Revisiting the Date of **Mahabharata war:** astronomical methods using **planetarium software**

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हरिः ओं
श्री गुरुभ्यो नमः/
परम गुरुभ्यो नमः/
श्रीमदाचार्य गुरुभ्यो नमः/
शुक्लांबरधरं विष्णुं शशिवर्णं चतुर्भुजम्
प्रसन्नवदनं ध्यायेत् सर्वविघ्नोपशान्तये//
नारायणाय परिपूर्णगुणार्णवाय
विश्वोदयस्तिथिलयोन्नियतिप्रदाय/
ज्ञानप्रदाय विभुदासुरसौख्यदुःख
सत्कारणाय विततय नमो नमस्ते//
नारायणं नमस्कृत्य नरंचैव नरोत्तमं/
देवीं सरस्वतींचैव ततो जयमुदीरयेत्//
व्यासाय विष्णुरूपाय व्यासरूपाय विष्णवे
नमोवै ब्रह्मनिधये वासिष्ठाय नमोनमः//

Outline of the talk

The date of the Mahabharata war

- **Initial attempts using Planetarium software**
- **determined as a unique date, 3067 BCE**
- **based on the astronomical data within the epic**
- **independent of any other source**

  Consistency of 3067 BCE with traditional reckoning of Kaliyuga

"**The Bharata War is the central landmark in Indian traditional history and fixing the date of that event will give us a starting point in settling dates of events occurring before and after that.**"

_A.D.Pusalker

Antare caiva samprapte kali dvaparayo rabhut |
Samanta pancake yuddham kuru pandava senayoh ||

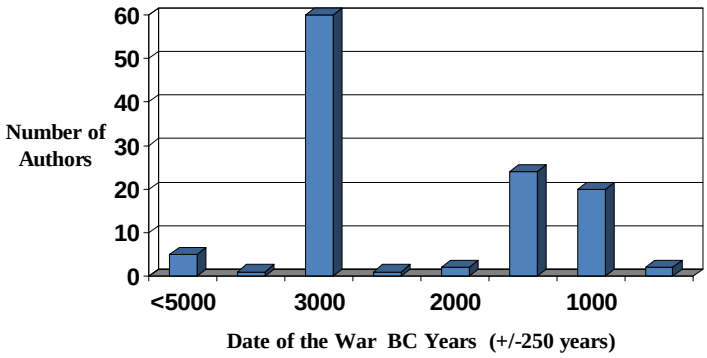
"The war between the kuru and pandava armies took place at the samanta pancaka region at the junction of kali and dvapara yugas"
-Adi parvan.

However, scholars did not believe this.
So, they put forth their own ideas about the date.

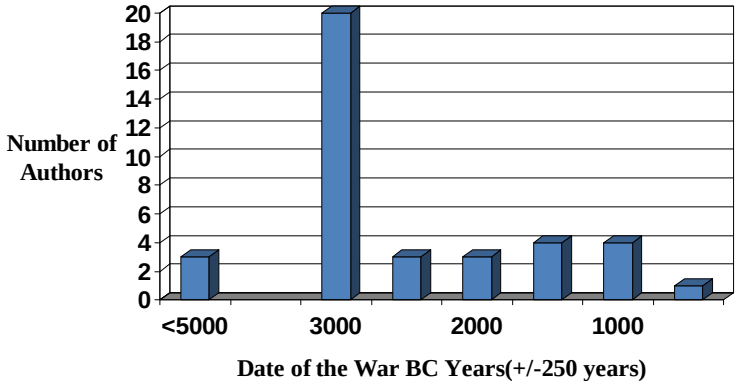
Methodologies used in Dating

- Linguistics
- Textual evidence from Vedic texts
- Genealogical lists found in Puranas
- Astronomical references
- Archeological evidence
- Nearly 200 publications have appeared on the problem of Date of the Mahabharata war
- Nearly half of all these publications are based on the astronomical references

Date of the Mahabharata War
Number of Authors promoting it



Date of the Mahabharata War based on Astronomy
Number of Authors promoting it

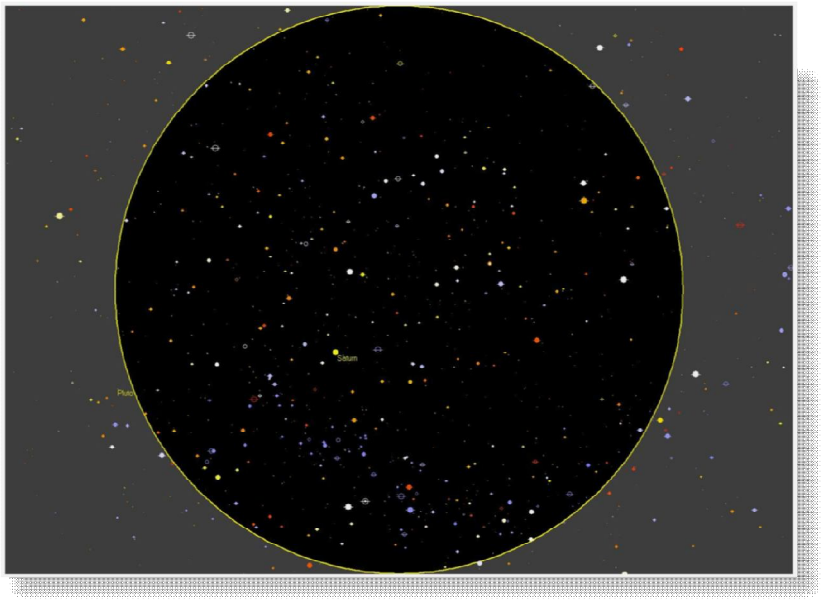


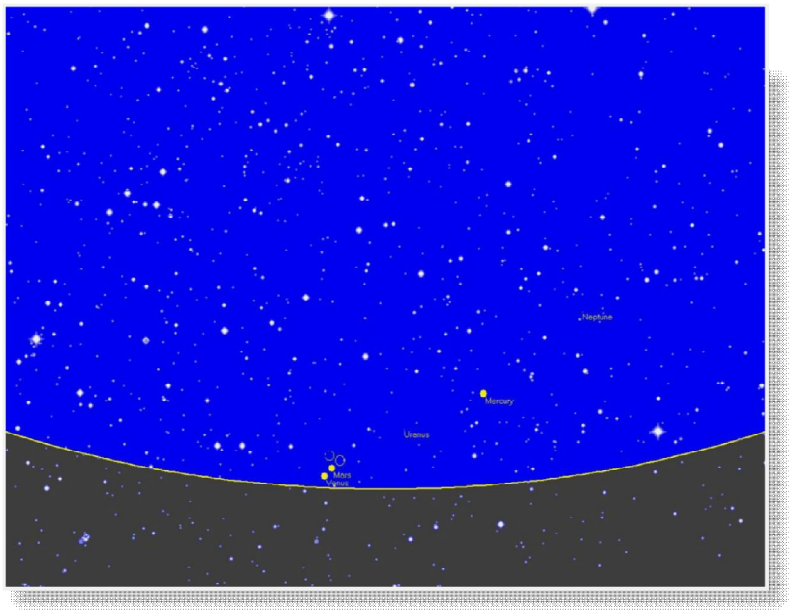
Astronomical Events referred to in the Epic

