modestly better fit than the eclipse of 10 May 1054 (maximum of 0.39 at 16.9h), since the 1053 eclipse maximum was over an hour past the noon double-hour of 11:00-13:00, which hardly qualifies as 'midday'. While the translation of *zhengyang* as 'at midday' might be defensible if either eclipse had occurred at noon, in fact, there is another explanation. It should be remembered that the chief significance of this passage is astrological; therefore, it is not surprising that the terminology should depart from the typical observational record. Had the author been an astronomer, he would doubtless have been more precise about the location of the guest star, as well as the hour of the eclipse. As it happens, however, in certain contexts the term *zhengyang* has a specialized astrological significance of '4<sup>th</sup> month', which fits the context perfectly here.<sup>2</sup> Because this is precisely when the dominance of the *yang* force is culminating, the portentological interpretation stresses that a solar eclipse in this month is particularly ominous (*mutatis mutandis* in the tenth month). This

explains why the astrological term *zhengyang* appears here in conjunction with a solar eclipse, rather than the more standard '4<sup>th</sup> month'.<sup>3</sup> Therefore, what we have in this record is not a competing date for the guest star, but a correct dating of the 10 May 1054 solar eclipse to the fourth month.

### 2.3 *Lidai mingchen zouyi* (Memorials by Famous Officials Through History)

The *Lidai mingchen zouyi* (see Figure 1) dates to AD 1414, and includes the following account:

2<sup>nd</sup> year of the Zhihe reign period of Emperor Renzong of Song [1055]; Attendant Censor Zhao Bian submitted a letter saying: "Your servant considers that, since the 5<sup>th</sup> month of last year [when] the baleful star appeared, a full year has passed and until now its brilliance has not faded [lit. 'retreated']. This is what Gu Yong meant by 'its rapid movement, the variations in the length of its flaming rays, and the [asterisms] on which it has trespassed successively,' as a censorious anomaly it is greatly to be feared." (Ch. 301: 3916b).

This is a passage that has not been placed in evidence previously. It is excerpted from a memorial to the Throne written by Palace Censor Zhao Bian (趙卞) (1008–1084), a high-ranking official in the Censorate, which independently investigated malfeasance among Palace personnel and court officials (see Hucker, 1985:

431). Zhao is writing in connection with an impeachment case involving the Grand Chancellor, in late July or August of 1055 (see Wu, 1990: 240).<sup>4</sup> Immediately following Zhao Bian's memorial is another by a lower-ranking official, Fan Zhen. In it Fan also mentions the guest star's period of visibility as "... one year up to the present." Based on an internal reference to the autumnal equinox on "... the 23<sup>rd</sup> day of the present month ..." (16 September 1055), Fan's memorial may be dated to the eighth month of 1055. It is worth noting that both Zhao's and Fan's memorials interpret the significance of the astral omen quite differently from the Director of Astronomy, Yang Weide, who put a positive spin on the anomaly. Unlike Yang, who was clearly out to flatter the Emperor, it was Zhao Bian's official duty to investigate wrongdoing and to remonstrate with the Emperor concerning the Government's shortcomings. In quoting the Former Han Dynasty official, Gu Yong (谷永), Zhao is alluding to the dismal portents associated with the ominous appearance of Halley's Comet in 12 BC (cf. Cullen, 1991: 117). He is not asserting that the guest star of 1054 has moved, but is drawing an analogy with the dismal implications of the precedent of 12 BC. Zhao has truncated Gu's statement, leaving it to the informed reader to draw the appropriate implications. Gu Yong's original comment is worth quoting in full:

