

Arundhatī, Vasiṣṭha, and Nilesh Oak's Dating of the Mahābhārata War—A Critical Examination

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Dedicated to Nilesh Oak and Prabhakar Phadnis

Abstract

This essay discusses and criticises Nilesh Oak's interpretation of the Arundhatī-Vasiṣṭha omen which according to the Mahābhārata took place shortly before the great war. Oak is of the opinion that this omen refers to a change of the relative positions of the two stars Mizar and Alcor in right ascension due to the precession of the earth axis. He concludes that the Mahābhārata War must have taken place between about 11,091 BCE and 4508 BCE. Keeping aside the problems that arise for such a high chronology from historical and archaeological facts, in this essay it is argued that Oak's interpretation is based on so extremely long-term changes in the appearance of the sky that it does not provide a plausible "omen". After the discussion of Oak's solution, possible alternative solutions are studied. The author proposes that the verse could refer to a time of the year in autumn when Alcor was above Mizar after sunset, but below Mizar before sunrise, so that during the night Arundhatī "placed" Vasiṣṭha "on her back", as it were. Finally, the date of war proposed by Oak is examined, namely 16 October 5561 BCE. Some verses of the Mahābhārata that mention astronomical circumstances during the war and that in Oak's opinion support this proposed date are carefully studied. It is demonstrated that in reality they do not support this date but actually prove it wrong.

Contents

Approaches to the Arundhatī-Vasiṣṭha Verse	2
1. Description of a Miracle?	2
2. Change of Relative Position Due to Precession?	4
3. Temporary Invisibility of Alcor?	9
4. A Temporary Outburst in Brightness of Variable Star Alcor?	12
5. Did Mizar Lose Circumpolarity before Alcor?	13
6. A Seasonal Phenomenon—Mizar above Alcor at Sunrise?	14
Which Solution is Correct?	20
Other Astronomical Information from the Mahābhārata Used by Oak	21
Jupiter and Saturn near Viśākhā	21
Saturn near Bhaga (Uttaraphalgunī)	24
Mars "going vakri near Magha"	25
"Tivra or Tikshna, Planet or nakshatra near Krittika"	26
Seven Planets Near the Sun	27
Solar and Lunar Eclipse	33
Conclusion	34

Approaches to the Arundhatī-Vasiṣṭha Verse

1. Description of a Miracle?

In Bhīṣmaparva 2, Vyāsa informs King Dhṛtarāṣṭra about omens that took place shortly before the war and allegedly indicated a great bloodshed. One of his verses reads as follows (translation mine):

या चैषा विश्रुता राजंस्त्रैलोक्ये साधुसंमता

अरुन्धती तयाप्येष वसिष्ठः पृष्ठतः कृतः (31)

*yā caiṣā viśrutā rājaṃstrailokye sādhusaṃmatā
arundhatī tayāpyeṣa vasiṣṭhaḥ prṣṭhataḥ kṛtaḥ (31)*

And, O king, she who is praised in the three worlds and esteemed highly by the Sādhus, Arundhatī, she has even placed [her husband] Vasiṣṭha on her back (or put him behind herself?).

While everybody agrees that Arundhatī and Vasiṣṭha are the two stars Mizar and Alcor in the constellation Ursa Major, the exact astronomical meaning of the verse remains a mystery. Neither ancient nor modern authorities give an explanation, with the only exception of Nilesch Oak in his book “When did the Mahabharata War Happen?” Before examining Oak’s solution let us pay tribute to the context of the verse:

देवताप्रतिमाश्चापि कम्पन्ति च हसन्ति च

वमन्ति रुधिरं चास्यैः स्विद्यन्ति प्रपतन्ति च

*devatāpratimāścāpi kampanti ca hasanti ca
vamanti rudhiraṃ cāsyaiḥ svidyanti prapatanti ca (26)*

The idols of the deities both tremble and smile
and vomit blood with their mouths, they sweat and fall down.

अनाहता दुन्दुभयः प्रणदन्ति विशां पते

अयुक्ताश्च प्रवर्तन्ते क्षत्रियाणां महारथाः

*anāhatā dundubhayaḥ praṇadanti viśāṃ pate
ayuktāśca pravartante kṣatriyāṇāṃ mahārathāḥ (27)*

Without being beaten, the drums give sounds, o lord of the people;
and without {animals} yoked to them, the great chariots of the *kṣatriyas* are set in motion.

कोकिलाः शतपत्राश्च चाषा भासाः शुकास्तथा

सारसाश्च मयूराश्च वाचो मुञ्चन्ति दारुणाः

*kokilāḥ śatapatrāśca cāṣā bhāsāḥ śukāstathā
sarasāśca mayūrāśca vāco muñcanti dāruṇāḥ (28)*

Kokilas, wood-peckers, blue jays, vultures, and parrots,
swans, and peacocks utter cruel cries.

गृहीतशस्त्राभरणा वर्मिणो वाजिपृष्ठगाः

अरुणोदयेषु दृश्यन्ते शतशः शलभव्रजाः

*grhītaśastrābharaṇā varmiṇo vājipṛṣṭhagāḥ
aruṇodayeṣu drśyante śataśaḥ śalabhavrajāḥ (29)*

Having taken their weapons, decoration, and armour, {soldiers} ride on the back of their horses.
At dawn and sunrise swarms of locusts by hundreds are seen.

उभे संध्ये प्रकाशेते दिशां दाहसमन्विते

आसीद्रुधिरवर्ष च अस्थिवर्ष च भारत

*ubhe saṃdhye prakāśete diśāṃ dāhasamanvite
āsīdrudhiravarṣaṃ ca asthivarṣaṃ ca bhārata (30)*

Both dawn and dusk were glowing, accompanied by a burning of the [four] directions.
There was a rain of blood and a rain of bones, O Bhārata.

या चैषा विश्रुता राजंस्त्रैलोक्ये साधुसंमता

अरुन्धती तयाप्येष वसिष्ठः पृष्ठतः कृतः

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And, O king, she who is praised in the three worlds and esteemed highly by the Sādhus, Arundhatī, she has even placed [her husband] Vasiṣṭha on her back (or put him behind herself?).

रोहिणीं पीडयन्नेष स्थितो राजञ्शनैश्चरः

व्यावृत्तं लक्ष्म सोमस्य भविष्यति महद्भयम्

*rohiṇīm pīḍayanneṣa sthito rājañśanaishcaraḥ
vyāvṛttaṁ lakṣma somasya bhaviṣyati mahadbhayam (32)*

Saturn stands tormenting Rohiṇī, O king.
The {hare} sign of the Moon has disappeared. There will be great danger (or: fear).

अनभ्रे च महाघोरं स्तनितं श्रूयतेऽनिशम्

वाहनानां च रुदतां प्रपतन्त्यश्रुबिन्दवः

*anabhre ca mahāghoraṁ stanitaṁ śrūyate 'niśam
vāhanānāṁ ca rudatāṁ prapatantyaśrubindavaḥ (33)*

In the cloudless {sky} a great terrible thunder is heard incessantly,
and teardrops of crying riding animals are falling.

The whole list of omens is considerably longer, but we need not go into further detail.

In his attempt to explain the Arundhatī-Vasiṣṭha verse, Oak does not care about its context. He focuses on the one verse only, takes it as a historical astronomical observation, and tries to give a plausible explanation for it. While it is certainly possible that the verse could go back to a factual astronomical observation, the context does not contribute much to encourage such an interpretation, since it is not really of an astronomical nature. Rather it is a list of very disparate omens, i.e. extraordinary and miraculous occurrences of all kinds that announce disaster. For this reason, the verse could also be interpreted as the description of a miraculous apparition, just like the drums that sounded without being beaten or the chariots that moved without animals yoked to them or the images of the gods that were laughing, trembling, vomiting blood, etc. All these phenomena appear in the same passage as the Arundhatī-Vasiṣṭha observation. If these things could happen, then why should the stars not have appeared in reversed position as a result of a miracle?¹

Nevertheless, let us assume that the verse is based on an astronomical observation and examine possible interpretations!

¹ The careful reader should notice that I do not deny the possibility of miracles. I am not taking a position in this respect.

2. Change of Relative Position Due to Precession?

Oak proposes that the verse refers to the distance in right ascension between the two stars. Although their positions relative to each other are very stable in a sidereal reference frame, the precession of the earth axis causes an apparent change of their orientation within the equatorial coordinate system. As a result, the following phenomenon could have been observed in the remote past: Before about 11,089 BCE (or two years earlier according to Oak), the star Vasiṣṭha transited the meridian² before the star Arundhatī. After that, between 11,089 BCE and 4508 BCE, Arundhatī transited the meridian shortly before Vasiṣṭha. And finally, since the year 4508 BCE, Vasiṣṭha has transited the meridian before Arundhatī again. Oak believes that Vyāsa's verse refers to this phenomenon.

Oak's astronomical calculations are no doubt correct—if it is assumed that the sidereal proper motions of the stars are constant over a period of several thousand years. Since this is a difficult and unresolved question, let us assume that the years calculated by Oak and myself are correct.

If Oak's approach were correct, it would follow that the Mahābhārata War must have taken place some time after 11,089 BCE, at a time when star gazers still were of the opinion—based on an old tradition—that Vasiṣṭha moved ahead of Arundhatī but suddenly discovered that this was no longer true and Arundhatī actually went ahead of Vasiṣṭha. Now, Oak does not date the war near 11,000 BCE, but as late as 5561 BCE, i.e. about 5500 years *after* Arundhatī and Vasiṣṭha had “commuted” their positions. While this is still a lot too early from an historical and archaeological point of view, let us leave this point aside because Oak does not accept this kind of argument.³

The verse quoted above is taken from a passage where Vyāsa reports astronomical observations (omens) that were made in the very year of the war, more precisely only a few days before the war. He certainly would *not* have mentioned any observations that could have been made *every* night for thousands of years before 5561 BCE.

Oak counters this kind of objection by stating that the separation between the two stars reached a maximum shortly before 5561 BCE and that the phenomenon may have been discovered only near this year. (<https://nileshoak.wordpress.com/2014/02/03/arundhati-vasistha-av-observation-of-mahabharata/>) He writes:

Naked eye resolution is about 1 arc-min. The maximum separation (with Arundhati ahead of Vasistha) between Arundhati and Vasistha were around 500 arc-sec, which is about 8 arc-min.

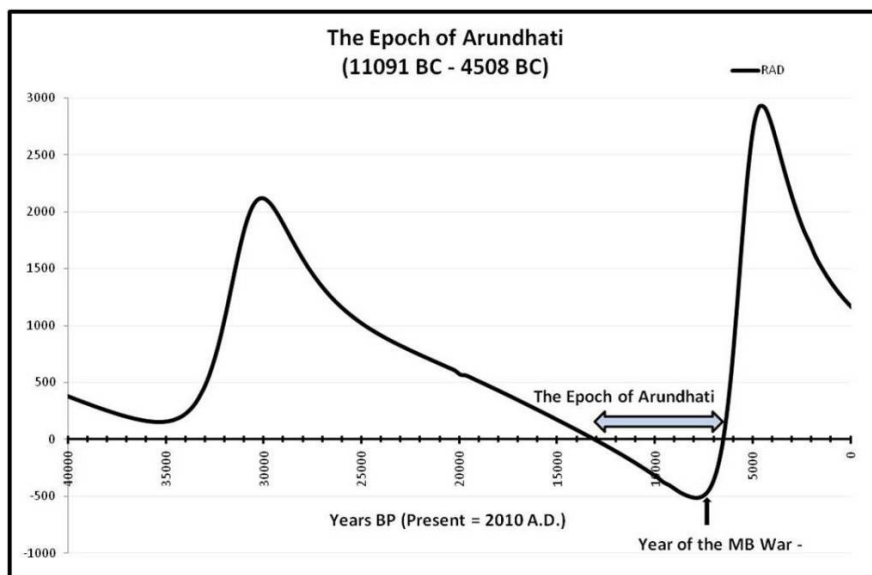
Thus one can make a case that while Arundhati began walking ahead of Vasistha as early as 11091 BCE, only around the time of the Mahabharata War (5561 BCE) it would have become apparent to someone observing them (Arundhati and Vasistha) with naked eye.

Thus, Oak is assuming that for 5500 years astronomers believed that Vasiṣṭha was moving ahead of Arundhatī and never realised they were wrong. Only in 5561 BCE they would have noticed that their knowledge about the two stars had become outdated. While it is hard enough to believe that such a long-term unbroken oral tradition is possible, it could also be objected that if they were not able to determine which star came first, they could at least have found out that the two stars crossed the meridian approximately at the same time and that it was not possible to determine which one came first. Most likely they would have given up the old outdated teaching even thousands of years before 5561 BCE.

Moreover, we have to ask the question as to how many years before 11,089 BCE Vasiṣṭha's going ahead of Arundhatī could have been observed. Using Oak's logic, this would have been as early as 16,500 BCE, because a clear ascertainment of this fact would of course have been gained *in a similar way*, i.e. based on a distance in right ascension of 500 arcsec between the two stars. Thus, for more than 10,000 years—an incredible time span for an unbroken oral tradition—there would have been this teaching of Vasiṣṭha's going ahead of Arundhatī, when according to Oak himself it was difficult to ascertain its truth. And this difficulty would never have been noticed during this long period of time.

² The meridian can be defined as the great circle that goes through the north point on the horizon, the zenith vertically above our head, the south point on the horizon, and the nadir vertically below our feet.

³ Oak's interview with Koenraad Elst: <http://www.pragyata.com/mag/dating-of-mahabharat-and-ramayan-309>.

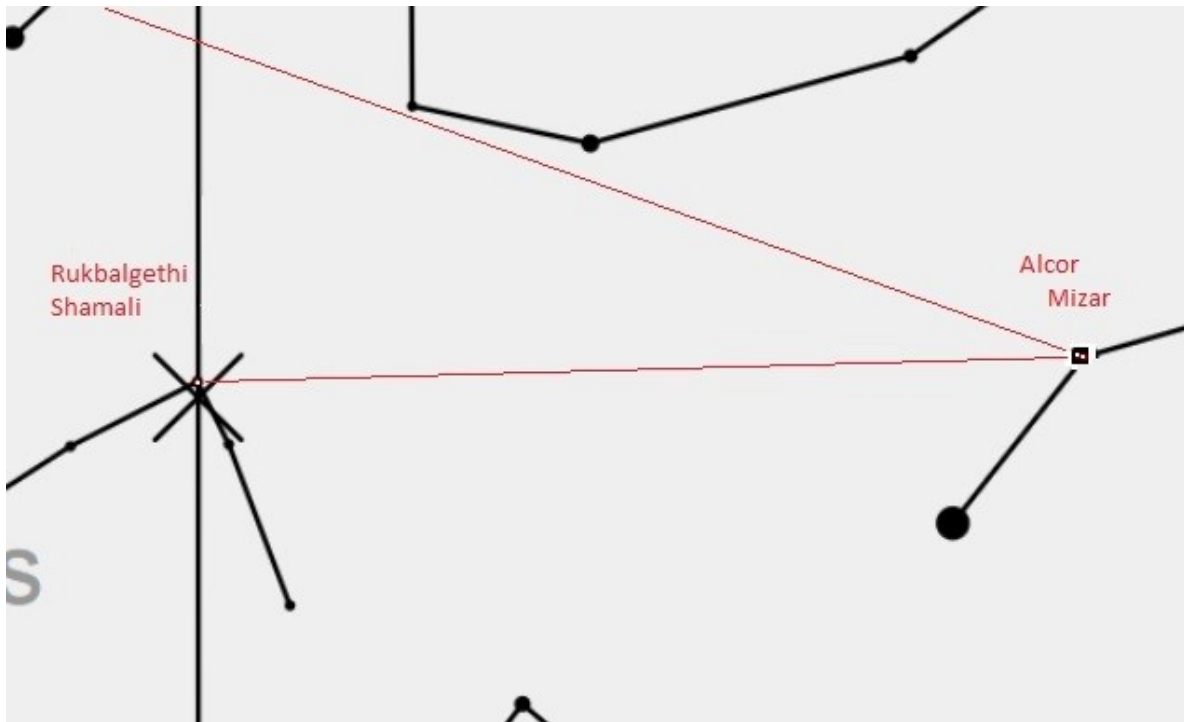


Graphic from Niles Oak's book "When did the Mahabharata War Happen?" (Fig. 4, unnumbered page in appendix). It illustrates the difference in RA in seconds of arc between the two stars Vasiṣṭha and Arundhatī. The years are given before present, so the year 2000 CE corresponds to 0 and the alleged year of the Mahābhārata War 5561 BCE (-5560) to -7560. In 5561 BCE, Arundhatī was 500 arcsec ahead of Vasiṣṭha, whereas currently she is about 1167 arc sec behind him.