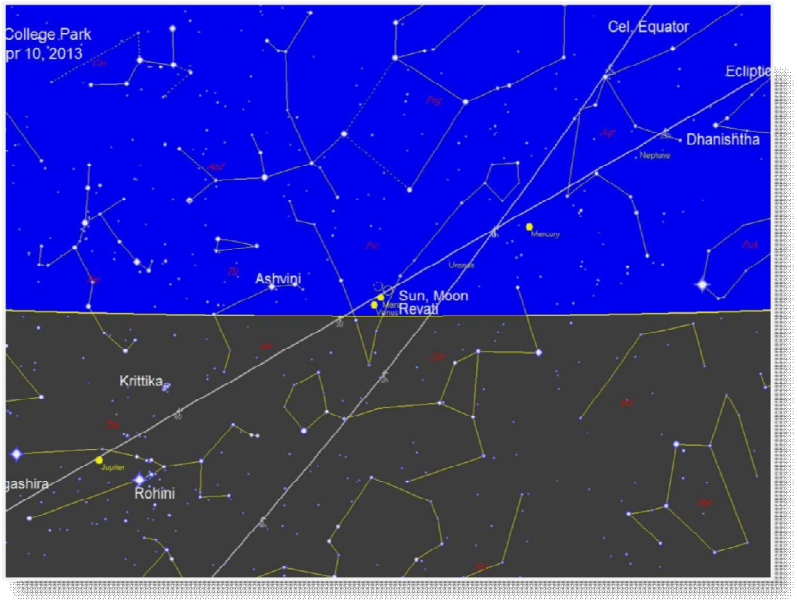
- Eclipses, Lunar and solar;
  Eclipse pair occurring within 13 days
- 'graha'-Planetary positions
  example: Saturn (Shani), Mars (Angaraka)
- Specific days: tithi and nakshatra
- Equinoxes and Solstices

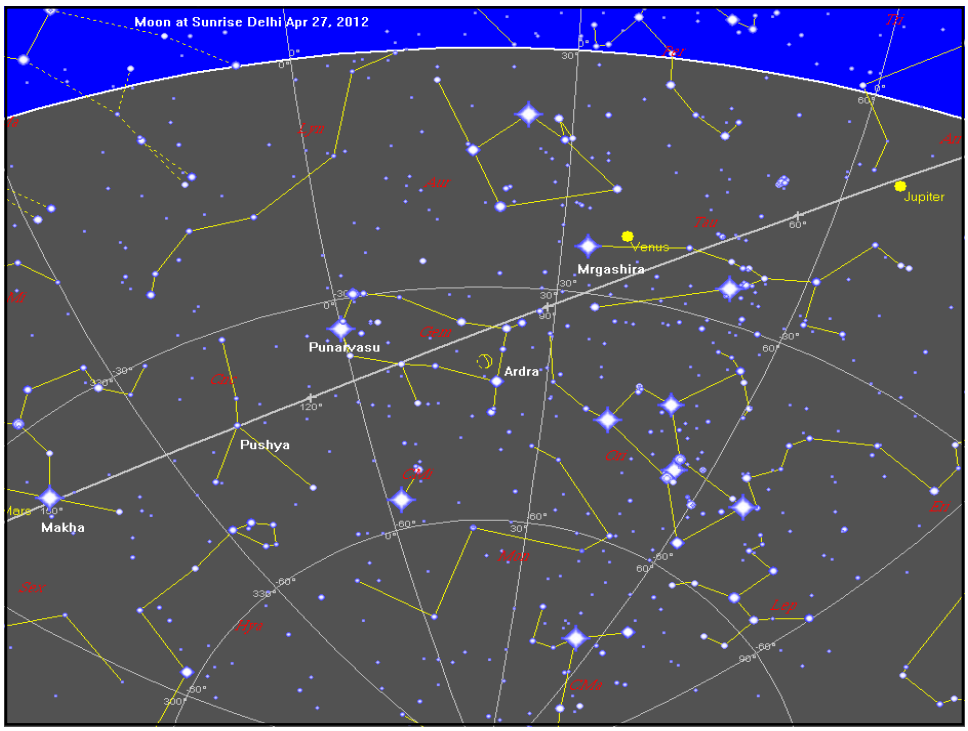
Planetarium Software

- Can project the view of the sky at any time
- And any place of the world.
- All one needs is the date, and latitude and longitude of the place
- View of Delhi sky at midnight Apr 10, 2013
- View of the sky Apr 10 at Sun rise


Saturn
Pluto


Neptune
Mercury
Uranus
Mars
Venus

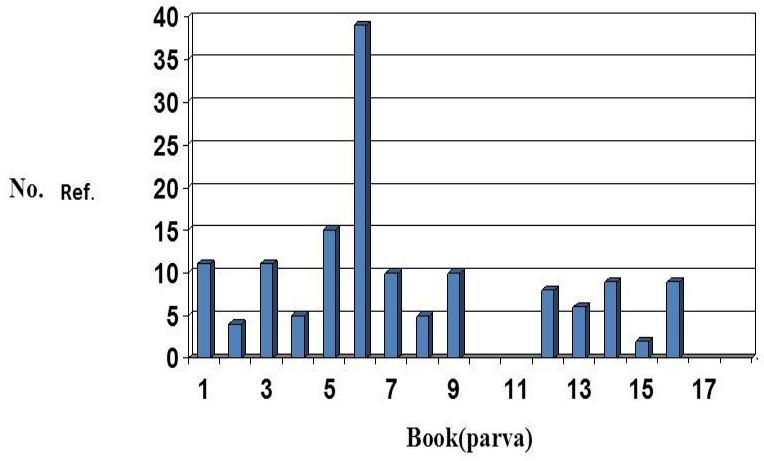

College Park
pr 10, 2013
Cel. Equator
Ecliptic
Dhanishtha
Ashvini
Sun, Moon
Revati
Krittika
Rohini


Moon at Sunrise Delhi Apr 27, 2012
Jupiter
Venus
Mrgashira
Punarvasu
Ardra
Pushya
Makha

Using the Planetarium Software

- Could be used for investigating the dates of the Mahabharata war proposed by various authors.
- This is how:
  - Select a benchmark set of astronomical events in the epic
  - Select the date given by some scholar
  - Check to see if on that date the pre-selected events occur using the planetarium software.
  - If positive, the date is a possible date for further study.
  - If not, reject the date.
  - Go to the next author, and his date

Distribution of astronomical references among the Parvans



- Astronomical references most pertinent to the war are in **Udyoga** and **Bhishma parvans.**
- Scholars such as Dikshit, Kane, Vaidya …all have criticized the astronomical references in Bhishma Parvan practically unanimously
- Sengupta's words:
- "**All this is hopelessly inconsistent astrological effusions of evil omens fit for Mother Goose's Tales only"**
- **"We can not put any faith in any statement of this chapter of Mahabharata."**

Initial attempts

- Decided to consider only references in udyogaparvan
- Consider four research works, all astrophysicists, astronomers, and mathematicians and two of them, sanskrit pandits
- Dates given by them span the range
- Easy to check whether the benchmark data are reproduced on the date
- Reject or accept as possible date