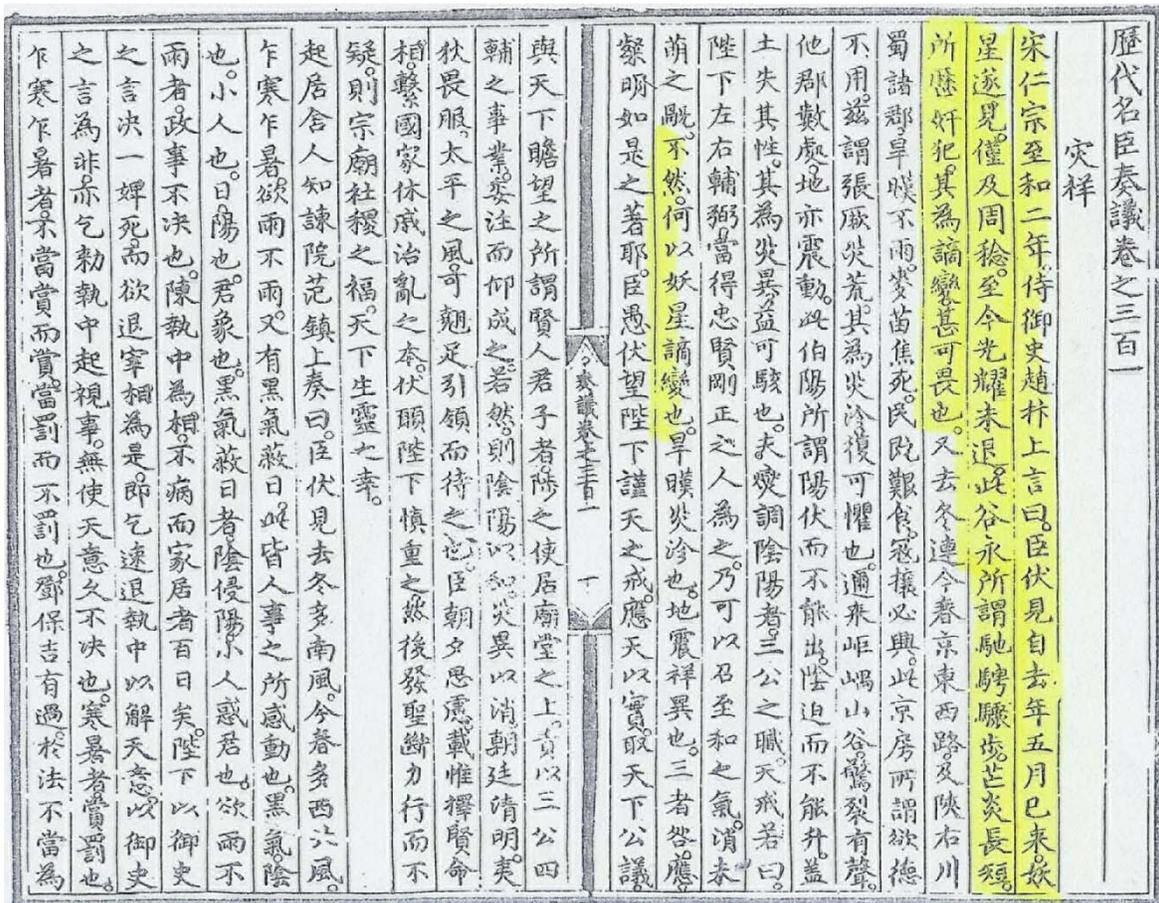


Figure 1: Zhao Bian's memorial to Emperor Renzong from *Lidai mingchen zouyi*. The shaded passages refer to the guest star.

谷永对曰：“上古以来，大乱之极，所希有也。察其驰骋骤步，芒炎或长或短，所历奸犯，内为后宫女妾之害，外为诸夏叛逆之祸

Gu Yong responded: “This is an omen of extreme disorder such as has rarely been seen since high antiquity. If we examine its rapid movement, the variations in the length of its flaming rays, and the [asterisms] on which it has trespassed successively, [it clearly signifies] harm to the women of the rear palace within, and the disaster of rebellion in the realm without.” (after Cullen, 1991: 117, but with modifications).

In fact, the Former Han Dynasty fell barely twenty years after this ominous portent in 12 BC. In the present case, among the recent calamities referred to in Zhao’s and Fan’s memorials are severe drought, widespread banditry, and earthquakes, all indicative of an imbalance of *yin* and *yang*, which reflected badly on the Imperial administration. Even allowing for a certain amount of rhetorical exaggeration, specifically the implication that the guest star had not faded for a full year (unless, of course, he simply meant it had not disappeared), Zhao Bian’s memorial provides independent confirmation from an impeccable source that the supernova was first observed in the fifth month of 1054.

#### 2.4 *Meigetsuki* (*Diary of the Bright Moon*)

The *Meigetsuki*, by Fujiwara no Teika [Sadaie] (1162–1241), states:

Tenki reign period of Emperor Go-Reizei, second year, fourth lunar month, after the middle ten-day period (zhongxun yihou). At the (double) hour of chou (1-3 am), a guest star appeared in the degrees of (the lunar lodges) Zui (xi) and Shen. It was seen in the eastern direction and emerged [bo] at the star Tianguan. It was as large as Jupiter.