In a public discussion, Mr. Prabhakar Phadnis, a friend of Mr. Oak's, said that he considered this graph a "probability chart" for the discovery of the changed relative positions of the two stars. Unfortunately, Oak did not think about likely methods of observation. E.g., today the polar star is a great help in detecting which of the two stars goes ahead. An imaginary line from Vasiṣṭha to the polar star will make it obvious. Or, maybe even easier: One could draw an imaginary line through Vasiṣṭha and Arundhatī and examine on which side it passes the polar star. Nowadays, it is very obvious that Vasiṣṭha is moving ahead of Arundhatī. This method would even work well if the difference in RA between the two stars were considerably smaller. However, for ancient epochs, there is the problem that a polar star was not always given. Due to the precession of the earth axis, polar stars appear and disappear over centuries and millennia. During periods when there was no polar star, the question could not have been answered as easily. For such periods, we will have to search for alternative methods.

Let us first ask the question whether a polar star was available during some periods between 11,000 BCE and 4500 BCE. These periods could have been more likely times for a discovery of Arundhatī's going ahead of Vasiṣṭha. Astronomers of these times could have drawn an imaginary line through Vasiṣṭha and Arundhatī (or a line through the polar star and Vasiṣṭha) and estimated which of the two was in front. The change from "ahead" to "behind" or vice-versa could have been discovered when an older, outdated, polar star was given up and a new one determined.

Around 7600 BCE the star *Tau Herculis* with the Arabic name *Rukbalgethi Shamali* was close to the celestial north pole, only about a lunar diameter away from it, even a bit closer than Polaris is today. This would have been a good time to discover Arundhatī's being ahead of Vasiṣṭha. The following graphic should demonstrate it. Inside the black square on the right side two small white dots can be seen. One has to look carefully or zoom the picture in order to see them. The lower one more to the right is Vasiṣṭha-Mizar, the higher one more to the left is Arundhatī. (The graphic is bad, but I am unfortunately not good at graphics.) The polar star Rukbalgethi Shamali is also shown as a small white dot slightly above the "x", which represents the celestial north pole. The rotation of the stars around the polar star is in counter-clockwise direction. I draw an "imaginary" line in red through Vasiṣṭha (Mizar) and Arundhatī (Alcor). It clearly passes above the polar star, which means that Arundhatī is ahead of Vasiṣṭha. In addition, I draw another line in red between the polar star Rukbalgethi Shamali and Vasiṣṭha (Mizar), which can also make the situation obvious, because Arundhatī (Alcor) is clearly above this line. The difference in right ascension between Arundhatī and Vasiṣṭha was slightly more than 6 arcmin.



Now, since in 5561 BCE no visible star was closer than 6° (or 12 lunar diameters) to the celestial pole, observations of this kind could not have been made around that year, although the difference in right ascension between the two stars was even greater than nowadays. On the other hand, since a polar star was given in 7600 BCE, it was considerably easier to discover Arundhati's being ahead of Vasiṣṭha near 7600 BCE than it was near 5561 BCE.

Could it have been discovered even earlier and without a polar star? Could early star gazers have found a different means to determine which of the two stars first crossed the meridian? Of course, they did not necessarily have to be familiar with the concept of a "meridian". If they were aware that stars culminated exactly in the north and south, they could have used an erected wooden pole in northern direction as an equivalent of the meridian, or a branchless spruce or a rope hanging from a tree branch with a stone at its end. The stone age astronomer could then have observed which of the two stars first appeared from behind the pole or first disappeared behind it. Using this method, the resolution of the human eye should not have played a relevant part, as long as the two stars were perceived as separate lights. If the pole was standing in a vertical position, if the observer was sitting or lying due south of it and kept his head in a fixed position (perhaps leaning the head against another pole), then he would have seen the stars just at the moment they appeared. In principle—although there maybe additional complications (see further below)—the phenomenon could even have been detected if the one star appeared only a fraction of a second after the other. Thus, even if the one star preceded the other only by a few arc seconds, this could have been noticed, although the corresponding difference in arc seconds would have been considerably below the resolution of the human eye.

It must be understood that this has really nothing to do with the resolution of the human eye – as long as the two stars are seen as separate points of light. The diameters of the disks of the stars, as seen from the earth, are practically zero. They are point sources. Their appearance from behind the wooden pole will be sudden and sharp. So, when Arundhati was 1 arc minute ahead of Vasiṣṭha, then one can calculate: The sky rotates 1 degree in 4 minutes, or 1 arc minute in 4 seconds. Two stars flash within an interval of 4 seconds. In 5500 BCE, the difference in right ascension was 8 arc minutes, the time difference was therefore 32 seconds. Now, *if this method works*, then it makes no relevant difference, whether it is 4 seconds or 32 seconds. The one observation should not be more difficult than the other. Thus, if this method had been used, then the likelihood for the discovery of Arundhati's being ahead would not have been higher in 5560 than it was in 7000 or 8000 or 9000 BCE. In fact, as has been stated, the probability was highest in 7600 BCE, because a polar star was available as an auxiliary around this year.

The example shows how accurate observations could be made even with rather simple instruments and methods. The only problem with this method, which I must not conceal, is that I have not tested it in

practice. What is not clear to me from a theoretical point of view are the side-effects of the special characteristics of *scotopic vision* on this kind of observation, namely the “unsteadiness” of *parafoveal vision*, the *Pulfrich effect*, and possibly other factors that I am not aware of but could make the observation more complicated. Some practical experiments should be made. I don’t know if there is literature about this particular kind of problem.

Interesting in our context is the story of the rivalry between the two *ṛṣis* Vasiṣṭha and Viśvāmitra, which also appears in the Mahābhārata. In Ganguli’s translation it is found in Ādiparva, chap. 177 (<http://www.sacred-texts.com/hin/m01/m01178.htm>). It starts with Viśvāmitra’s unsuccessful attempt to capture Kāmadhenu and continues with the story about King Kalmāṣapāda. Viśvāmitra turns the king into a man-eating monster, after which he devours all sons of Vasiṣṭha. Arundhatī does not appear in the story, but interestingly there is another female figure who “walks behind the back” of Vasiṣṭha, namely Adṛśyatī the widow of Vasiṣṭha’s son Śakti, who had been eaten by Kalmāṣapāda. She is pregnant with the *ṛṣi* Parāśara (chap. 179, <http://www.sacred-texts.com/hin/m01/m01180.htm>). Parāśara, after learning who was his true father and how he had died, decides to destroy the world. Four other members of the Saptarṣis, Atri, Pulastya and Pulaha, and Kratu, prevent him from doing so (chap. 183 <http://www.sacred-texts.com/hin/m01/m01184.htm>). The astronomical background of the story is obvious. The seven *ṛṣis* are identified with the constellation *Ursa major*. Vasiṣṭha, Atri, Pulastya and Pulaha, and Kratu are usually reckoned among the seven *ṛṣis*. Bṛhadāraṇyakopaniṣad 2.2.4 also reckons Viśvāmitra among them.

Most interesting is the following passage, where Adṛśyatī walks behind her father-in-law Vasiṣṭha:

वध्वाद्दृश्यन्त्यानुगत आश्रमाभिमुखो ब्रजन् ।

अथ शुश्राव सङ्गत्या वेदाध्ययननिःस्वनम् ।

पृष्ठतः परिपूर्णार्थैः षड्विंशैरलङ्कितम् ॥

vadhvādrśyantyānugata āśramābhimukho vrajan

atha śuśrāva saṅgatyā vedādhyayananiḥsvanam

prṣṭhataḥ paripūrṇārthaiḥ ṣaḍbhiraṅgairalaṅkṛtam (MBh 1.167.11, BORI edition)

While, **followed** by Adṛśyantī, his daughter-in-law,
he went towards his Āśrama,
he heard by chance
the sound of a *Veda* recitation
from behind his back, with its complete (or: accomplished) matters,
adorned with the six Vedāṅgas.

अनुव्रजति को न्वेष मामित्येव च सोऽब्रवीत् ।

अहं त्वद्दृश्यती नाम्ना तं श्रुषा प्रत्यभाषत ।

शक्तेर्भार्या महाभाग तपोयुक्ता तपस्विनी ॥

anuvrajati ko nveṣa māmityeva ca so'bravīt

ahaṁ tvadrśyatī nāmnā taṁ śruṣā pratyabhāṣata

śakterbhāryā mahābhāga tapoyuktā tapasvinī (12)

“Who is this who is **following** me?”
so he asked.
“I am the one called Adṛśyatī,”
answered him his daughter-in-law,
“the wife of Śakti, o highly fortunate one,
[his wife, who is] yoked in *tapas*, rich in *tapas*.”

Like the stars, who never stop moving or turning around, Vasiṣṭha does not stop or turn around but continues moving forward while asking his question. It seems that in this story, where Arundhatī does not appear, Adṛśyatī takes her place. This is supported by the fact that the name Adṛśyatī (or Adṛśyantī according to verse 11 quoted above) means “the invisible one”. The star Alcor is notoriously difficult to observe.

If this interpretation is correct and if Adṛśyatī’s going behind Vasiṣṭha’s back means that she transits the meridian after him, then this causes another problem for Niles Oak’s theory. According to Oak, Alcor had been ahead of Mizar for thousands of years before the Mahābhārata War. However, the above story

cannot have happened so long before the great war because Parāśara is the father of Vyāsa and Satyawatī is his mother. This means that the above story cannot be dated not too long before the Mahābhārata War.

As has been stated already, historical and archaeological clues indicate that the war actually took place far later. The cities mentioned in the epic all appear in the so-called *Painted Grey Ware Culture*, which is dated to 1200 – 600 BCE. The Indian archaeologist B. B. Lal, who discovered the connection of the epic with this culture, dates the war to about 900 BCE. If this is correct, then Oak's interpretation of the Arundhatī-Vasiṣṭha verse, namely that it has something to do with their difference in right ascension, is most probably wrong. This means that alternative interpretations of the verse need to be found.

Or maybe we have to modify Oak's idea and think of a different scenario: *In a far later time, e.g. after 400 BCE, when the Mahābhārata found its final written form, the Vedic astronomical tradition could have remembered that in very old times (i.e. around 4508 BCE) the order of the two stars had changed. The phenomenon could have been wrongly associated with the Mahābhārata War and therefore been inserted in the text.*

3. Temporary Invisibility of Alcor?

Let us return to the verse:

या चैषा विश्रुता राजंस्त्रैलोक्ये साधुसंमता
अरुन्धती तयाप्येष वसिष्ठः पृष्ठतः कृतः

*yā caiṣā viśrutā rājaṃstrailokye sādhusaṃmatā
arundhatī tayāpyeṣa vasiṣṭhaḥ pṛṣṭhataḥ kṛtaḥ (Bhishmaparva 2.31)*

And, O king, she who is praised in the three worlds and esteemed highly by the Sādhus, Arundhatī, she has even placed [her husband] Vasiṣṭha on her back (or put him behind herself?). (my translation)

Ganguli's translation of the second line reads:

Arundhati keepeth (her lord) Vasistha on her back.

Let us first discuss the translation. According to my dictionaries (Monier-Williams, Boethling, Apte) the expression पृष्ठतः कृ (pṛṣṭhataḥ kṛ-) can mean either

- “to put something or somebody on one's own back” or
- “to leave something or somebody behind” or “to abandon something or somebody”.

Nilesh Oak interprets the verse as meaning that Arundhatī “leaves” her husband Vasiṣṭha “behind” by her motion. In an attempt to verify or falsify this understanding, I sifted through the Mahābhārata, the Rāmāyaṇa, and Purāṇas in search for other places where the expression pṛṣṭhataḥ kṛ- is used. It turned out that it does appear in a number of places and, indeed, often has the meaning of “leaving somebody or something behind”, “abandoning somebody or something” or “turning one's back towards somebody or something”. E.g., evil persons could “leave behind” the teacher, the *dharma*, the Vedas. Cowards “could leave” behind a battle, whereas good or spiritual persons could “leave behind” injustice, anger, desires, wealth, etc. There is no other place where the expression is used in the same sense in connection with Arundhatī and Vasiṣṭha. In one place, Bhīṣma advises Yudhiṣṭhira that victory could be gained if the army “left behind” the constellation Ursa major or if it had the Sun or Venus in its back.⁴ Thus, Arundhatī could either be leaving her husband behind or abandoning him or turning her back towards him.

This interpretation seems to be supported by another passage in the Mahābhārata (MBh 1.224.26-31; Ganguli 1.235). Saint Mandapāla had four sons with Jaritā. When he took a second wife, Jaritā turned away from him. In this context, Mandapāla says to her:

न स्त्रीणां विद्यते किञ्चिदन्यत्र पुरुषान्तरात्
सापत्नकमृते लोके भवितव्यं हि तत्तथा

*na strīṇāṃ vidyate kiñcidanyatra puruṣāntarāt
sāpatnakamṛte loke bhavitavyaṃ hi tattathā (26)*

{Even} elsewhere {and} because of another man, nothing {else} is found with women in the world than rivalry {with another woman}. Because this is how it must be. (26)

⁴ *saptarṣīṇ pṛṣṭhataḥ kṛtvā yudhyerann acalā iva
anena vidhinā rājāṇ jigīṣetāpi durjayān (MBh 12.101.16, cf. Ganguli 12.100)*

Putting the Seven Sages behind their back, they should fight like immovable rocks.
According to this rule, o king, one should try to defeat even those who are difficult to defeat.