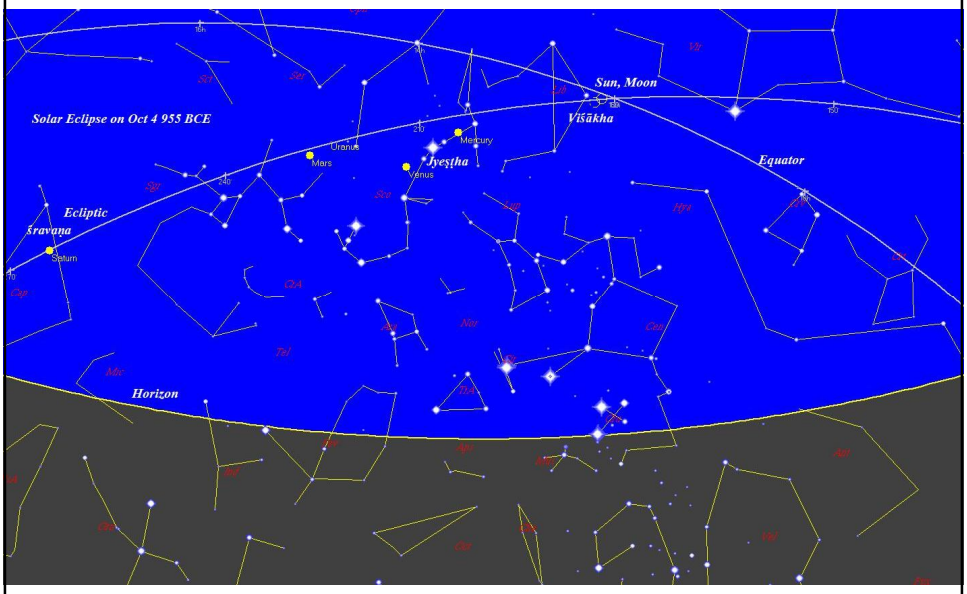
• SenGupta	Ancient Indian Chronology(1947)	2449BCE
• Raghavan	The Date of the Mahabharata War(1969)	3067BCE
• Kochhar	The Vedic People (1997)	955 BCE
• Siddharth	The Celestial Key to the Vedas (1999)	1311BCE

Benchmark Set of Astronomical References in udyogaparvan

- Krishna leaves on a diplomatic mission for peace: in Kartika, revati
- Reaches Hastinapura on :bharani
- Lunar eclipse on: Kartika pornima
- Talks for peace go on until the day of pushya
- Krishna leaves Hastinapura on day of uttara phalguni
- Karna and Krishna ride together on that day. Krishna advises "Seven days from now the new moon occurs at jyeshtha. War rituals be started on that day."
- Amavasya at Jyeshtha nakshatra
- Karna notes that it will be solar eclipse on that day.
- Saturn is at rohini
- Mars had become retrograde near Jyeshtha

Kochhar

- Acknowledges more than 150 references to astronomical phenomena in the epic
- Holds the view that most of them are nothing more than just poetic imagery
- Considers only significant event to be a solar eclipse
- 4th October 955 BCE

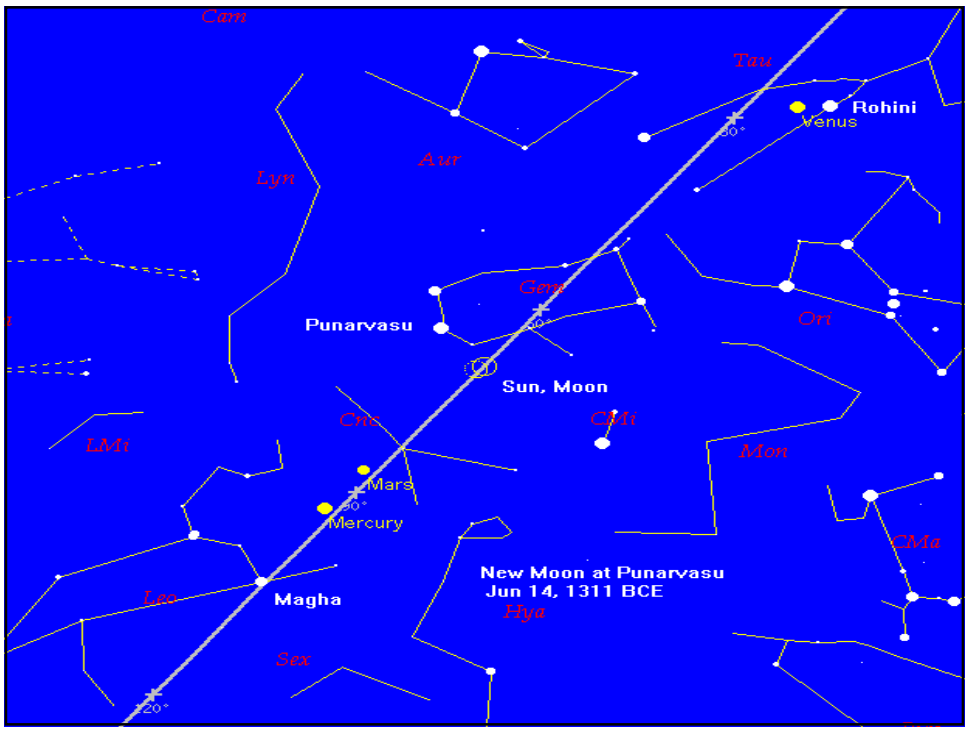


Results for Kochhar's Date

- The solar eclipse takes place at vishakha and not jyeshtha
- Saturn is at shravana and not Rohini
- Winter solstice occurs in the waning Phase and not in the waxing phase.
- None of the events match those in the epic