Stephenson is translating the record found in the poet Fujiwara’s diary, written ca. 1230, nearly a century and a half after the event, although it draws on some unknown eyewitness testimony. Like all Japanese records of astronomical observations from this period, it is in Classical Chinese. Breen and McCarthy (1995: 372) suggest the possibility of a common origin with the *Song huiyao* account above, which Stephenson and Green (2002: 126) discount on the grounds of linguistic variation. In fact, the *Song huiyao* records were kept secret within the Palace, suffered great losses when the Song Dynasty fell in 1279, and were only partially preserved in the form of Li Xinchuan’s (1166–1243) *Xu zonglei huiyao* which was later copied into the *Yongle dadian* encyclopedia in the Ming Dynasty (Hervouet, 1978: 177-178). Since Li and Fujiwara were exact contemporaries, it is most unlikely that Fujiwara or his predecessors in Japan who were responsible for the record could have had access to the *huiyao*. The *Meigetsuki* account is an independent record of the guest star.

Most researchers now agree that the 4<sup>th</sup> month date in *Meigetsuki* must be a mistake for ‘5<sup>th</sup> month’, not least because in the humid climate of Kyoto in summer ζ Tau’s heliacal setting ought to have occurred not later than 8-9 May. The fourth month did not begin until 10 May, and the report states that the guest star was not observed until after the twentieth day of the month, or 29 May, at which time ζ Tau was still in conjunction with the Sun. Some who have discussed

this passage in the past have also been perplexed by the use of *bo* (‘fuzzy/bristling/tail-less comet’), and have questioned whether the final clause refers to the original guest star or to the appearance of a new comet. Ho Peng Yoke et al. (1972: 5) express doubt, but Duyvendak (1942a; 1942b) does not, and Breen and McCarthy (1995: 372) ultimately also draw the correct conclusion, as do Stephenson and Green (2002: 126) and Stephenson (2004: 98): this last clause is not reporting a separate phenomenon. In fact, the verbal use of *bo* here, which actually means ‘fuzzy’ or ‘bushy’, is entirely regular and consistent with cometary records where it is used to describe the appearance of tail-less comets, or the changed aspect of a comet after having lost its tail. Classical Chinese grammar requires that the common term for this circumstance, *xing bo* (‘star’ + ‘fuzzy’), be understood, not as a noun modifying a following noun, but as a subject followed by a verb (literally ‘a star fuzzied’), which may suggest a change from a pre-existing condition. This ancient usage derives from a conception in which stars were thought to be capable of spontaneously becoming fuzzy, growing a tail, and even moving about at will. It is therefore inappropriate to translate *xing bo* as ‘bushy star’ by analogy with *hui xing* (‘broom’ + ‘star’), which is quite properly translated ‘broom star’. Thus, when one reads in the record of the comet that appeared in the sixth month of AD 396, *you xing hui yu maotou* (有星慧于髦头) (*Wei shu: tianxiang zhi*, Chapter 10), while this is conceivably an accidental inversion of *hui xing* (‘broom star’), one cannot rule out the rendering “... there was a star that became broom-like in MAOTOU [i.e. lunar mansion 19, MAO].” In the passage from *Meigetsuki*, *bo* is intended to suggest that when first spotted the guest star resembled the head of a comet. Only on continued observation would it become clear that the stationary object was not a comet. Moreover, where there is no explicit change of subject, the grammar and syntax of Classical Chinese also require following verbs to refer to the nearest antecedent subject. Stephenson and Green, sensing the need for a verb in the clause, resort to rendering *bo* here as ‘emerged’, but this is inappropriate as it substitutes a different meaning instead of verbalizing the existing word whose sense in such contexts is well known. Therefore, I suggest the following is more appropriate: “... it appeared in the east, fuzzy [like a tail-less comet] at the star Tianguan, and as large as Jupiter.”

#### 2.5 *Song shi: Tianwen Zhi* (*Treatise on Astrology*)

Stevenson and Green (2002: 123) translate Chapter 56 in the *Song shi* as follows:

Zhihe reign period, first year, fifth lunar month, (day) jichou [26]. [4 July 1054] (A guest star) appeared (chu) to the southeast of Tianguan possibly several inches away (ke shu cun). After a year and more it gradually vanished (shaomo).

#### 2.6 Synthesis

Once the problematical passages are accounted for, as Stephenson and Green demonstrate, the collected records from a variety of East Asian sources on the whole provide a detailed and consistent account of this exceptionally long-lasting and luminous object. Consistent, that is, with one exception. A remaining non-trivial problem is the reported position of the guest star

southeast of *Tianguan*, or  $\zeta$  Tau, which is at odds with the actual position of the Crab Nebula about  $1.1^\circ$  northwest of that star.