*yato vāyur yataḥ sūryo yataḥ śukras tato jayah
pūrvam pūrvam jyāya eṣāṃ samnipāte yudhiṣṭhira*

From where the Wind {blows}, from where the Sun and from where Venus {shine}, from there {comes} victory.
Among these, the earlier-mentioned is better than the later-mentioned in a battle, o Yudhiṣṭhira.

सुव्रतापि हि कल्याणी सर्वलोकपरिश्रुता

अरुन्धती पर्यशङ्कद्वसिष्ठमृषिसत्तमम्

*suvratāpi hi kalyāṇī sarvalokapariśrutā
arundhatī paryaśaṅkadvasiṣṭhamṛṣisattamam (27)*

For even the one with good vows, the beautiful one about whom the whole world has heard,
{even} Arundhatī distrusted Vasiṣṭha, the best of the sages, (27)

विशुद्धभावमत्यन्तं सदा प्रियहिते रतम्

सप्तर्षिमध्यगं वीरमवमेने च तं मुनिम्

*viśuddhabhāvamatyantaṁ sadā priyahite ratam
saptarṣimadhyagaṁ vīramavamene ca taṁ munim (28)*

the {sage} whose state of being is pure, who is beyond {all} ends, who is always pleased by the
welfare of his dear ones,
who wanders in the middle of the Seven Sages, the hero; and she despised that saint. (28)

अपध्यानेन सा तेन धूमारुणसमप्रभा

लक्ष्यालक्ष्या नाभिरूपा निमित्तमिव लक्ष्यते

*apadhyānena sā tena dhūmāruṇasamaprabhā
lakṣyālakṣyā nābhirūpā nimittamiva lakṣyate (29)*

Because of this jealousy she is of smoke-red light,
is perceptible {and} imperceptible, not beautiful, and is perceived like an omen. (29)

अपत्यहेतोः सम्प्राप्तं तथा त्वमपि मामिह

इष्टमेवङ्गते हित्वा सा तथैव च वर्तसे

*apatyāhetoh samprāptaṁ tathā tvamapi māmiha
iṣṭamevaṅgate hitvā sā tathaiḥ ca vartase (30)*

You also in the same way, when I arrived on behalf of my offspring,
abandoned me, the beloved one, under such circumstances, and {now} you exist just in the same
way (: namely as a reduced, smoke-red light). (30)

नैव भार्येति विश्वासः कार्यः पुंसा कथञ्चन

न हि कार्यमनुध्याति भार्या पुत्रवती सती

*naiva bhāryeti viśvāsaḥ kāryaḥ puṁsā katham cana
na hi kāryamanudhyāti bhāryā putravaṭī satī (31)*

Never should a man place his trust {in a woman} just because she is his wife.
For, a wife does not worry about her duty after she has children. (31)

This text does not use the expression *prṣṭhataḥ kṛ-*, “to leave somebody behind”. However, it seems to explain its meaning in other words: Arundhatī was jealous and therefore “despised” (*avamene* < *ava-man-*) and “abandoned” (*hitvā* < *hā-*) her husband Vasiṣṭha. As a result, she lost her brightness and became dim like dying embers.

What can we conclude from this passage for the verse under discussion? Did Arundhatī really “leave him behind” in the sense that she moved ahead of him? Or did she turn away or move away from him in a different way? *Could her abandoning him be meant in the sense that Arundhatī just became temporarily invisible and disappeared from his side? Alcor is visible only if the sky is particularly clear. Otherwise she is not visible. Could her invisibility have been an evil omen and her visibility an auspicious omen?* Could it have been considered a bad time for a battle if Arundhatī was not visible during the night?

Interestingly, it is also a bad omen if the other Seven Ṛṣis are hid/covered/obscured for some reason. For among the omens before the war, there is also the following one:

ग्रहौ ताम्रारुणशिखौ प्रज्वलन्ताविव स्थितौ

सप्तर्षीणामुदाराणां समवच्छाद्य वै प्रभाम्

grahau tāmṛāruṇaśikhau (var. -nibhau) prajvalantāviva sthitau
saptarṣīṇāmudārāṇām samavacchādya vai prabhām (MBh 6.3.24)

The two planets (or: Two planets) with a copper-red crest (or: hair tuft) (var. copper-red-like) stood there burning, as it were,
and they hid/covered/obscured the light of the exalted Seven Ṛṣis.

The two planets could perhaps be comets with a huge tail which cover the Seven Ṛṣis.

Varāhamihira apparently refers to this omen in Bṛhatsaṃhitā 13.7:

उल्काशनिधूमाद्यैर्हता विवर्णा विरश्मयो ह्रस्वाः

हन्युः स्वं स्वं वर्गं विपुलाः स्निग्धाश्च तद्वृद्धये

ulkāśanidhūmādyairhatā vivarṇā viraśmayo hrasvāḥ
hanyuḥ svaṃ svaṃ vargaṃ vipulāḥ snigdhaśca tadvr̥ddhaye

When they are struck (or: killed) by meteors, lightning or mist (or: smoke) etc.

and {for this reason} they are pale, without brightness, faint,

then they might strike their own domain;

{however} if they are abundant {in luminosity} and gentle (or: lovely), they {produce}
growth for the same {domain}.

Since Varāhamihira lists Arundhatī among the Seven Ṛṣis in the preceding verse (not quoted here), this statement also applies to Arundhatī when she becomes invisible due to mist or haze. Thus, Arundhatī's "leaving behind" her husband could just mean that she became very dim or invisible.

I think this solution is very simple and clearly preferable to Oak's interpretation with its problematic ramifications for archaeology and history.

4. A Temporary Outburst in Brightness of Variable Star Alcor?

In another tale also found in the Mahābhārata (MBh 9.47.28-47; G 9.48), the Seven Sages leave (*tyaktvā*) Arundhatī in a year of draught and go to the Himālaya for twelve years to practise *tapas*. Meanwhile, Arundhatī also practises an *even greater tapas*. For twelve years she cooks jujubes for a brahman—in fact Śiva in disguise—, herself fasting all the while. Śiva tells the Seven Sages:

भवद्भिर्हिमवत्पृष्ठे यत्तपः समुपार्जितम् ।

अस्याश्च यत्तपो विप्रा न समं तन्मतं मम

bhavadbhirhimavatpṛṣṭhe yattapaḥ samupārjitam
asyāśca yattapo viprā na samam tanmataṁ mama (41)

The *burning (tapas)* that you acquired on the back of the Himavat and *her burning (tapas)*, o priests, is not equivalent, I think. (41)

अनया हि तपस्विन्या तपस्तप्तं सुदुश्चरम् ।

अनश्नन्त्या पचन्त्या च समा द्वादश पारिताः

anayā hi tapasvinyā tapastaptaṁ suduścaram
anaśnantiā pacantiā ca samā dvādaśa pāritāḥ (42)

For, the *burning (tapas)* that was *burnt* by this {lady} rich in *burning* is quit difficult to practise, since she has passed twelve years, {all the while} cooking without eating. (42)

Sanskrit *tapas* literally means “burning”, so she exceeds them in “burning”. Does this mean that for some time the star Arundhatī, namely Alcor, was brighter than the *saptarṣis*? Thus, when Arundhatī “left behind” (*pṛṣṭhataḥ kṛ-*) Vasiṣṭha, does this mean that for some time she “*left him behind*” in *brightness*, i.e. *surpassed him in brightness*?

The BORI edition of the Mahābhārata in its comment on the Arundhatī-Vasiṣṭha verse, Vol 1, p. 757 apparently supports this kind of interpretation and renders *pṛṣṭhataḥ kṛta-* as “thrown into shade”.

Interestingly, Alcor is listed in the *New Catalogue of Suspected Variable Stars* under No. NSV 6238. According to data from the *Hipparcos mission*, its apparent magnitude varies with an amplitude of about 0.017^m. However, this is a very small variation, and it is hard to say if Alcor could ever have been so much brighter as to even surpass Mizar. Although such an outburst of brightness cannot be ruled out, there is no historical testimony for it, and therefore this solution remains speculative.

Moreover, I think that *if* the Arundhatī-Vasiṣṭha verse wanted to state that Arundhatī temporarily became brighter than Vasiṣṭha and “left him behind” with regard to luminosity, then this probably would have been expressed more explicitly. The expression “to leave behind” does not convey the idea well enough. Apart from that, I do not think the sources provide sufficient evidence of an ancient outburst in Alcor’s luminosity. Instead, they can be interpreted as attempts to explain why Mizar is, and always was, so much brighter than Alcor.

5. Did Mizar Lose Circumpolarity before Alcor?

There was a public discussion by e-mail in April 2017 about Niles Oak's Arundhatī-Vasiṣṭha theory. Besides Oak and myself, a considerable number of participants were included in the mailing list, among which R.N. Iyengar, S. Kalyanaraman, and Prabhakar Phadnis, who had published an elaborate criticism of Oak's book. During the discussion, R.N. Iyengar raised an interesting question. The two stars were circumpolar in Antiquity but as a consequence of the precession of the equinoxes, they lost their circumpolarity after 1060 CE (at geographic latitude 30°N). Usually, circumpolarity is defined geometrically without taking into account the atmospheric extinction which makes stars invisible even a few degrees above the horizon. But from the point of view of an ancient observer, it would make more sense to define circumpolarity as the *visibility of a star at its lower meridian transit*. Now Arundhatī (Alcor) is notoriously difficult to see. Iyengar proposed that perhaps Mizar could have lost circumpolarity in this sense before Alcor, so that Alcor could have been seen whereas Mizar could not. That would have been a kind of "role reversal" between the two stars.

Unfortunately, this suggestion is problematic, too. The declination of Alcor is only a few minutes of arc higher than Mizar's and changed little even in the remoter past. So, the extinction coefficient at the lower meridian transit should be similar for both of them. However, there is a huge difference in apparent magnitude between the two stars (Mizar: 2.27 mag; Alcor: 4.01 mag). For this reason, Alcor should "become extinct" before Mizar in any case. I asked two experts for their opinion. Bradley Schaefer found the whole discussion ridiculous. However, Rumen Kolev, an experienced observer, gave me his estimations for the altitudes, at which the two stars should become invisible. He wrote:

(Mizar: 2.27 mag; Alcor: 4.01 mag)

I think Mizar should be visible at around 4 and Alcor at 8 degrees alt.

But the denser the atmosphere the bigger the difference. It may be 5 and 12 deg. in denser atmospheres.

This seems to rule out Iyengar's proposal.

6. A Seasonal Phenomenon—Mizar above Alcor at Sunrise?

In what follows I want to present yet another explanation of the Arundhatī-Vasiṣṭha verse which I had also proposed in the public discussion mentioned above. As has been stated already, all important dictionaries (Monier-Williams, Boethlingk, Apte) give the following meanings for the expression पृष्ठतः कृ (prṣṭhataḥ kṛ-):

1) “to place something or somebody on one’s own back” or

2a) “to leave something or somebody behind”; 2b) “to abandon something or somebody”.

A number of references for significations 2a and 2b can be found in Mahābhārata and Rāmāyaṇa. However, signification 1 is rare. It does not appear in Mahābhārata is found only in one place in Rāmāyaṇa⁵:

ततो देवाः सगन्धर्वास्तुष्टुवुर्मधुसूदनं ।

त्वं गतिः सर्वभूतानां विशेषेण दिवौकसाम् ॥

tato devā sagandharvāstuṣṭuvurmādhūsūdanam
tvam gatiḥ sarvabhūtānāṃ viśeṣeṇa divaukasām (R 1.45.28)

Then the Devas together with the Gandharvas praised Kṛṣṇa (Madhusūdana):
“You are the goal of all beings and in particular of those who inhabit in the sky!

पालयास्मान्महाबाहो गिरिमुद्धर्तुमर्हसि ।

इति श्रुत्वा हृषीकेशः कामठं रूपमास्थितः ॥

pālayāsmān mahābāho girimudhartumarhasi
iti śrutvā hrṣīkeśaḥ kāmāṭhaṃ rūpamāsthitaḥ (29)

Protect us, you with great arms! May you tear out the mountain!“
When Kṛṣṇa (Hṛṣīkeśa) heard this, he entered the shape of a tortoise.

पर्वतं पृष्ठतः कृत्वा शिश्ये तत्रोदधौ हरिः ।

पर्वाताग्रं तु लोकात्मा हस्तेनाक्रम्य केशवः ।

देवानां मध्यतः स्थित्वा ममन्थ पुरुषोत्तमः ॥

parvatam prṣṭhataḥ kṛtvā śiśye tatrodadhau hariḥ
parvatāgraṃ tu lokātmā hastenākramya keśavaḥ
devānāṃ madhyataḥ sthitvā mamantha puruṣottamaḥ

Hari **placed the mountain on his back** and lay there in the ocean.
And the Self of the world, Keśava, moved his hand to the peak of the mountain,
standing in the middle of the Devas, and churned {the ocean}, he, the Highest Puruṣa.

Kṛṣṇa is acting in at least two different bodies in this passage. Firstly, he takes the form of a tortoise, and places himself on the ground of the milk ocean. Secondly, he is standing in the middle of the Devas and helps them churning the ocean.

Now, if *prṣṭhataḥ kṛ-* is taken in this sense, it means that Arundhatī was carrying Vasiṣṭha on her back. The verse then seems to allude to common terms used in the Mahābhārata to denote “husband” and “wife”, namely *bhartā* (*bhartṛ*) and *bhāryā*, literally “the one who carries (i.e. nourishes and protects)” and “the one who is to be carried (i.e. nourished and protected)”. The husband should carry the wife, the wife should be carried by the husband, not the other way round. We find this idea nicely expressed in the following verses from the Mahābhārata. When Pradveṣī leaves her blind husband Dīrghatamās, she says:

⁵ Text according to: *The Rāmāyaṇa of Vālmīki*, with the commentari (Tilaka) of Rāma, edited by Wāsudev Laxman Śāstrī Paṇṣīkar, Bombay, 1930. The verses do not appear in the critical text.

पतिर्भार्यानुभरणाद्भर्ता चेति प्रकीर्त्यते
अहं त्वां भरणं कृत्वा जात्यन्धं ससुता सदा
नित्यकालं श्रमेणार्ता न भरेयं महातपः

*patirbhāryānubharaṇād bhartā ceti prakīrtyate
aham tvāṁ bharaṇaṁ kṛtvā jātyandhaṁ sasutā sadā
nityakālaṁ śrameṇārtā na bhareyaṁ mahātapaḥ*

It is because a man [master] *carries* the “wife” [lit. “the one to be carried”],
that he is called the “husband” [lit. “the one who carries”].
{However,} it is *I* who have done the carrying for *you*,
{because} you are blind from birth, {although} I am always having sons.
Oppressed by exertion for everlasting time,
I do not {want to} carry {you anymore}, o you who {have} great *tapas*.⁶

Another text that exemplifies this relation between husband and wife is the story of Jaratkāru in Ādiparva. The sage Jaratkāru had taken the vow not to marry and have children. His ancestors urge him to take a wife and father a scion. Jaratkāru consents to do so under several conditions that are nearly impossible to fulfil: The woman should also be called *Jaratkāru*, she should be given to him as an alms, and he should not have to “carry her” (*bhr̥*), but somebody else should “carry” her for him. Eventually, Jaratkāru marries the nāga Vāsuki’s sister Jaratkāru, after Vāsuki consents to “carry” her for him.