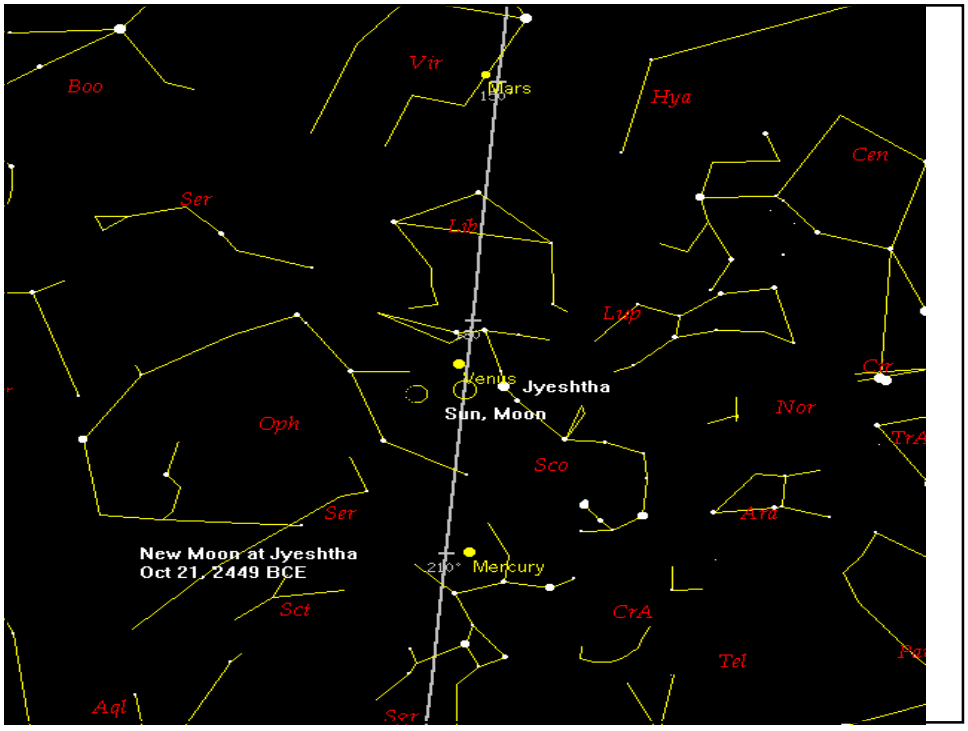
Sidharth

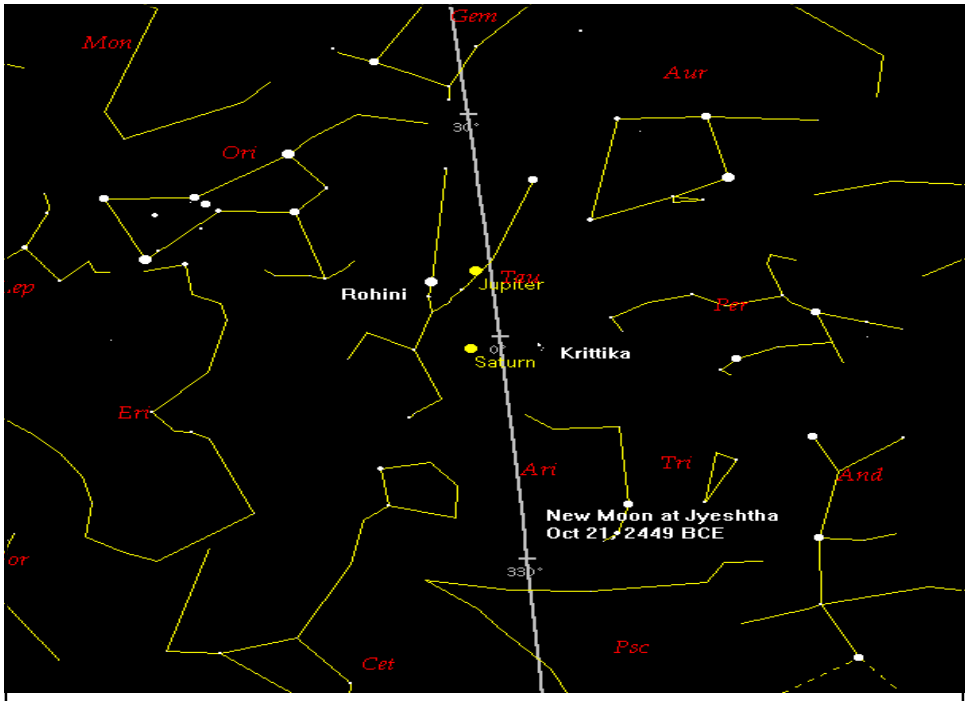
- Only astronomical event considered is a solar eclipse
- occurs on June 14th , 1311 BCE
- The eclipse occurs at Punarvasu and not Jyeshtha
- It occurs before the summer solstice, too far away from winter solstice to be considered a candidate for the war.
- Does not agree with any bench mark event



Sengupta

- Considers following facts to be relevant:
  - New Moon at Jyeshtha before the war broke out
  - Sun turned northward 80 days after this event
  - On the eve of the war, moon was 13 days old and was in conjunction with krittika
  - On the last day of the war, Moon was 31 days old and was in conjunction with Shravana
- Does not use any other references to astronomy listed
- Harshest criticism of the references quoted
  - "**All this is hopelessly inconsistent astrological effusions of evil omens fit for Mother Goose's Tales only**"
  - **"We can not put any faith in any statement of this chapter of Mahabharata."**



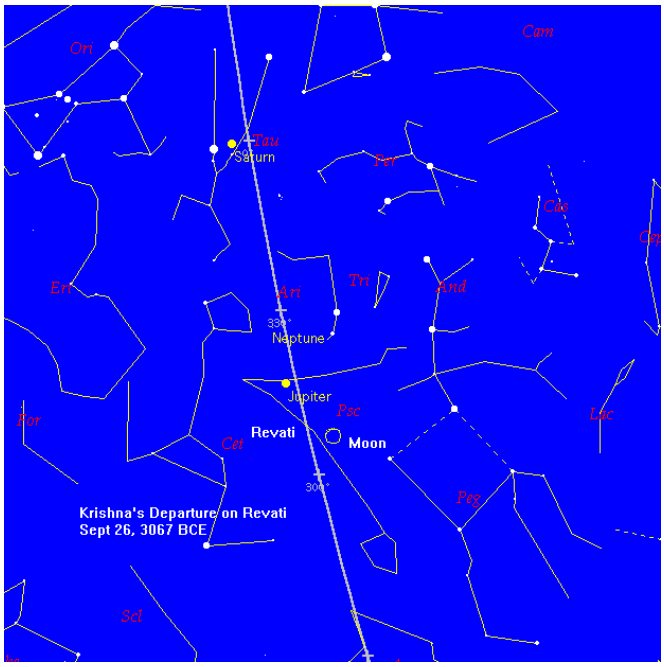


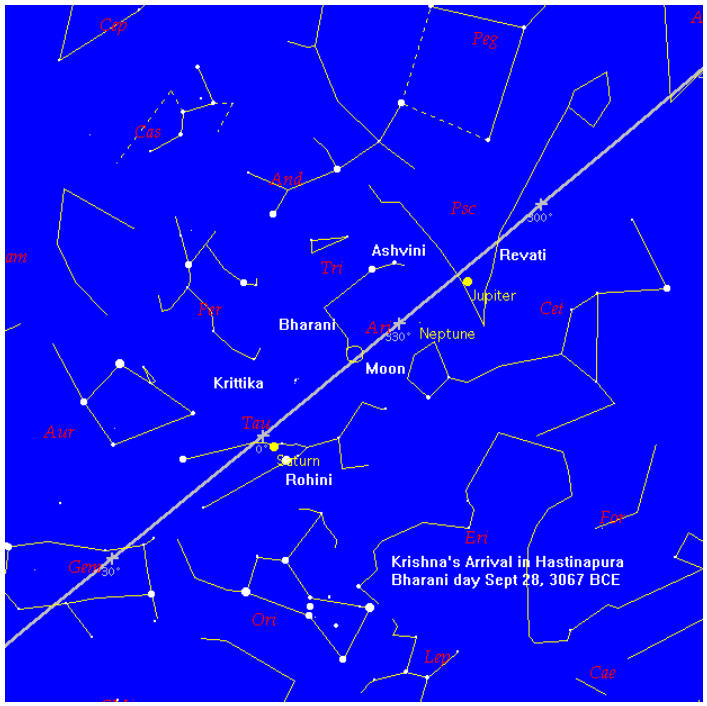
Results for Sengupta's Date

- New Moon at Jyeshtha on October 21, 2449 BCE, but no eclipse.
- He suggests that the eclipse in the epic may have occurred two years before the war and were chronicled as being contemporaneous with the war
- Saturn at krittika and not rohini
- Mars retrograde near purvabhadra
- No match with bench mark events