Now, Ho et al. (1972: 9) quite rightly point out that "... the eleventh century in China happened to be a period renowned for its astronomical instruments and accurate observations." Stephenson and Green (2002: 131) and Stephenson (2004) provide detailed analysis of contemporaneous records of planets trespassing on *Tianguan*, which confirms the observational precision of which medieval Chinese astronomers were capable. Stephenson's (2004: 100) investigation of angular separations of recorded planetary conjunctions establishes the equivalence  $1 \text{ cun} \approx 0.1^\circ$ . Faced with the problem of reconciling the Song astronomers' observational acumen and the reported location of the guest star with the actual location of the Crab, Breen and McCarthy (1995: 370) propose that the use of the term *shou* ('guard') in several records carries the implication that the guest star was positioned above the *Tianguan* star, and they conclude that the records placing the guest star southeast of  $\zeta$  Tau must have resulted from an inadvertent substitution of 'southeast' for 'northwest'. Stephenson (2004: 101) re-examines records of *shou* ('guarding') and concurs with Breen and McCarthy that, "... when a planet or other celestial body was said to 'guard' a star it nearly always lay a little towards the north of the star ..." and that a reversal of relative directions must have occurred. However, directionality does not figure in any of the several definitions of *shou* cited by Ho (1966: 36). Nor are there any Chinese terms corresponding to *shou* for the circumstance when a planet or other object 'guards' a star to the south, east, or west. Therefore, the suggestion that *shou* implies a specific direction relative to the object being 'guarded' requires both a convincing explanation of the term's usefulness as well as further instances before it can be accepted. An inadvertent confusion of 'southeast' (東南) with 'northwest' (西北), whether by copyist's error or mental lapse, while not inconceivable, seems an unsatisfying explanation.

### 3 DISCUSSION

In drawing attention to the comparatively precise measurements of which the Song astronomers were capable, Ho et al. (1970), Stephenson and Green (2002: 132) and Stephenson (2004: 100) offer a clue that may point in a fruitful direction. Given that Song Dynasty astronomers routinely achieved an observational accuracy of  $\pm 0.5^\circ$ , what could explain the vagueness of the positional information found in the *Xu zizhi tongjian changbian* and *Song shi* records which place the guest star "... about a few inches southeast of *Tianguan*"?<sup>5</sup> How can such a seemingly crude report be reconciled with the excellent reputation of the Directorate of Astronomy? If we can satisfactorily answer this question, perhaps it will be possible to arrive at a different explanation for the contradiction between the reported position of the guest star and the actual location of SN1054, besides the conjectured substitution of 'southeast' for 'northwest'.

Let me briefly suggest a scenario that might account for the discrepancy. We know from the guest star's subsequent visibility in daylight that its maximum apparent visual magnitude would have equaled or exceeded  $-3.7$ , and that it appeared to emit rays in all directions. The imprecision of the recorded linear

distance from  $\zeta$  Tau, at a time when the astronomers were capable of measuring the location of fixed stars to within a few tenths of a degree, certainly seems to indicate some impediment to direct observation. Recalling that the guest star's luminosity at this time may have approximated that of Venus,<sup>6</sup> and that it is reported to have been seen to 'sparkle' or scintillate, as a practical matter it may not have been possible even to see  $\zeta$  Tau ( $m_v = +2.96$ ) with the guest star only  $1^\circ$  away.

Under the best of circumstances, from the Song capital at Kaifeng ( $34.47^\circ$  N,  $114.20^\circ$  E) with good seeing ( $k = 0.20$ ) and a limiting visual magnitude of  $+6.0$ ,  $\zeta$  Tau's heliacal rising could ideally have been observed on 2 July, with the star at an altitude of  $6^\circ$  and the Sun at  $-14^\circ$ . As has already been mentioned, however, the atmosphere in North China in late spring and summer is often loaded with loess dust, particularly in a year of severe drought such as 1054. Under such conditions, observation of  $\zeta$  Tau's heliacal rising could well have been delayed by quite a few days. In addition, in the pre-dawn hours on 4 July,  $\zeta$  Tau's angular separation from the waning Moon (21% illuminated and at magnitude  $-7$ ) was only  $21^\circ$ , probably resulting in a limiting visual magnitude of about  $+3.0 \pm 20\%$ . Taken together, these considerations—SN1054 as bright as Venus and only  $1^\circ$  away, poor seeing, the Moon's proximity—suggest that it is highly unlikely  $\zeta$  Tau could have been directly observed on 4 July. Indeed, Collins et al. (1999: 875) show that "... it would have been more than a week after July 4 before  $\zeta$  Tau became visible in the dawn sky."