This makes the idea behind our verse obvious: The wife is “carrying” the husband, which is not right. Because it is not right, it is an evil omen, and apparently indicates an inauspicious time for an enterprise such as a war.

The next point I have to explain is the fact that celestial observations at the time of dawn and dusk played an important role in Mahābhāratan times. *Interestingly, the verse that immediately precedes the Arundhatī-Vasiṣṭha verse reads as follows:*

उभे संध्ये प्रकाशेते दिशां दाहसमन्विते
आसीद्रुधिरवर्ष च अस्थिवर्ष च भारत

*ubhe saṁdhye prakāśete diśāṁ dāhasamanvite
āsīdrudhiravarṣaṁ ca asthivarṣaṁ ca bhārata (Bhishmaparva 2.30)*

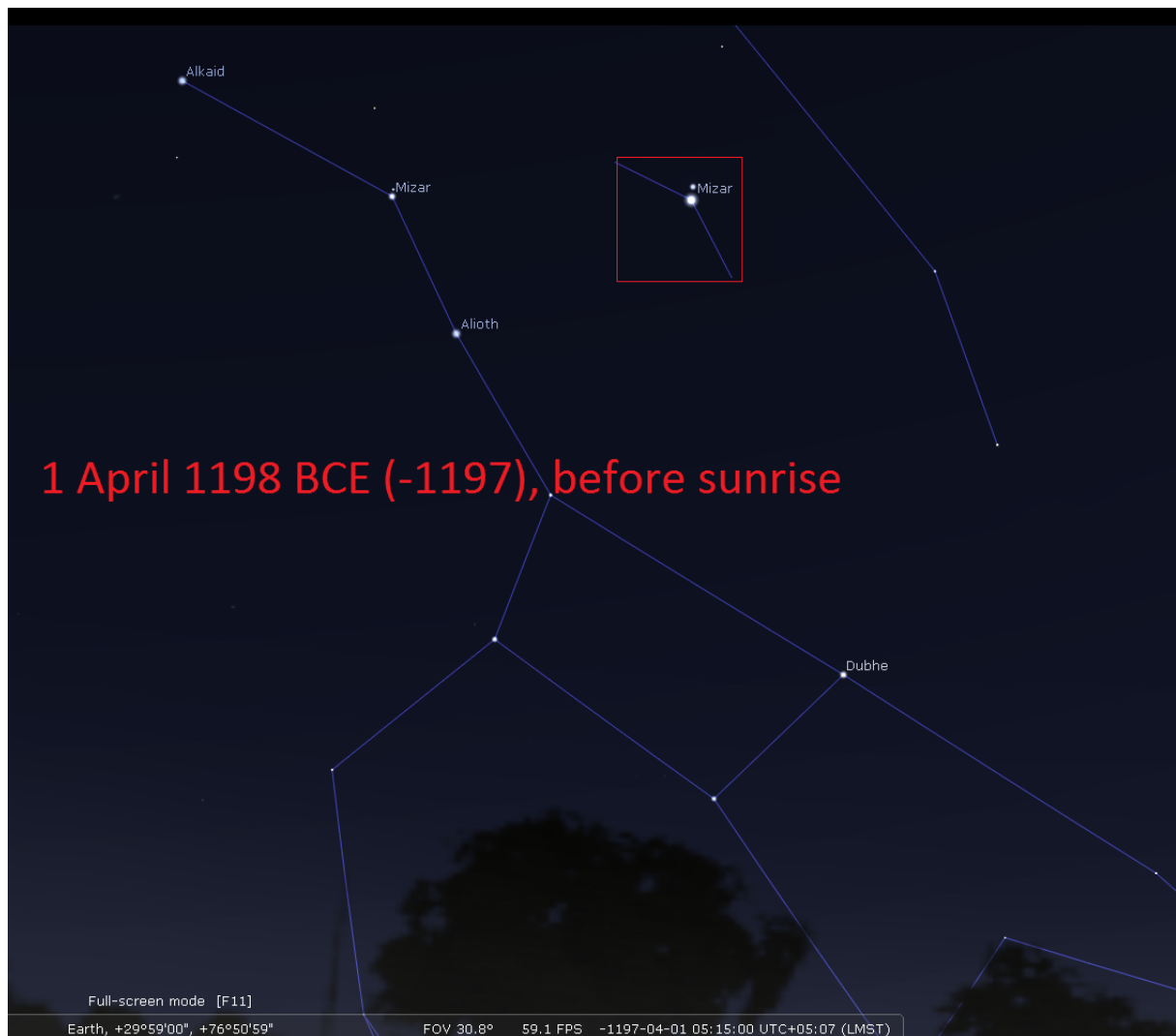
Both dawn and dusk were glowing, accompanied by a burning of the [four] directions.
There was a rain of blood and a rain of bones, O Bhārata.

Why were observations at dawn and dusk important? For one, the look of the sky at dusk and dawn can be used to determine the season of the year. Many ancient peoples who had lunar calendars used such observations (among others) to find out whether their calendar was right or whether a leap month had to be inserted.

In addition, as I explain in my book, the Mahābhārata war took place at the time of a *planetary pralaya*, where all planets temporarily disappeared in the light of the Sun and no planet could be seen in the sky from dusk to dawn. Planetary *pralayas* were considered omens of the end of a yuga. Such a *pralaya* could only be detected if the sky was observed during dawn and dusk and if no planet could be found in the sky at either of these times.

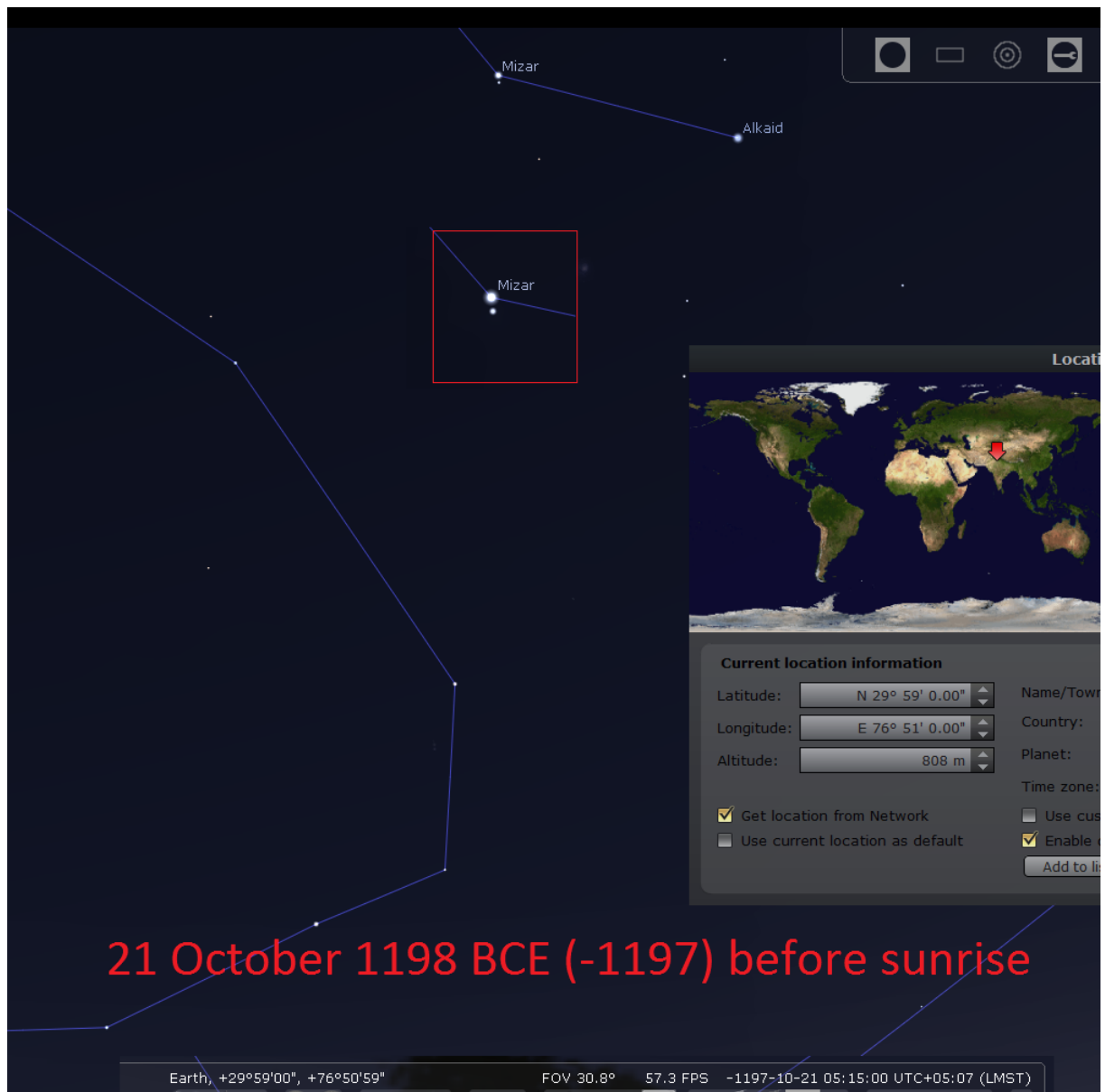
Now, let us study some sky views at dusk and dawn in the year which I have proposed for the Mahābhārata War. The following sky maps were created using the astronomy software Stellarium:

⁶ BORI edition vol 1. (Ādiparva), p. 906, text 56, lines 3-5 (% S ins. after 1.98.17: Dn, after 1038*: D4 (suppl. % fol. sec. m.), after line 1 of 1038*).



This is a view of the northern sky on 1 April 1198 BCE (-1197), *in the early morning before sunrise*. It shows Arundhatī above Vasiṣṭha, so the husband is carrying his wife. This is how it should be in a matrimony (although modern feminists may not agree). The husband is the one who carries, the wife the one who is to be carried.

Now let us compare this to the following picture:



This graphic shows the northern sky on 21 October of the same year, about half a year later, also in the early morning before sunrise. The situation is now inverted. Vasiṣṭha is above Arundhatī, “placed on her back”, as it were. This situation, where the wife carries the husband, is “wrong”, it contradicts *dharma*. The wife should not carry the husband. And this is apparently the reason why it is a bad omen or a bad time to make war.

Of course, the two configurations in the early morning occur every year and last for several months. Nevertheless, it may have been a relevant consideration for planning a war. We should also remember another phenomenon that occurs every year, but nevertheless has an alleged relevant impact on our destiny. Vedic literature considers it better to die after *uttarāyaṇa* than after *dakṣiṇāyaṇa*. Thus my explanation of Arundhatī carrying Vasiṣṭha should be a plausible ominous observation, too.

If we study the details of the phenomenon, we will find the following phases:

Phase 1: For some period of time during the year, Vasiṣṭha was seen carrying Arundhatī all through the night. In 1198 BCE this was the case for a few weeks in June and July.

Phase 2: During the following months, Arundhatī appeared above Vasiṣṭha in the evening but then **“took him on her back” during the night** and was seen below him in the morning. This fits the nights preceding my proposed first day of the war, namely 21 October, and also the following nights. Vasiṣṭha was nearly vertically above Arundhatī before sunrise.

Phase 3: In early January, Arundhatī was “carrying” Vasiṣṭha nearly all the night through, but was seen *slightly above* him both at dusk and dawn. (Arundhatī carrying Vasiṣṭha during the whole night did never occur, because winter nights were too long.)

Phase 4: After that, Arundhatī was “carrying” Vasiṣṭha at dusk, but Vasiṣṭha was “carrying” Arundhatī at dawn. So, during the night Vasiṣṭha used “to take Arundhatī on his back”.

Note, today these phenomena cannot be observed anymore from Northern India because due to the precession of the celestial pole (or/and equinox) the declination of the two stars has decreased so much that they are no longer circumpolar.

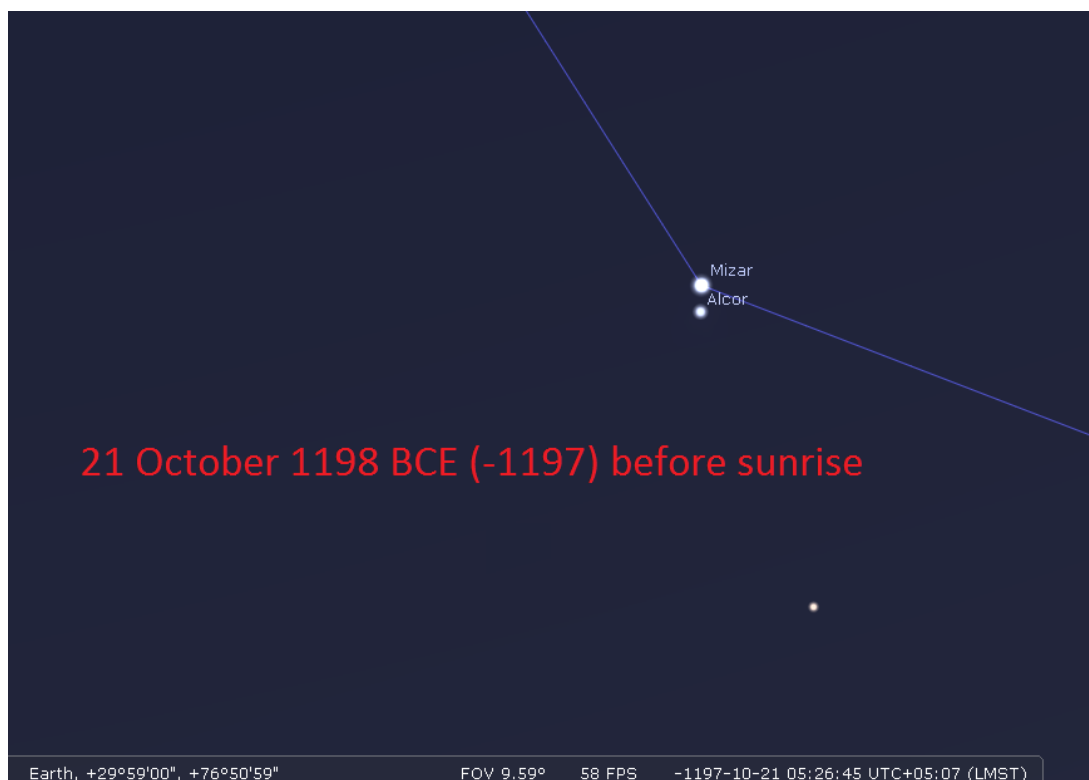
Now, phase 2 seems to fit my date of the war. When Vyāsa observed the sky in the evening and in the morning, he found out that during the night “Arundhatī took her husband on her back” and he classified it as an evil omen. (See graphics on next page)

One could object that the year 1198 BCE does not fit this verse any better than any other year that has been proposed for the Mahābhārata War. This is correct. In fact, the same interpretation could also be used with Nilesh Oak’s proposed date of the war, namely 16 October 5561 BCE, despite the precession of the equinox. Nevertheless, if this was considered an inauspicious time for waging a war, it was a relevant omen worth mentioning and it obviously had to be mentioned by Vyāsa in his list of omens.