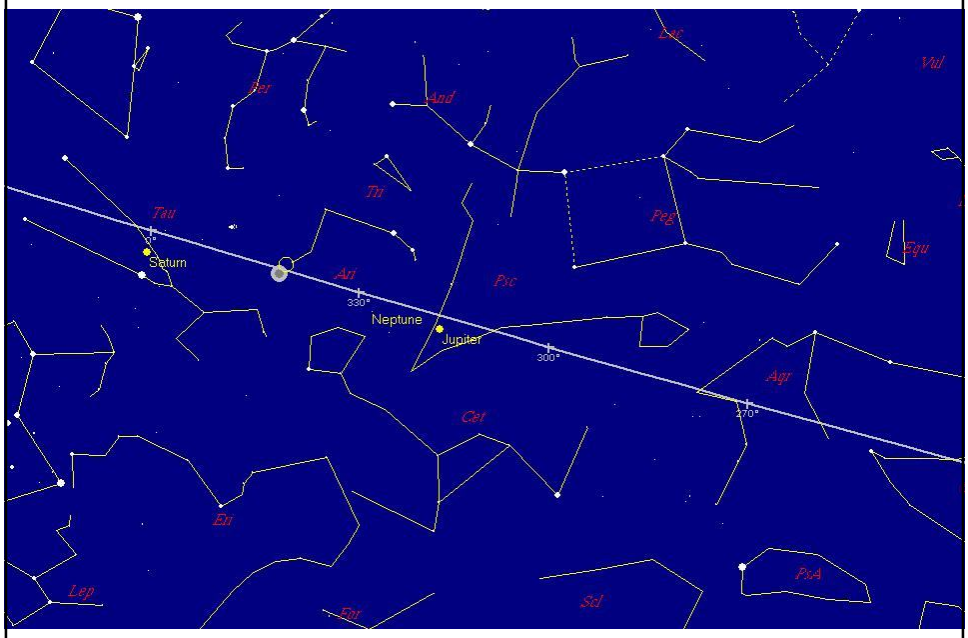
Raghavan's Chronology 3067 BCE

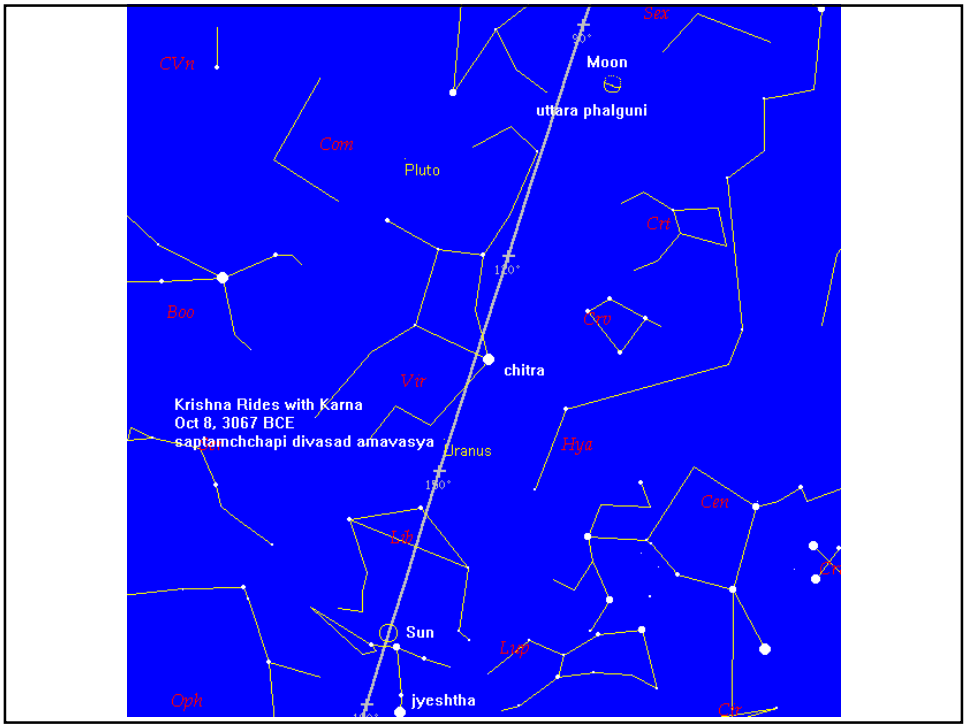
- Krishna's departure for Hastinapura (revati nakshatra) — Sept. 26
- Krishnaa reaches Hastinapura(Bharani) — Sept. 28
- Lunar eclipse on Kartika Pornima — Sept. 29
- Krishnaa rides with Karna (u. phalguni) — Oct. 8
- Solar eclipse at jyeshtha — Oct. 14
- War starts — Nov. 22
- Winter solstice — Jan 13, 3066 BCE
- Bhishma expires (rohini) (magha shukla ashtami) — Jan 17, 3066 BCE