### 4 CONCLUSION

Given the above circumstances, perhaps an alternative explanation may be conjectured. First, given the likelihood that  $\zeta$  Tau was invisible on 4 July, it is probably safe to conclude that the report of the guest star's position relative to that star is not the result of direct measurement at all. Since the guest star was observed only in daylight for the next three weeks, it may be that the position of SN1054 was measured as soon as practicable using an armillary sphere, perhaps based on the location of a known body some distance away (such as  $\beta$  Tau, or some other nearby reference star). Although routine, such indirect procedures would have been prone to larger error than direct measurement. Error could also arise from the previously-measured position of the reference star chosen, or depending on the method employed, as a result of clock error in timing meridian transits. In either case—and certainly the latter—an error of the order of less than two degrees in the presumed position of the guest star would hardly be surprising, and is comparable with positional measurements of the guest star of 1006 (see Stephenson and Green, 2002: 171). Whatever the case may be, it is difficult to reconcile the vagueness of the language employed in the 1054 record with the supposition that this is the result of actual measurement of the separation of SN1054 from  $\zeta$  Tau on 4 July.

One must also keep in mind the astrological imperative motivating the observations. This was not dispassionate scientific inquiry. Rather, it would immediately have been a matter of great urgency to determine the nature of the occurrence and its approximate position, so as to report the phenomenon and its

implications to the Court, at least preliminarily. Subsequently, it would have been essential to watch for any movement of the guest star in order to provide a definitive astrological interpretation. Given the major controversy at the Court a half-century earlier provoked by the appearance of the guest star of 1006, it is likely that the astronomers would have been working under intense pressure. Therefore, the reported position "... about a few inches southeast of *Tianguan* ..." may simply represent the best approximation possible under the circumstances, which the astronomers clearly signaled by the imprecision of their language—*ke shu cun* ("... about a few inches ..."). Positional reports concerning stationary objects amenable to precise measurement otherwise lack that telltale *ke* ('about') and *shu* ('a few'). Once the approximate position of the guest star was established accurately enough for astrological purposes, bureaucratic inertia or a lack of scientific curiosity meant that its precise position was never reported—even when it was later possible to measure it—and the official interpretation of the phenomenon was settled at the time of Yang Weide's report to the Emperor on 27 August 1054. However, as we have seen from Zhao Bian's remarks, when the brilliant guest star continued to linger after a full year, the initial auspicious interpretation of the phenomenon was very much open to question in the minds of some high-ranking officials.

## 5 NOTES

1. Chinese reports of the supernova of 1006, which was observed on 1 May that year, stress the yellowish coloration of that guest star as well. Simultaneous Japanese observations (Stephenson and Green, 2002: 161) report the color as bluish-white, which shows clearly that the Chinese were accurately reporting local atmospheric effects in North China.
2. For this definition of *zhengyang*, see *Zhongwen da cidian* (*The Encyclopedic Dictionary of the Chinese Language*), Volume 5, page 7575, sub 16611.324, glosses 3 & 4.
3. In Stephenson's (2004: 97) re-examination of this record he alludes to this possible alternative rendering, but without further comment.
4. Wu Yiyi (1990: 241) provides a date of 20 February 1055 for this memorial, but there is no precise date given in the text and, in any case, Zhao Bian clearly states that a full year had elapsed since the first appearance of the guest star. Wu also misinterprets (and mistranscribes) *zhouren* ('a round year') in the passage as the name of an asterism.
5. Stephenson and Green (2002) and Stephenson (2004) consistently translate *ke* in this context as 'possibly'. They and others appear to have been influenced by the modern binome, *keneng*, which does mean 'possibly'. In Classical Chinese, however, depending on the context, *ke* by itself means 'can/may', 'permit' or 'approximately', but not 'possibly'.
6. The *Song shi* (Chapter 12), reports a near simultaneous daytime observation of Venus (apparent visual magnitude  $-4.1$ ) on 7 July 1054, three days after the discovery of the guest star, so the *Song hui yao* report comparing the daylight appearance of SN1054 with Venus could well imply that the two were comparable in brightness.

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- Dr David Pankenier is Professor of Chinese at Lehigh University, Bethlehem, Pennsylvania (USA). An intellectual historian by inclination, his current research interests range from the history of ideas in China to cultural astronomy and contemporary Chinese affairs. He has co-authored *East Asian Archaeoastronomy: Historical Records of Astronomical Observations of China, Japan, and Korea* (Amsterdam, 2000), as well as numerous research papers on ancient Chinese astronomy, astrology, chronology, classical literature, and intellectual history.