What makes this interpretation particularly interesting is the fact *that it allows us to understand the verse in its context, namely in connection with the preceding verse which refers to astronomical observations at dusk and dawn*. This is an important advantage over Nilesh Oak’s interpretation. What also makes it preferable to Oak’s Arundhatī-Vasiṣṭha observation—let me repeat this—is the fact that the latter does not make any sense as an observed omen.

No matter whether Nilesh Oak will accept this solution, his claim that he is the only author who has ever proposed an explanation of the Arundhatī-Vasiṣṭha verse is no longer true. In addition, it can be stated that, if my interpretation is correct, then the time frame Oak proposes for the war, namely 11091 - 4508 BCE, is not compulsory.

The following page shows the view of Arundhatī (Alcor) and Vasiṣṭha (Mizar) at dusk and dawn on 20/21 October 1198 BCE (-1197) Julian and how Arundhatī took Vasiṣṭha on her back during the night:



Observations of the northern sky at dusk and dawn on 20/21 October 1198 BCE.
During the night, Arundhatī took Vasiṣṭha on her back.

Which Solution is Correct?

In the above considerations, several different interpretations of the Arundhatī-Vasiṣṭha verse have been discussed.

1. *Miraculous phenomenon*: Since the verse appears in the context of various omens, some of which are of a miraculous nature, it could describe a miraculous phenomenon, as well. It is not possible to rule out this explanation.

2. *Change of relative position in right ascension*: The verse could refer to a phenomenon caused by the precession of the Earth axis, namely Arundhatī's temporary "going ahead of" (*prṣṭhataḥ kṛ-*) Vasiṣṭha in its diurnal motion between 11089 and 4508 BCE. (Oak's proposal) This solution has the disadvantage that it stands against historical and archaeological facts. Moreover, it has been stated that the observation of this phenomenon would not have been a plausible omen because it would have been valid for thousands of years before and after the war.

3. *Temporary invisibility of Alcor*: The verse could refer to the fact that Arundhatī is not always visible due to the presence of mist or haze. In such moments Arundhatī "abandons" (*prṣṭhataḥ kṛ-*) her husband. This solution seems to be supported by another verse in the Mahābhārata and by Varāhamihira.

4. *Temporary outburst in brightness of Alcor*: The verse could refer to an outburst of the variable star Alcor in the remote past. If so, Arundhatī would have "surpassed" (*prṣṭhataḥ kṛ-*) her husband *in brightness*. Here, I made the objection that the verse could have made this fact clearer by explicitly referring to Arundhatī's brightness.

5. *Loss of circumpolarity due to precession*: In the remote past, the two stars Mizar (Vasiṣṭha) and Alcor (Arundhatī) were circumpolar and visible even at their lower culmination. Due to precession, they lost their visibility at lower culmination at some point in time. R.N. Iyengar suggested that Vasiṣṭha, whose declination is lower, could have lost his lower culmination visibility before Arundhatī and in this way could have been "left behind" by her. Against this, it has been stated that because of the huge difference in magnitude between the two stars, Alcor might still have lost its lower culmination observability before Mizar.

6. *Mizar above Alcor at Sunrise*: The verse could refer to the fact that in autumn, when the Mahābhārata War took place, Alcor was standing above Mizar at sunset and below Mizar at sunrise. Here, the verse is understood in the sense that during the night Arundhatī "placed Vasiṣṭha on her back" (*prṣṭhataḥ kṛ-*) (proposal by D. Koch in a public debate on Oak's theory). This solution has the advantage that it connects the verse with the previous verse which concerns astronomical observations at dusk and dawn.

After examining all evidence, I find that solutions 3 and 6 are best, but I give preference to solution 6 because of its nice symbolism.

Other Astronomical Information from the Mahābhārata Used by N. Oak

Jupiter and Saturn near Viśākhā

Let's turn to Niles Oak's date of the Mahābhārata War and some other astronomical clues given in the text. He dates the beginning of the war on the new moon of 16 October 5561 BCE (-5550) Julian. This date had previously been maintained by P.V. Vartak. Although Oak found that Vartak's explanations of the astronomy observations in the Mahābhārata were not convincing, he still believes the date is correct.

Oak has searched for all astronomical clues given in the Mahābhārata and discusses a great number of them.⁷ I am not aware of any relevant verse he does not mention. This is laudable. Other authors did not make such an effort for completeness. However, the interpretations Oak gives for these verses and the way he forces them to fit the year 5561 BCE are disappointing. In what follows I want to illustrate this with a few cases. For a more complete criticism of Oak's interpretations of the Mahābhārata, I refer to Prabhakar Phadnis' book.⁸

The first omen Oak discusses reads as follows (my translation):

संवत्सरस्थायिनौ च ग्रहौ प्रज्वलितावुभौ
विशाखयोः समीपस्थौ बृहस्पतिश्चरौ

saṃvatsarasthāyinau ca grahau prajvalitāvubhau
viśākhayoḥ samīpasthau brhaspatiśanaiścaraḥ (MBh 6.3.25)

The two burning planets, Jupiter and Saturn, stay for one year standing in the vicinity of the Viśākhā [stars].

Oak studied the celestial configuration a year before the war and found that "Jupiter is near *Mula* (Shaula) and Saturn is near *Hasta* (Algorab), positions nearly equidistant, in nakshatra space, east and west of *Vishakha* (Zubeneschamali)". He notes that for one year "Jupiter stayed in the region of *Mula-UttaraAshadha*, Saturn stayed in the region of *Chitra-Uttara Phalguni*", and he concludes: "I treated this as satisfactory corroboration of this Mahabharata observation".⁹

In reality, if this verse is taken seriously, it is not a corroboration but a very *obvious refutation* of the year 5561 BCE as the year of war. The sky map on the following page should make it very obvious. *The distance between Jupiter and Saturn is huge, and the distance of both of them from Viśākhā is enormous, as well.* On the day the war allegedly began, Jupiter was located 55 degrees from the end of Viśākhā, Saturn 24 degrees from the beginning of Viśākhā, the distance between the two planets being 92 degrees.

⁷ Oak, *When did the Mahabharata War Happen?* On p. 76, there is an overview over the planetary observations Oak takes into account.

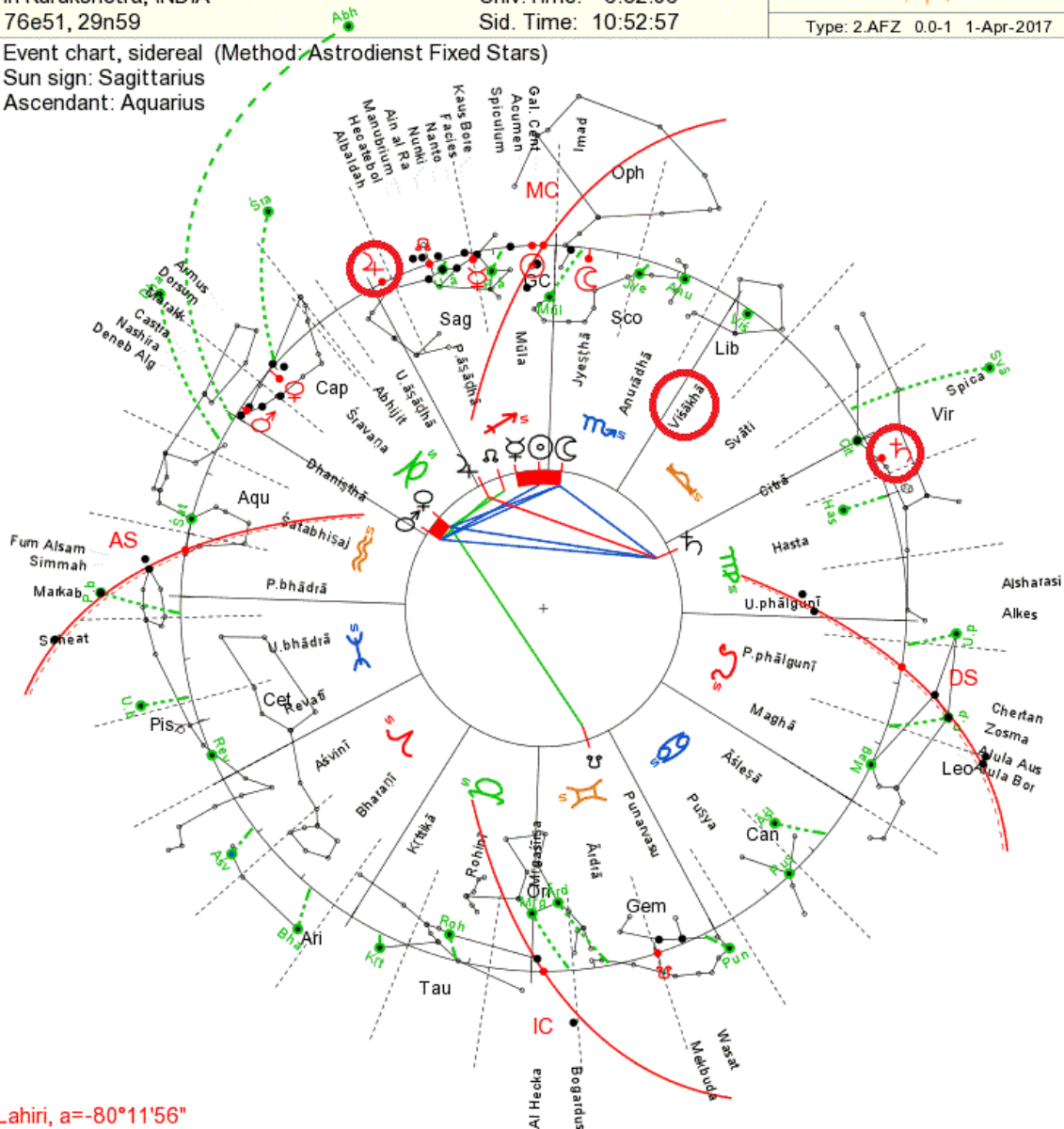
⁸ Prabhakar Phadnis, *Mahabharat War - Year and Date 16th Oct. 5561 BCE ? : Critical Comments On The book of Mr. Niles Oak – When did the Mahabharat War Happen? The Mystery of Arundhati*, <https://www.amazon.in/Mahabharat-War-Critical-Comments-Arundhati-ebook/dp/B01JJB1GX0> (free of charge.)

⁹ op. cit. p. 79.

Name: Mahabharata Vartak/Oak
date: Su., 16 Oct. 5561 BC (-5560) jul.
in Kurukshetra, INDIA
76e51, 29n59

Time: 12:00 p.m. LMT
Univ. Time: 6:52:36
Sid. Time: 10:52:57

Event chart, sidereal (Method: AstroDienst Fixed Stars)
Sun sign: Sagittarius
Ascendant: Aquarius



Lahiri, $a = -80^{\circ}11'56''$

sidereal, topocentric Latitude house

☉ Sun	↗ $3^{\circ}44'30''$	0° 0'S 19.28
☾ Moon	↖ $24^{\circ}34'12''$	2°36'S 18.59
☿ Mercury	↗ $13^{\circ}20'18''$	1°45'S 20.00
♀ Venus	↘ $20^{\circ}55'4''$	3°12'S 22.82
♂ Mars	↘ $28^{\circ}13'39''$	1°34'S 23.37
♃ Jupiter	↗ $28^{\circ}13'55''$	0°19'N 21.12
♄ Saturn	↖ $25^{\circ}53'41''$	1°46'N 14.19
♊ Mean Node	↗ $20^{\circ}15'50''$	0° 0'N 20.52
♋ Desc.M.Node	↖ $20^{\circ}15'50''$	0° 0'N 7.02
AS:	↗ $22^{\circ}39'1''$	2: ↘ $23^{\circ}9'$ 3: ↖ $27^{\circ}2'$
MC:	↗ $1^{\circ}55'37''$	11: ↘ $3^{\circ}32'$ 12: ↖ $29^{\circ}59'$

Lines and circles in the outer part of the chart:

- black: the zodiac (ecliptic)

Labeled stars are either close to a planet (orb=5°) or on the horizon or meridian (orb=2° in RA).

Only stars with an ecl. latitude below $\pm 40^{\circ}$ are considered.

- red: meridian and horizon (- - - refraction horizon)

- orange: house boundaries

- green: Yogataras, dashed lines indicate polar projection onto the ecliptic.

The above picture shows the celestial configuration on 10 Oct. 5561 BCE jul., the alleged day before the beginning of the Mahābhārata War according to Nilesh Oak and P.V. Vartak. Jupiter and Saturn are far away from Viśākhā.

For comparison, I show the configuration on the date proposed by myself, 21 Oct. 1198 BCE jul. Here, we do have a conjunction of Jupiter and Saturn near the star Viśākhā (ι Librae), as indicated in Vyāsa's verse:

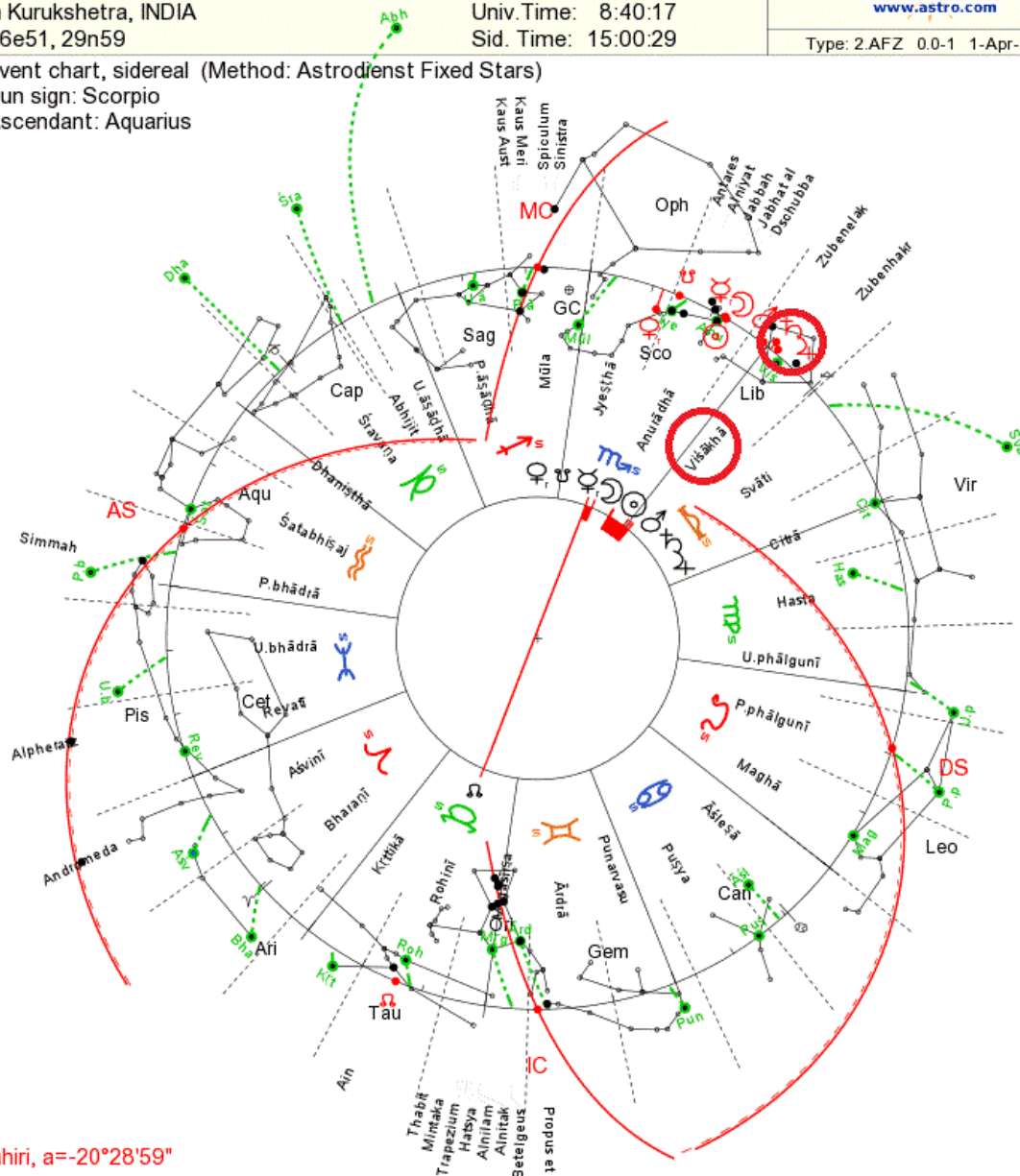
Name: Mahabharata D. Koch
date: Fr., 21 Oct. 1198 BC (-1197) jul.
in Kurukshetra, INDIA
76e51, 29n59