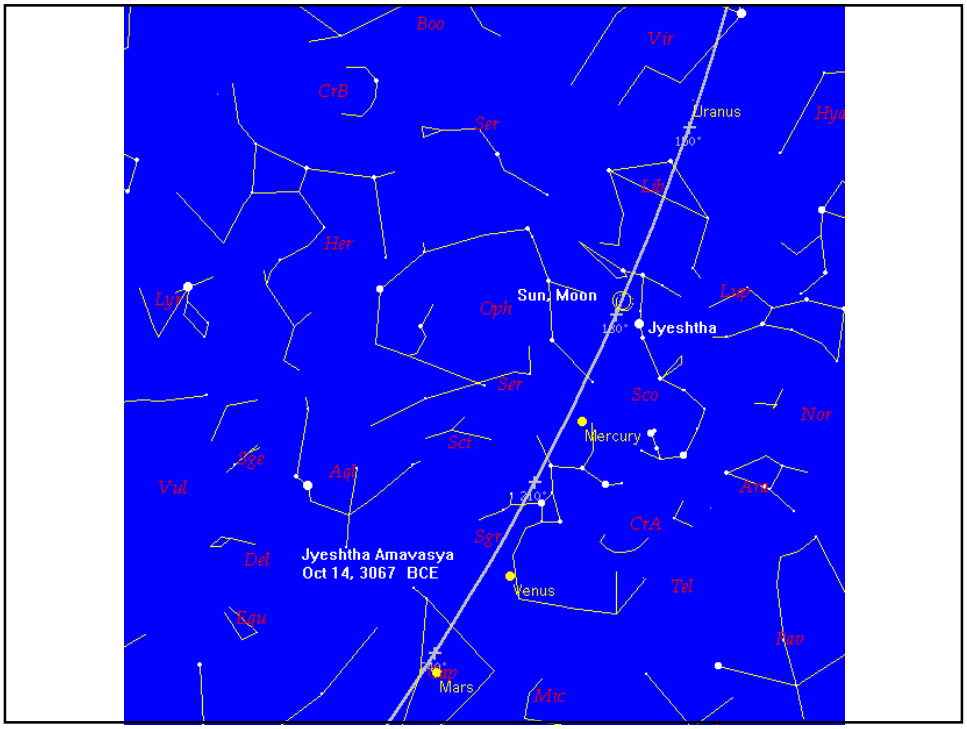


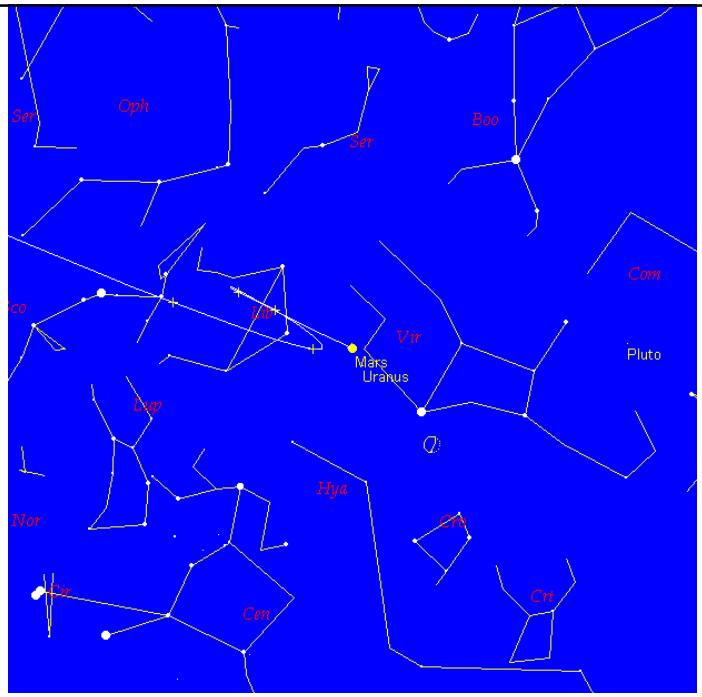


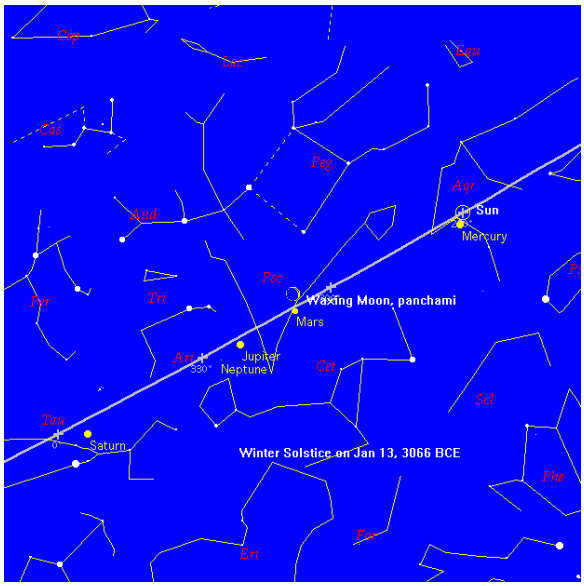
Lunar Eclipse on Sept 29, 3067 BCE

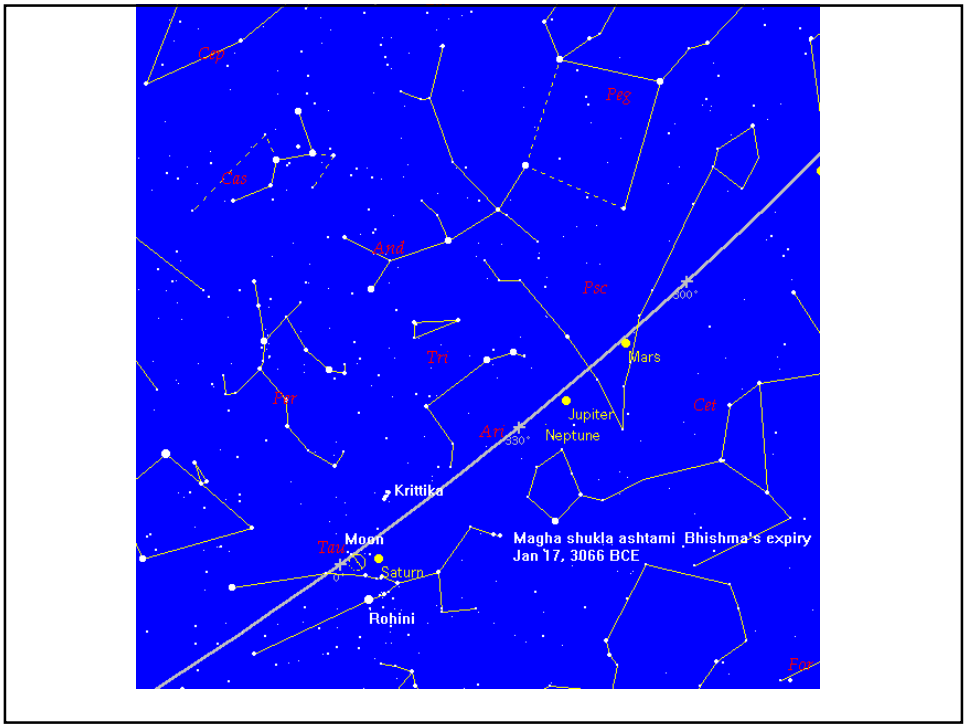


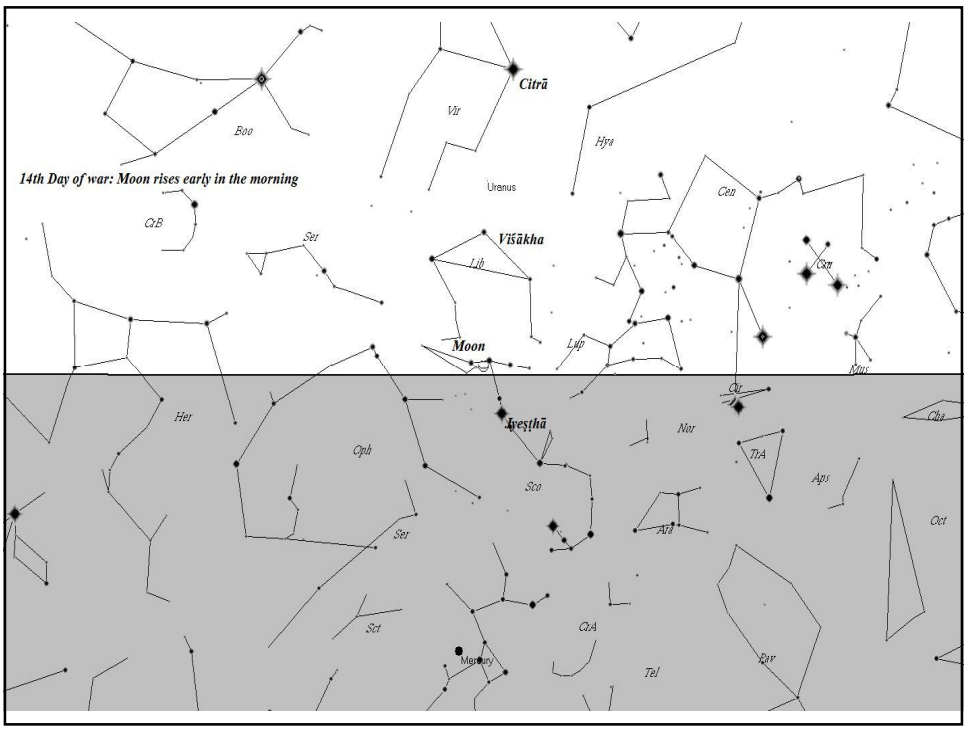

Ser
CVn
Moon
uttara phalguni
Com
Pluto
CrB
Boo
Vir
chitra
Krishna Rides with Karna
Oct 8, 3067 BCE
saptamchchapi divasad amavasya
Uranus
Hya
Cen
Lib
Sun
Lup
jyeshtha
Oph
Sgr

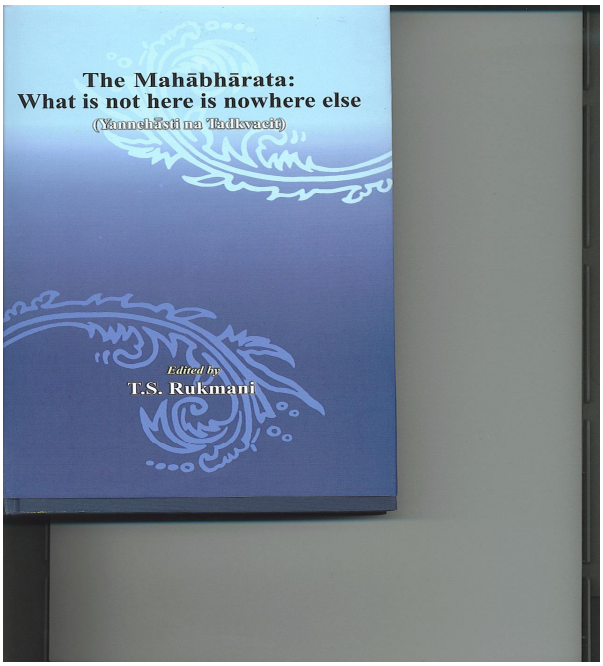

Boo
Vir
CrB
Ser
Uranus
Hya
Her
Lib
Sun, Moon
Oph
Lup
Jyeshtha
Ser
Sco
Nor
Mercury
Sct
Aql
Vul
Ara
CrA
Sgr
Del
Jyeshtha Amavasya
Oct 14, 3067 BCE
Venus
Tel
Equ
Pav
Mars
Mic