Time: 1:47:41 p.m. LMT
Univ. Time: 8:40:17
Sid. Time: 15:00:29

ASTRODIENST
www.astro.com

Type: 2.AFZ 0.0-1 1-Apr-2017

Event chart, sidereal (Method: AstroDienst Fixed Stars)
Sun sign: Scorpio
Ascendant: Aquarius



Lahiri, a=-20°28'59"

sidereal, topocentric

Latitude house

☉ Sun	♏ 7° 37' 58"	0° 0'S 17.32
☾ Moon	♏ 7° 40' 55"	0° 3'N 17.33
☿ Mercury	♏ 7° 57' 17"	0° 19'N 17.35
♀ Venus	♏ 18° 21' 38"	5° 10'S 18.13
♂ Mars	♏ 0° 50' 21"	0° 22'N 16.81
♃ Jupiter	♏ 28° 23' 13"	1° 7'N 16.63
♄ Saturn	♏ 29° 20' 13"	2° 18'N 16.70
♁ Mean Node	♏ 15° 40' 6"	0° 0'N 4.43
♁ Desc.M.Node	♏ 15° 40' 6"	0° 0'N 17.93
AS: ♏ 20° 56' 33"	2: ♏ 1° 4'	3: ♏ 8° 26'
MC: ♏ 8° 9' 22"	11: ♏ 2° 31'	12: ♏ 25° 21'

Lines and circles in the outer part of the chart:

- black: the zodiac (ecliptic)

Labeled stars are either close to a planet (orb=5°) or on the horizon or meridian (orb=2° in RA).

Only stars with an ecl. latitude below +40° are considered.

- red: meridian and horizon (- - - refraction horizon)

- orange: house boundaries

- green: Yogataras, dashed lines indicate polar projection onto the ecliptic.

Celestial configuration on 21 Oct. 1198 BCE jul.: The eclipse new moon at the beginning of the Mahābhārata war according to D. Koch. Jupiter and Saturn were in Viśākhā.

One may dislike the date I propose, but it does give a nice example for what the verse requires. In reality, the verse about Jupiter and Saturn near Viśākhā clearly disproves Oak's and Vartak's solution.

A side note: In the public discussion mentioned earlier, Prabhakar Phadnis pointed to the previous verse and the expression 'प्रज्वलन्ताविव स्थितौ' (prajvalantāiva sthitau), translated by him as "steady and bright as if burning" (I would prefer to render it as: "they both stood as if burning"). Since the outer planets are

particularly bright only when they are in opposition to the Sun, he argued that this description does not fit my date and graphic, because the two planets are close to the Sun, have just had their heliacal rising, and therefore are not very bright. It can be added that the Jupiter-Saturn-Viśākhā verse itself also states that the two planets are “both burning” (प्रज्वलितवुभौ, *prajvalitāvubhau*).

However, my interpretation of this “burning” is different. In the chart above with Jupiter and Saturn “near Viśākhā”, the two planets have just had their heliacal rising, which means that they are actually faint. However, they are surrounded by the “fire” of the Sun who is about to rise, so they can be said to be “burning”, namely in the light of the daybreak. We also have to remember the “burning” of the horizon, which often occurs in the Mahābhārata. Thus, the planets are seen “burning” in the red sky of the morning. Therefore, the objection that the planets must have been very bright and therefore in opposition to the Sun and retrograde is not correct, or at least not compulsory.

Let us see if the previous verse has to say more about it:

ग्रहौ ताम्रारुणशिखौ प्रज्वलन्ताविव स्थितौ

सप्तर्षीणामुदाराणां समवच्छाद्य वै प्रभाम्

grahau tāmraṛuṇaśikhau (var. -nibhau) prajvalantāviva sthitau
saptarṣīṇāmudārāṇāṃ samavacchādy vai prabhām (MBh 6.3.24)

The two planets (or: Two planets) with a copper-red crest (or: hair tuft) (var. copper-red-like) stood there burning, as it were,
 and hid/covered/obscured the light of the exalted Seven Ṛṣis.

Although this verse precedes the Jupiter-Saturn-Viśākhā verse, it is not certain that the “two planets” are Jupiter and Saturn, since they are not mentioned in previous verses. The fact that they have a “copper-red crest” or “hair tuft” could indicate they are comets. In addition, it is completely impossible that Jupiter and Saturn “hide” or “cover” or “obscure” the light of the Seven Ṛṣis. Only bright comets would be able to do that if they covered the constellation of the Big Dipper with their tails. It thus seems that this verse does not add any information about Jupiter and Saturn.

Saturn near Bhaga (Uttaraphalgunī)

The next verse, discussed very briefly by Oak, is Bhīṣmaparva 3.14 (in BORI edition; my translation):

भाग्यं नक्षत्रमाक्रम्य सूर्यपुत्रेण पीड्यते

शुक्रः प्रोष्ठपदे पूर्वे समारुह्य विशां पते

उत्तरे तु परिक्रम्य सहितः प्रत्युदीक्षते

bhāgyaṃ nakṣatramākramya sūryaputreṇa pīḍyate
śukraḥ proṣṭhapade pūrve samāruhya viśāṃ pate
uttare tu parikramya sahitaḥ pratyudīkṣate (MBh 6.3.14)

Venus, having entered Pūrvabhādrā, O ruler of the people,
 is tormented by Saturn, who has entered the lunar mansion Bhāgya (=Uttaraphalgunī),
 But after [Venus] has gone round in Uttarabhādrā, she shines forth together [with that *nakṣatra* (?
 or with the Sun?).]

Ganguli's translation is different:

The Sun's offspring (Sani) (= Saturn; D.K.) approaching towards the constellation Bhaga (= Uttaraphalgunī; D.K.), afflicteth (*pīḍ-* = “tormented”; D.K.) it.
 The planet Sukra (= Venus; D.K.), ascending towards Purva Bhadra, shineth brilliantly,
 and wheeling towards the Uttara Bhadra, looketh towards it, having effected a junction (with a smaller planet). (translation by Ganguli¹⁰)

In both translations, Saturn is approaching or entering the *nakṣatra* Uttaraphalgunī. However, this is in contradiction with the verse about Jupiter and Saturn in Viśākhā, because the end of Uttaraphalgunī is 40° away from the beginning of Viśākhā. No interpretation trick can remove this contradiction. One of

¹⁰ <http://www.sacred-texts.com/hin/m06/m06003.htm>

the two verses must be wrong. I decided that the latter must be wrong, for reasons not to be discussed here.

But let us see what Oak does with this verse. He says that “Saturn is near *Bhaga* (*Uttara Phalguni*) for a period of more than two years leading to the first day of Mahabharata War, when it began approaching *Chitra*”. However, the verse states that Saturn had just *entered* (*ākramya*) Uttaraphalgunī on the day or a few days before the beginning of the war, whereas on Oak’s date in October 5561 BCE Saturn was in Citra! (see graphic above) Thus Oak is not in agreement with this verse either.

Mars “going vakri near Magha”

The next verse I would like to discuss reads (translations mine):

सेनयोरशिवं घोरं करिष्यति महाग्रहः

मघास्वङ्गारको वक्रः श्रवणे च बृहस्पतिः

senayoraśivaṃ ghoram kariṣyati mahāgrahaḥ
maghāsvaṅgārako vakraḥ śravaṇe ca br̥haspatiḥ (6.3.13)

The (or: A) great planet will cause dreadful calamity for the two armies.

Mars is moving backward in Maghā, and Jupiter [moves backward (? or: is ?)] in Śravaṇa.

and:

कृत्वा चाङ्गारको वक्रं ज्येष्ठायां मधुसूदन

अनुराधां प्रार्थयते मैत्रं संशमयन्निव

krtvā cāṅgārako vakram jyeṣṭhāyām madhusūdana
anurādhāṃ prārthayate maitraṃ saṁśamayanniva (5.141.8)

And Mars, O Kṛṣṇa, after having made a turn in Jyēṣṭhā,
runs towards Anurādhā in order to end friendships, as it were.

Oak correctly states that Mars cannot go retrograde twice within a year, both in Maghā and Jyēṣṭhā/Anurādhā. He therefore concludes that the actual meaning of *vakra* cannot be “retrograde”. The possibility that the text *with its great number of variants* could in parts be incorrect or have interpolations does not come to his mind.

Oak arrives at the conclusion that “going vakri” must have meant that Mars crossed the ecliptic from north to south or from south to north. He asserts that “Mars began crossing the ecliptic and was clearly on the other side (north) of the ecliptic when it reached Magha”.

However, this assertion is completely misleading. While it is true that Mars was north of the ecliptic when he reached Regulus (latitude was about 45 arc min north), the planet *did not cross the ecliptic in Maghā, but in Punarvasu* (on 12 June 5562 BCE (-5561) jul.)! Not to mention the problem, that it might have been hard for ancient star gazers to tell exactly where the line of the ecliptic was.

A bit later, Oak continues: “Mars began crossing the ecliptic again, was on the other side (south) of the ecliptic near *Anuradha*, travelled towards Jyeshtha...” In fact, Mars crossed the ecliptic in the first days of June 5561 BCE (-5560) jul. in the second half of Viśākhā. This is at least not far from Anurādhā. But again, it is in conflict with the verse which states that Mars makes a *vakra* in Jyēṣṭhā and from there runs towards Anurādhā. Mars is obviously in retrograde motion (the traditional meaning of *vakra* is obviously correct!), whereas on the date Oak is referring to Mars was moving direct. Here again, Oak’s statements are very inaccurate and conceal the real problems. Unfortunately, lay readers won’t notice.

“Tivra or Tikshna, Planet or nakshatra near Krittika”

Another verse in the Bhīṣmaparva reads as follows:

कृत्तिकासु ग्रहस्तीव्रो नक्षत्रे प्रथमे ज्वलन्
वपुंष्यपहरन्भासा धूमकेतुरिव स्थितः

*kṛttikāsu grahas tīvro nakṣatre prathamē jvalan
vapūṣyapaharanbhāsā dhūmaketuriva sthitaḥ (6.3.26)*

A (or: The) strong/sharp (*tīvra*) planet burned in the Kṛttikās, the first lunar mansion, and robbed from them their beauty with his light, standing there like [the comet] Dhūmaketu (or: like the Sun).

Oak and Vartak believe this mysterious planet to be Pluto. This is really absurd because Pluto is invisible to the human eye. Even if one shared Oak’s belief that Vedic astronomers used telescopes, his interpretation makes no sense at all: How could a planet that is invisible to the naked human eye *outshine* the stars of *Kṛttikā*? Unfortunately, Oak does not explicitly quote the verse. Had he done so, he would certainly not have overlooked this problem.

Moreover, it must be kept in mind that in other places of the Mahābhārata only “five planets” or “seven planets” are mentioned and that Rāhu and Ketu are considered as planets too. There is not the slightest clue that Vedic sages were aware of the planets beyond Saturn. Even modern Hindu astrology does not use any planets beyond Saturn.

Nevertheless, since Vyāsa is said to be omniscient let’s examine Oak’s calculation! Oak asserts that “Pluto is seen between *Rohiṇī* and *Kṛttikā*, rather closer to *Rohiṇī* on the first day of the War”. According to my calculations based on JPL Ephemeris DE431, Pluto was located in a very different place, namely in *Revatī* on 16 Oct. 5561 BCE. Maybe the software Oak is using has a bad ephemeris of Pluto. If so, this is not Oak’s fault, however his argument turns out to be totally messed up.

What other planet could be meant by *grahas tīvraḥ*? I don’t know. So far, I have seen only speculative answers to this question. At best, the verse can be used as a wild card, when a date is found and an otherwise missing planet is found in *Kṛttikā*.

Since *tīvra* is not a common name of a particular planet, I wonder *why the composer did not make it clear which planet he was referring to*. Was it a nameless comet? Or is the verse not genuine and did the writer not know what planet exactly he was talking about? I think it must be accepted that some verses in the Mahabharata remain a mystery.

Seven Planets Near the Sun

An important theme found in the Mahābhārata are clusterings of all planets. In my own attempt to date the Mahābhārata War, such great conjunctions or super-conjunctions play an important part. Oak is aware of these verses but unfortunately fails to take them seriously. Oak first mentions the following verse:

मघाविषयगः सोमस्तद्दिनं प्रत्यपद्यत

दीप्यमानाश्च संपेतुर्दिवि सप्त महाग्रहाः

maghāviṣayagaḥ somastaddinampratyapadyata
dīpyamānāśca sampeturdivi sapta mahāgrahāḥ (MBh 6.17.2)

On that day, the Moon entered the area of Maghā.
The seven great planets burned in the sky and flew together.

This observation really does not fit Oak's date, i.e. 16 October 5561 BCE:

- 1) The Moon obviously is not in Maghā, as can be seen from the graphic on page 4, but in Jyēṣṭhā.
- 2) Oak identifies the “seven planets” as: Neptune, Uranus, Mars, Venus, Jupiter, Mercury, and Saturn. Particularly disturbing is the presence of Uranus and Neptune, which are not visible to the naked eye.¹¹ Also, Mercury was too close to the Sun to be seen.
- 3) The planets “flew together”. These words seem to indicate a close conjunction of the planets. However, the graphic on p. 11 makes it obvious that Mars and Saturn were on different sides from the Sun and 122 degrees away from each other. Uranus and Neptune were in Aquarius. Neptune was 146 degrees away from Saturn. The planets did *not* “fly together”.
- 4) Oak is not sure the planets were seen. He speculates they could have been seen during the total solar eclipse on that day. I will discuss the alleged total solar eclipse later. However, it must be noted that the sky is never 100% dark during a total solar eclipse, and an observation of fainter stars and planets are usually difficult.

I fail to see any connection between this verse and the celestial configuration on 16 October 5561 BCE.

I think, my own solution fits the text a lot better. In October 1198 BCE, all planets “flew” into the light of the Sun and formed a great conjunction. (See graphic on p. 5.) No planet was visible all night long. Later the text states that the “seven planets” were “going forth from the Sun” again, which confirms this interpretation (see below). No matter what one thinks of 1198 BCE as the date of the Mahābhārata, the configuration of that year fits Vyāsa's verse. When the last planet (Venus) disappeared in the light of the Sun eight days before the new moon on 13 October, the Moon was in Maghā! The seven planets that made their assembly around the Sun were Mercury, Venus, Mars, Jupiter, Saturn, Rāhu and Ketu (comet). Here it must be understood that in Vedic literature and in astronomical context the term Ketu usually applies to comets. The identification of Ketu with the descending lunar node appears only in later astrology.¹² The identity of the comet that appeared in 1198 BCE (if the account of the Mahābhārata is correct) is unknown.¹³ Also, it must be understood that in Vedic literature and the Mahābhārata Rāhu does not stand for the ascending lunar node, but is considered a planet or demon that swallows the Sun or the Moon.

¹¹ Uranus may be visible for sharp eyes and in clear skies near its opposition to the Sun, but ancient cultures were not aware of this planet, and it never appears in planet lists in Sanskrit texts. On Oak's Mahābhārata date, Uranus had an elongation of only 58 degrees, so it was far from opposition.

¹² More information is found in my book in the chapter “Ketu, Dhūmaketu, and Comets” on pp. 295ff.

¹³ Even nowadays, unfortunately, long-term ephemerides of comets are a difficult astronomical problem. And since many comets have very long cycles of thousands of years it is possible that a comet that appeared in 1198 BCE or even in 5561 BCE was never seen again. Therefore, if some authors claim that a “comet storm” with a great number of comets appeared in the year of the Mahabharata war, this cannot be declared 100% impossible, although it is rather unlikely and not very plausible from the statements found in the Mahābhārata.

The following verse, which is also discussed by Oak, also refers to a super-conjunction:

निश्चरन्तो व्यदृश्यन्त सूर्यात्सप्त महाग्रहाः

उल्कापातश्च संजज्ञे दिशां दाहस्तथैव च

तथाशन्यश्च संपेतुर्ववुर्वाताश्च दारुणाः

*nīscaranto vyadrśyanta sūryātsapta mahāgrahāḥ
ulkāpātaśca saṁjajñe diśāṁ dāhastathaiva ca
tathāśanyaśca sampeturvavurvātāśca dāruṇāḥ (MBh 8.26.34)*

The seven planets were seen going forth from the Sun.
A meteor shower occurred, and a burning of the [four] directions.
Lightning struck, and wild winds blew.

The going forth of the planets from the Sun *must* indicate an approximately simultaneous heliacal rising of all planets after a joint conjunction around the Sun (*pralaya*). It is obvious that this configuration has extremely powerful symbolism.

Oak correctly interprets the verse as meaning that “seven planets were seen going away from the Sun”. However, then he tries to apply it to the 17th day of the war, i.e. to 2 November 5561 BCE. He identifies the seven planets as Pluto (!), Neptune (!), Jupiter, Mars, Venus, [Uranus (!)] and Mercury. However, the planets were not going away from the Sun on this date; most of them were actually approaching the Sun. More precisely, the Sun was about to catch up with them and to overtake them. Only Mercury was moving away from the Sun for a few days.

Thus, when Oak says: “The fact that seven planets could be seen in the sky immediately after the sunset is sufficient corroboration for this Mahabharata observation”, this cannot be accepted. To the contrary! *It is a very clear refutation!* It seems that Oak himself also finds his conclusion problematic, for he adds: “however I would like to add that the statement ‘going away from the Sun’ might refer to the fact that these seven planets were moving to the east, i.e. away from the Sun, unless of course any one of them were in retrograde motion.” Oak takes refuge to a sidereal reference frame here, however forgets that he should also apply it to the Sun. In reality, the angular distance of the planets from the Sun was continually decreasing. It would have been observed that from day to day or from evening to evening all planets (except Mercury) were gradually sinking towards the western horizon, until eventually they disappeared in the glare of the Sun. So, Oak has turned the meaning of the verse in its opposite.

On the 14th day of the war (30 Oct. 5561 BCE) in Oak’s time table, the following observation was made:

तेऽपीडयन्भीमसेनं क्रुद्धाः सप्त महारथाः

प्रजासंहरणे राजन्सोमं सप्त ग्रहा इव

*te’pīḍayanbhīmasenaṁ kruddhāḥ sapta mahārathāḥ
prajāsaṁharāṇe rājansomaṁ sapta grahā iva (MBh 7.112.22)*

These seven angry great warriors tormented Bhīma,
like the seven planets [torment] the Moon at [the time of] the destruction of the creation.

Let us study the sky map for Oak’s proposed date:

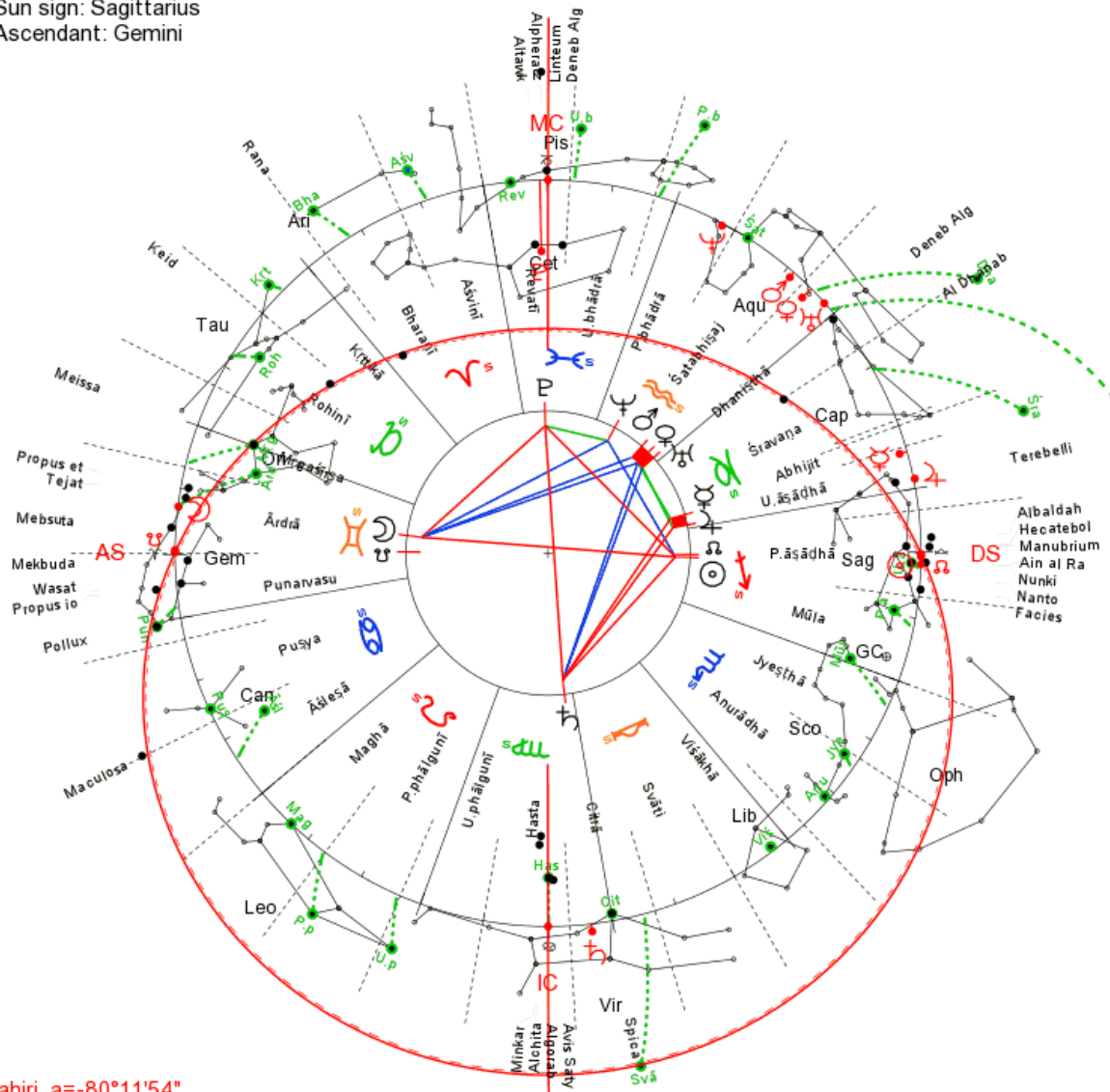
Name: Seven Planets attack the Moon/ Oak
date: Su., 30 Oct. 5561 BC (-5560) jul.
in Kurukshetra, INDIA
76e51, 29n59

Time: 6:10 p.m. LMT
Univ.Time: 13:02:36
Sid. Time: 17:59:10



Type: 2.AFZ 0.0-1 1-Apr-2017

Event chart, sidereal (Method: Astrodienst Fixed Stars)
Sun sign: Sagittarius
Ascendant: Gemini



Lahiri, a=-80°11'54"

sidereal, topocentric

Latitude house

☉ Sun	↗ 18° 19' 17"	0° 0'S	20.37
☾ Moon	↘ 12° 49' 20"	0° 6'S	6.46
☿ Mercury	↘ 5° 49' 11"	1° 52'S	21.69
♀ Venus	≈ 5° 9' 30"	3° 1'S	23.89
♂ Mars	≈ 8° 46' 42"	1° 31'S	24.16
♃ Jupiter	↘ 1° 29' 31"	0° 17'N	21.36
♄ Saturn	↗ 26° 40' 52"	1° 50'N	14.25
♅ Uranus	≈ 2° 9' 17"	0° 9'S	23.66
♆ Neptune	≈ 22° 2' 8"	0° 33'S	25.15
♇ Pluto	↘ 21° 16' 1"	17° 10'S	27.35
♊ Mean Node	↗ 19° 30' 30"	0° 0'N	20.46
♋ Desc.M.Node	↘ 19° 30' 30"	0° 0'N	6.96
♀ Lilith	↘ 29° 39' 12"	4° 50'S	12.22
AS: ☿	19° 53' 32"	2: ☿	28° 18'
MC: ☿	20° 0' 35"	11: ♀	13° 30'
		12: ☿	11° 36'

Lines and circles in the outer part of the chart:

- black: the zodiac (ecliptic)

Labeled stars are either close to a planet (orb=5°) or on the horizon or meridian (orb=2° in RA).

Only stars with an ed. latitude below +/-40° are considered.

- red: meridian and horizon (- - - refraction horizon)

- orange: house boundaries

Seven planets attack the Moon on 30 Oct. 5561 BCE after sunset, according to Nilesh Oak:

The Planets Pluto, Neptune, Mars, Venus, Uranus, Mercury, and Jupiter are in the western half of the sky and allegedly "attack" the rising Moon in the eastern sky.

The alleged "attack" apparently consists in the fact that the Moon and the planets are located in different quadrants of the sky. Interestingly, the Moon is actually moving away from the planets, so no direct encounter is going to take place. And the planets are setting while the Moon is rising.

I think Oak's interpretation of the verse is wrong. There are a considerable number of verses in the Mahābhārata and Harivaṃśa and other texts where planets gather around the Moon or the Sun, mostly as a symbol of war and battle, sometimes as a symbol of a friendly meeting. I have given a number of examples in my book in the chapter "... like the planets beset the Moon at the end of the age" and the subsequent chapter on pp. 111ff. This phenomenon is particularly often stated to occur at the end of a *yuga*. The merger of all planets into one great conjunction indicates a *pralaya*. This is also obvious from Siddhāntic planetary theories, which start their ephemerides from an assumed perfect conjunction of all planets at the beginning of Kaliyuga.

In fact, the above-quoted verse must be related to some super-conjunction, e.g. the one I proposed above. After all planets had gathered around the Sun and had been invisible (in *pralaya*), they reappeared in the eastern morning sky, and there they encountered the waning moon, a day or two before another new moon. The year 1198 BCE fits this description particularly well. On 18 Nov. 1198 BCE before sunrise, all the five planets and Rāhu (here the descending lunar node) and Ketu (understood as a comet, speculative for reasons mentioned above) were assembled around the Moon. The reader may notice that this was not the 14th day after the new moon, but rather on the 28th. However, it must be taken into account that the evidence for the beginning of the war on new moon is not conclusive. There are clues for a beginning of the war on new moon and others for a beginning on full moon. I won't go into details here, because I discuss it in my book on pp. 216ff.

Be that as it may, for the reasons explained above, my counterproposal to Nīlesh Oak's interpretation looks as follows (next page). Again, one may dislike the date I propose, but the graphic still shows what is required by Vyāsa's statement:

Name: Mahabharata Old Moon / Koch
date: Fr., 18 Nov. 1198 BC (-1197) jul.
in Kurukshetra, INDIA
76e51, 29n59

Time: 6:00 a.m. LMT
Univ. Time: 0:52:36
Sid. Time: 9:01:55

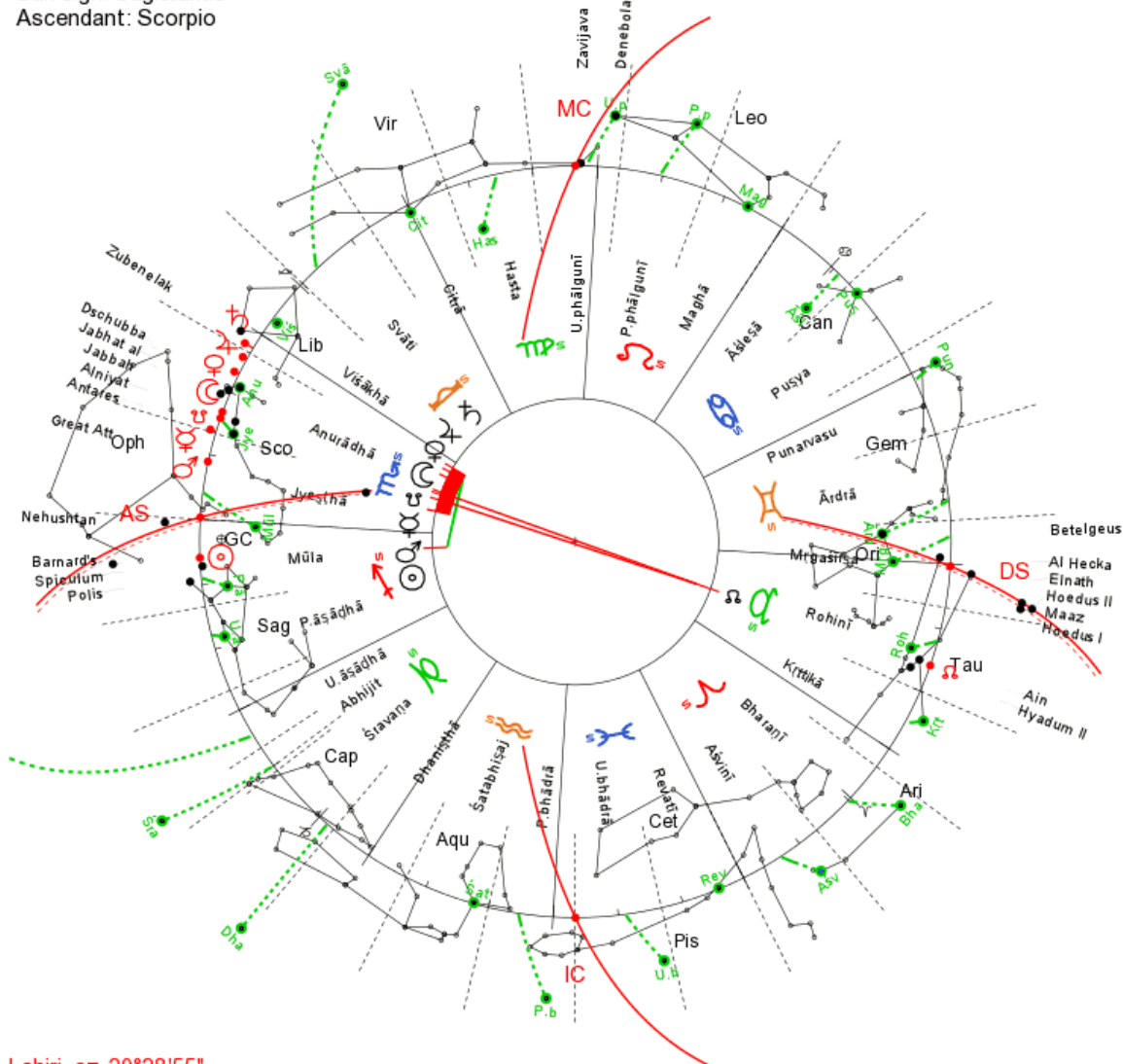


Type: 2.AFZ 0.0-1 1-Apr-2017

Event chart, sidereal (Method: Astrodienst Fixed Stars)