Ser
Oph
Ser
Boo
Com
Leo
Vir
Mars
Uranus
Pluto
Lup
Hya
Mon
CVn
Cru
Cen
CrA


Cep
Cas
Equ
Peg
Aqr
Aqd
Sun
Mercury
Psc
Tri
Per
Waxing Moon, panchami
Mars
Ari
Jupiter
Neptune
Cet
Scl
Tau
Saturn
Winter Solstice on Jan 13, 3066 BCE
Eri
For
Phe


Cep
Peg
Cas
And
Psc
300°
Tri
Mars
Per
Jupiter
Cet
Ari
330°
Neptune
Krittika
Moon
Tau
Saturn
Magha shukla ashtami Bhishma's expiry
Jan 17, 3066 BCE
Rohini
For


Citrā
Vir
Boo
Hya
14th Day of war: Moon rises early in the morning
Uranus
Cen
CrB
Ser
Viśākha
Lib
Moon
Lup
Her
Jyeṣṭhā
Nor
Oph
TrA
Aps
Sco
Oct
Ser
Ara
Sct
CrA
Mercury
Tel
Pyx



What about references in Bhishma Parvan?

Sage Vyasa meets Dhritarashtra on the eve of war. Describes all the omens he has seen.

- **"Oh King, a great destruction will occur in this war just as indicated by these omens which are harbingers of great calamity."**

Scholars say:

- **The astronomical references in Bhishma Parvan are confusing.**
- **Planetary positions are ambiguous and even contradictory.**
- **Each planet is listed as being found at the same time at two or more positions differing by as much as 30 degrees.**
- **Astronomical references occur in four separate segments**
- **Indicates interpolation**
- **May belong to observations made on several different dates, but brought together at one parvan.**

Table 1.Supposedly planetary positions derived by Sharma by a superficial analysis

Body	Location
Sun	**a)**In opposition to the moon, in between δ-Scorpi (Anuradha) and ι-Librae (vishakha)
	b) Aldebaran or Antares (Rohini)
Moon	**a)** Pleiades, (krittika) Lunar eclipse
	b) Aldebaran or Antares (Rohini), near the sun; Solar eclipse.
Mercury (Dark Planet)	**a)** Antares (Jyeshtha) **b**)Spica(Chitra)
Venus (White Planet)	**a)** Between α-Pegasi and α-Andromedae, retrograde (purva bhadraa and uttarabhadra)
	b) Spica (chitra)
Mars	**a)** Regulus, (Makha) retrograde
	b) Altair,(shravana) retrograde
Saturn	**a)** Aldebaran(Rohini)
	b) Near ι-Librae (vishakha) for one year together with Jupiter
	c) δ-Leonis (purva Phalguni)
Jupiter	**a**) Altair (shravana)
	b) Near ι-Librae for one year together with Saturn (Vishakha)
Rahu or Ketu (Cruel Planet)	**a**) Approaching the Sun
	b) Between Spica and Arcturus(chitra and swati)
	c) Pleiades(krittika)

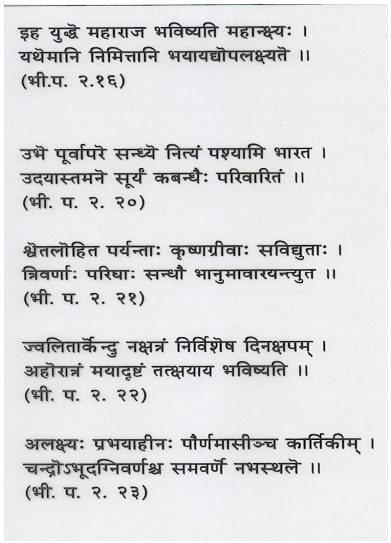
- **Aldeberan (Rohini) and Antares(Jyeshtha) are referred to by the same word 'Rohini' and Scholars infer ambiguity**
- **Each asterism has a presiding deity "prajapati" for Aldeberan and "indra" for Antares and the text is explicit and it is clear which asterism is meant.**
- **There are two eclipses a lunar and a solar, two different events, the positions of Sun and Moon have to be different.**
- **No ambiguity here at all.**
- **Scholars have assumed 'graha'=planet 'sveta'=white; 'svetagraha'=white planet=Venus**
- **Infer Dark planet, White planet and Cruel planet refer to Mercury, Venus and Moon's Node. This seems to be at the root of the problem**

Closer study

- **Planetary Positions derived from Ch 2, 3 of Bhishma Parvan**
- **Out of 79 verses of omens, 20 verses contain astronomical references**
- **but occur in four separate segments**
- **might have given the idea that Vyasa met the King on different occasions**
- **some scholars think that some verses may even belong to Sabhaparvan**
- **Some scholars base their analysis on English translations, without paying attention to what the original says**
- **some consider the verses to be interpolations at different times**
- **The story appears to be entirely different.**

६४. उत्पातलक्षणम्

१. १. परिचय: यह उपदेश अङ्गिरा और उशना के अनुसार है ।
१. २–३. उत्पात की परिभाषा और उसका वर्गीकरण ।
१. ४–२. ७. भूकम्प और चक्रवात ।
२. ८–३. १. गन्धर्व नगर ।
३. २–४. ८. राजा और राष्ट्र के विनाश की सूचना देने वाले अपशकुन ।
४. ९–५. ५. दुर्भिक्ष-सूचक लक्षण ।
५. ६–६. १. युद्ध-सूचक लक्षण ।
६. २–७. ७, गर्ग के अनुसार राजा और राष्ट्र के विनाश की सूचना देने वाले लक्षण
८. ८–८. २. घटित होने वाले ग्राम या नगर के लिये महान विपत्ति के सूचक शकुन
८. ३–४. विभिन्न जातियों के विनाश के सूचक शकुन ।
८. ५–७. वृक्ष लक्षण ।
८. ८. सर्प और मेढक लक्षण ।
८. ९–१०. १. ऐसे शकुन जो कुछ ऋतुओं में ही अनुकूल होते हैं । ये श्लोक बृहत्संहिता ४५.८३ और बाद में भी आते हैं जहाँ ऋषिपुत्र को इनका प्रणेता, कहा गया है यहाँ उल्लेखनीय है कि सूची का आरम्भ 'शिशिर' से होता है ।
१०. २–३. विक्षिप्तों, बालकों और स्त्रियों के लक्षण ।
१०. ४–६. शकुनों द्वारा उत्पन्न हो सकने वाले प्रभाव ।
१०. ७–१०. शकुनों के प्रगट होने पर राजा को महाशान्ति का रौद्री प्रकार सम्पन्न कराना चाहिये ।