Sun sign: Sagittarius

Ascendant: Scorpio



Lahiri, a=-20°28'55"

sidereal, topocentric Latitude house

☉ Sun	↗ 5° 51' 29"	0° 0'S	19.44
☾ Moon	♊ 13° 13' 20"	0° 5'N	17.74
☿ Mercury	♊ 16° 20' 7"	1° 27'N	17.98
♀ Venus	♊ 6° 53' 51"	1° 15'N	17.27
♂ Mars	♊ 21° 6' 38"	0° 5'N	18.33
♃ Jupiter	♊ 4° 21' 54"	1° 7'N	17.08
♄ Saturn	♊ 2° 25' 11"	2° 20'N	16.93
♅ Mean Node	♊ 14° 12' 6"	0° 0'N	4.32
♆ Desc.M.Node	♊ 14° 12' 6"	0° 0'N	17.82
AS: ♊ 29° 40' 22"	2: ↗ 28° 46'	3: ♊ 0° 14'	
MC: ♊ 3° 24' 32"	11: ♊ 5° 54'	12: ♊ 4° 55'	

Lines and circles in the outer part of the chart:

- black: the zodiac (ecliptic)

Labeled stars are either close to a planet (orb=5°) or on the horizon or meridian (orb=2° in RA).

Only stars with an ecl. latitude below +40° are considered.

- red: meridian and horizon (- - - refraction horizon)

- orange: house boundaries

Counterproposal by D. Koch, 18 Nov. 1198 BCE before sunrise: After the super-conjunction around the Sun, the five planets have made their heliacal rising and encounter ("attack") the waning moon. The sixth is Rāhu (as descending lunar node) and the seventh Ketu (as comet, not shown in the graphic; for Vedic terms of Rāhu and Ketu see explanations above on p. 27).

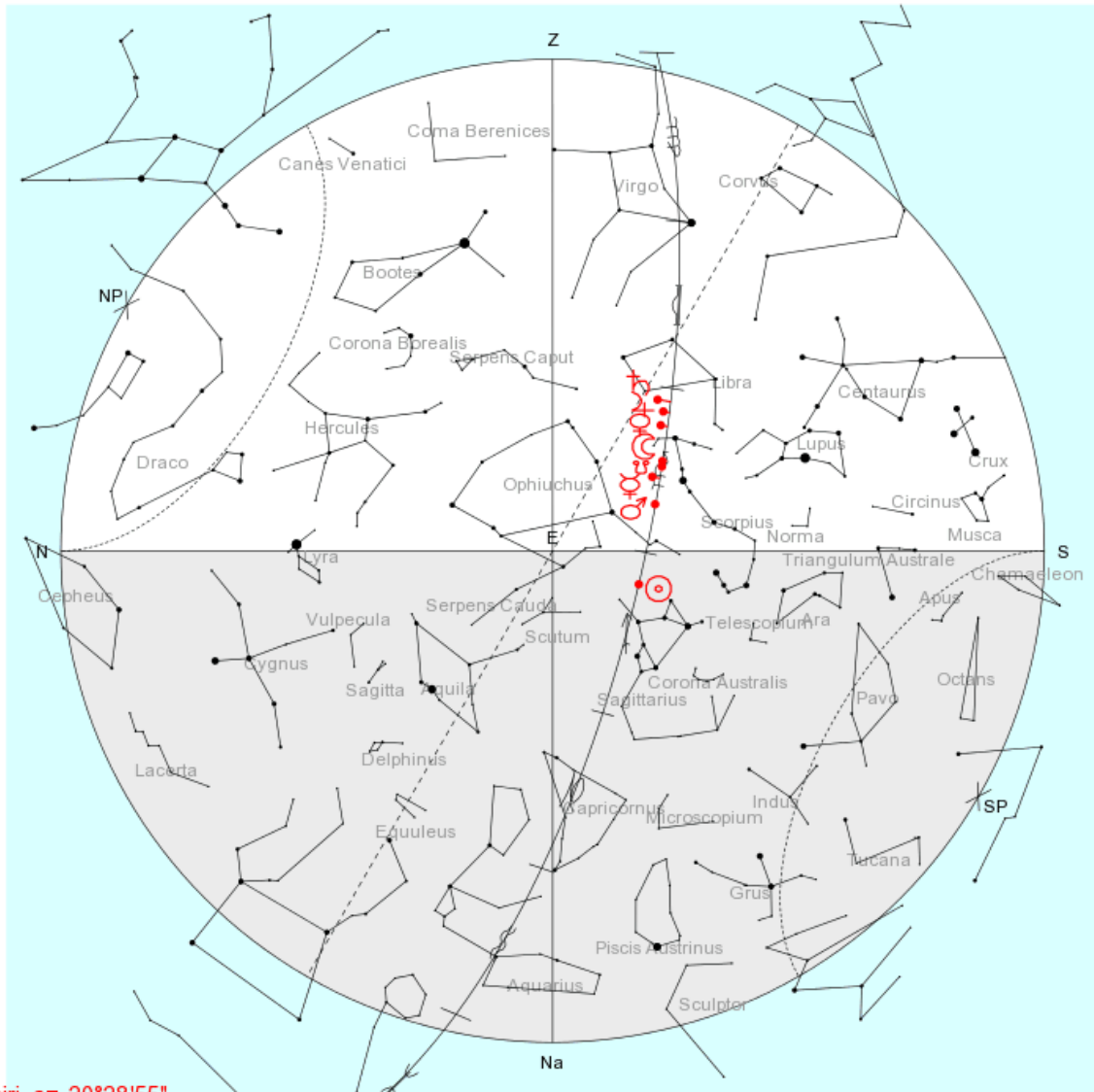
Name: Mahabharata Old Moon / Koch
date: Fr., 18 Nov. 1198 BC (-1197) jul.
in Kurukshetra, INDIA
76e51, 29n59

Time: 6:00 a.m. LMT
Univ.Time: 0:52:36
Sid. Time: 9:01:55



Type: 2.AXE 0.0-1 1-Apr-2017

Event chart, sidereal, topocentric (Method: Skymap East / Placidus)



Lahiri, $\alpha = -20^\circ 28' 55''$

sidereal, topocentric

Latitude house

☉ Sun	$5^\circ 51' 29''$	$0^\circ 0'S$	1.91
☾ Moon	$13^\circ 13' 20''$	$0^\circ 5'N$	1.14
☿ Mercury	$16^\circ 20' 7''$	$1^\circ 27'N$	1.24
♀ Venus	$6^\circ 53' 51''$	$1^\circ 15'N$	12.89
♂ Mars	$21^\circ 6' 38''$	$0^\circ 5'N$	1.41
♃ Jupiter	$4^\circ 21' 54''$	$1^\circ 7'N$	12.78
♄ Saturn	$2^\circ 25' 11''$	$2^\circ 20'N$	12.69
♁ Mean Node	$14^\circ 12' 6''$	$0^\circ 0'N$	7.17
♂ Desc.M.Node	$14^\circ 12' 6''$	$0^\circ 0'N$	1.17
AS: $29^\circ 40' 22''$	2: $28^\circ 46'$	3: $0^\circ 14'$	
MC: $3^\circ 24' 32''$	11: $5^\circ 54'$	12: $4^\circ 55'$	

A more realistic (and aesthetic!) view of the cluster of planets around the Moon in the eastern morning sky on 18 Nov. 1198 BCE.

Solar and Lunar Eclipse

The Mahābhārata mentions a solar and a lunar eclipse around the time of the war. It also mentions—if this interpretation of the text is correct—that the two eclipses are separated by only 13 days.

Oak finds a solar eclipse on 16 October 5561 BCE around mid-day and a lunar eclipse on 30 October “around mid-day but was visible at Kurukshetra only in the evening for less than two hours”. He concludes that “these two eclipses are separated by 13 days, i.e. not counting the days of eclipses themselves”.

Unfortunately, this does not work out either. I start with the 13-day difference. The text reads as follows:

चतुर्दशीं पञ्चदशीं भूतपूर्वा च षोडशीम्

इमां तु नाभिजानामि अमावास्यां त्रयोदशीम्

caturdaśī pañcadaśī bhūtapūrvā ca ṣoḍaśī
imāṃ tu nābhijānāmi amāvāsyāṃ trayodaśī (MBh.6.3.28)

[New moons] on the 14th, 15th or 16th there have been before.
But this new moon on the 13th day I do not know.

चन्द्रसूर्यावुभौ ग्रस्तावेकमासे (var. एकमासी; एकाह्ना हि) त्रयोदशीम्

अपर्वणि ग्रहावेतौ (var. ग्रहेणैतौ) प्रजाः संक्षपयिष्यतः

(var. अपर्वणि ग्रहं यातौ प्रजासंक्षयमिच्छतः)

candrasūryāvubhau grastāvekamāse (var. *ekamāsī*) *trayodaśī*
(var. *ekāhnā hi*)
aparvaṇi grahāvetau (var. *grahēṇaitau*) *prajāḥ saṃkṣapayiṣyataḥ* (29)
(var. *aparvaṇi grahaṃ yātau prajāsaṃkṣayamicchataḥ*)

Both the Moon and the Sun were eclipsed (swallowed) in one and the same month¹⁴ on the 13th [of the fortnight],
on a wrong date: these two eclipses (*grahau!*) will destroy the creatures.

The text states that the speaker has *never* seen an eclipse on the 13th of the fortnight, only eclipses on the 14th, 15th, and 16th. An eclipse on the 13th was on a “wrong date” (*aparvaṇi*) and *therefore inauspicious*. Now, the eclipses of 16 October and 30 October were actually 14 days apart, which is very normal, and there is nothing inauspicious about them, at least not with regard to the time distance between them. If the days of the eclipses themselves are not counted, then double eclipses 13 days apart are very common. Oak is obviously missing the point.

I need not discuss the difficult problem of eclipses on the 13th in this short review. I wrote a long chapter about it in my book, pp. 262ff. Instead, let us have a look at the eclipses on 16 and 30 October 5561 BCE. Were they visible from Kurukṣetra?

I can reproduce them using the Swiss Ephemeris, but find them on 17 October and 31 October. The difference is most probably explained by the usage of different Delta T models in the two softwares. Since the uncertainty of Delta T in 5500 BCE is considerable, it makes little sense to squabble over the exact local timing of the eclipses at Kurukṣetra.

The lunar eclipse on 31 October was total and may have been visible from Kurukṣetra. However, the solar eclipse on 17 October 5561 BCE (16 October according to Oak) *was only partial, had a low magnitude, and was seen only near Antarctica*. No playing around with the value of Delta T will provide a visible eclipse for India on this date.

partial solar eclipse on 17 Oct.-5560 (=5561 BC) jul., 0:48:56.5 UT maximum eclipse
core shadow width 109.769918 km **magnitude 0.2626/0.1537** jd= -309442.466013
begin of eclipse : 23:36:40.3 UT end of eclipse: 02:01:06.5 UT, delta t=176460.3
geographic location of greatest eclipse **98°31'E, 71°7'S**
(program call: swetest-solecl -b1.6.-5560jul -n1
magnitudes are fraction of solar diameter and fraction of solar disc covered by the moon)

¹⁴ Var. “on one and the same day” (*ekāhnā*). Since a solar and a lunar eclipse must be at least two weeks apart, they cannot take place on the same day. Or does it mean that both took place on 13th of their respective fortnight?

It is obvious that Oak did check not whether a total eclipse was possible on this date. Admittedly, this might have been difficult at the time he wrote his book. Unfortunately, NASA's Five-Millennium Eclipse Canon covers only the period from 2000 BCE to 3000 CE. The planetarium software Redshift 8 apparently only provides data after 4713 BCE. A recent download of Skymap Pro 12 Demo only provides eclipse dates after 2000 BCE.

Since the publication of the JPL Ephemeris DE431 in 2013, which covers the time range 13000 BCE to 17000 CE, the *Swiss Ephemeris* test program *swetest* is able to calculate solar eclipses before 5000 BCE. An online page that uses this program is found here: <http://www.astro.com/swiseph/swetest.htm> . However, the list of options must be studied before usage. To see the original output for the above calculation, the following string can be entered in the field "other options": -solecl -b1.6.-5560jul .

Another program that can calculate eclipses in the remote past, but is a bit difficult to handle, is *Solex* by Aldo Vitagliano, also available free of charge here: <http://www.solexorb.it/> . I don't know if other recent planetarium Software calculates eclipses before 2000 BCE.

Conclusion

More objections could be raised against Nilesh Oak's theory, but the above considerations should be sufficient to show that his study of the Sanskrit texts and the astronomical configurations are seriously flawed. On closer scrutiny, the evidence he provides in favour of the year 5561 BCE as the year of the Mahābhārata War dissolves into nothing.

I want to express my gratitude to Nilesh Oak for giving me the opportunity to think deeper in this matter.

In a place or two I referred to my book:

Dieter Koch, "Astronomical Dating of the Mahābhārata War" (2014/2015), Erlench/Switzerland. It can be downloaded free of charge from

<https://de.scribd.com/document/311786869/Dieter-Koch-Astronomical-Dating-of-the-Mahabharata-War>

or

<http://www.gilgamesh.ch/KochMahabharata.pdf>

Printed copies can be ordered from:

<http://www.lulu.com/content/17089496>

Dieter Koch, Switzerland, independent scholar, expert in Sanskrit, ancient astronomy and astronomical computing.