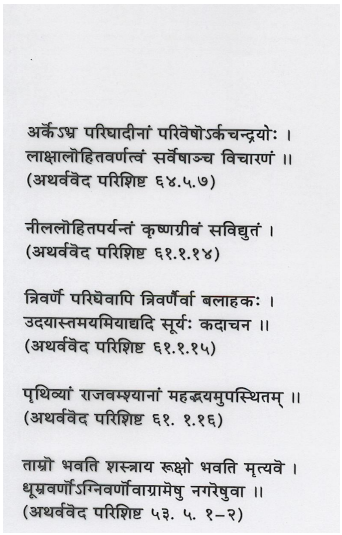
इह युद्धे महाराज भविष्यति महान्क्ष्यः ।
यथेमानि निमित्तानि भयायद्योपलक्ष्यते ।।
(भी.प. २.१६)

उभे पूर्वापरे सन्ध्ये नित्यं पश्यामि भारत ।
उदयास्तमने सूर्यं कबन्धैः परिवारितं ।।
(भी. प. २. २०)

श्वेतलोहित पर्यन्ताः कृष्णग्रीवाः सविद्युताः ।
त्रिवर्णाः परिघाः सन्धौ भानुमावारयन्त्युत ।।
(भी. प. २. २१)

ज्वलितार्केन्दु नक्षत्रं निर्विशेष दिनक्षपम् ।
अहोरात्रं मयादृष्टं तत्क्षयाय भविष्यति ।।
(भी. प. २. २२)

अलक्ष्यः प्रभयाहीनः पौर्णमासीञ्च कार्तिकीम् ।
चन्द्रोऽभूदग्निवर्णश्च समवर्णे नभस्थले ।।
(भी. प. २. २३)



अर्केऽध्र परिघादीनां परिवेषोऽर्कचन्द्रयोः ।
लाक्षालोहितवर्णत्वं सर्वेषाञ्च विचारणं ।।
(अथर्ववेद परिशिष्ट ६४.५.७)

नीललोहितपर्यन्तं कृष्णग्रीवं सविद्युतं ।
(अथर्ववेद परिशिष्ट ६१.१.१४)

त्रिवर्णे परिघेवापि त्रिवर्णैर्वा बलाहकः ।
उदयास्तमयमियाद्यदि सूर्यः कदाचन ।।
(अथर्ववेद परिशिष्ट ६१.१.१५)

पृथिव्यां राजवम्श्यानां महद्भयमुपस्थितम् ।।
(अथर्ववेद परिशिष्ट ६१. १.१६)

ताम्रो भवति शस्त्राय रूक्षो भवति मृत्यवे ।
धूम्रवर्णोऽग्निवर्णोवाग्रामेषु नगरेषुवा ।।
(अथर्ववेद परिशिष्ट ५३. ५. १–२)

Segment 1. Bh$&ma P. 2

AVP64, 61, &53.

Omens in 1st segment Bh.P.

- "I observe the sun every day both at sunrise and at sunset and have seen him as if encircled by long arms."
- I see the sun surrounded by halos on all sides, halos which are tri-colored, dark in the middle and white and red towards the edges and accompanied by lightning."
- "I have been watching days and nights, the fierce sun, the moon and the stars shining incessantly and have been unable to distinguish between day and night. Surely this forebodes utter destruction."
- "on the full moon night of kartika , the moon with a fiery tinge was hardly visible, devoid of glory and the horizons were also of the same hue."

Omens in AVP

(In predicting a War)

- "One should always consider the line of clouds and halos around the sun and the moon and observe whether they appear red or not in color."
- "which are blue and red towards the edges and dark in the middle and accompanied by lightning."
- "whenever the sun is surrounded at sunrise or sunset by tri-colored clouds, it indicates great calamity to the earth and royal families."
- "The color of the moon at the time of an eclipse indicates a battle if it is red and disaster to cities and villages if it is smoky or fiery."

- Omens in 2nd segment : calamities to Kuru family; identical to those from Udyogaparva.

रोहिणीं पीडययन्नेष स्तिथो राजन् शनैश्चरः ।
व्यावृत्तं लक्ष्म सोमस्य भविष्यति महद्भयम् ॥
(भी. प. २. ३२)

अभीक्ष्णं कम्पते भूमिरर्कं राहुस्तथाग्रसत् ।
श्वेतोग्रहस्तथा चित्रां समतिक्रम्य तिष्ठति ॥
(भी. प. ३. ११)

प्राजापत्यंहि नक्षत्रं ग्रहस्तीक्ष्णो महाद्युतिः ।
शनैश्चरः पीडयति पीडयन् प्राणिनोधिकं ॥
(उ. प. १४१.७)

कृत्वाचाङ्गारको वक्रं ज्येष्ठायां मधुसूधन ।
अनूराधां प्रार्थयते मैत्रं संशमयन्निव ॥
(उ. प. १४१.८)

नूनं महद्भयं कृष्ण कुरूणां समुपस्तिथम् ।
विशेषेण वार्ष्णेय चित्रां पीडयते ग्रहः ॥
(उ. प. १४१. ९)

सोमस्य लक्ष्म व्यावृत्तं राहुरर्कमुपेष्यति ।
(उ. प. १४१. १०)

चित्रासु कुरुक्षेत्राधिपस्य मरणं समादिशेत्तज्ञः ।
(बृ. स. ११.५७)

The third segment

Vyasa describes omens indicating harm to both the armies

"*senayorashivam ghoram*.."

This segment has caused so much difficulty for scholars who interpret *graha* to mean planets, and hence face the problem of planets appearing in two or more places at the same time leading to ambiguity and confusion.

'graha'=to grasp, could refer to any heavenly object which can grasp a nakshatra. i.e., planet or comet.

Vyasa leaves no doubt that he means comets:

'*grahau tamrarunashikhau prajvalitau'*

'The two grahas blazing with red coppery hair'

Only comets have "hair" ! (comet is from the greek for hair)

धूवः प्रज्वलितो घोरमपसव्यं प्रवर्तते ।
चित्रास्वात्यन्तरे चैव धिष्ठितः परुषो ग्रहः ॥
(भी. प. ३. १६)

वक्रानुवक्रं कृत्वाच श्रवणे पावकप्रभः ।
ब्रह्मराशिं समावृत्य लोहिताङ्गो व्यवस्थितः ॥
(भी. प. ३. १७)

संवत्सरस्थायिनौ च ग्रहौ प्रज्वलितावुभौ ।
विशाखयोः समीपस्थौ बृहस्पति शनैश्चरौ ॥
(भी. प. ३. २५)

कृत्तिकासु ग्रहस्तीव्रो नक्षत्रे प्रथमे ज्वलन् ।
वपूंष्यपहरन्भासा धूमकेतुरिव स्तिथः ॥
(भी. प. ३. २६)

त्रिषु पूर्वेषु सर्वेषु नक्षत्रेषु विशांपते ।
बुधः संपतते भीक्ष्णं जनयन् सुमहद्भयम् ॥
(भी.प. ३.२७)

- Comets in Bhishma P.

धूमकेतुर्महाघोरः पुष्यमाक्रम्य तिष्टति ॥
(भी. प. ३. १२)

सेनयोरशिवं घोरं करिष्यति महाग्रहः ।
मघास्वङ्गारको वक्रः श्रवणेच बृहस्पतिः ॥
(भी. प. ३. १३)

भाग्यं नक्षत्रमाक्रम्य सूर्यपुत्रेण पीड्यते ।
शुक्रः प्रोष्ठपदे पूर्वे समारुह्य विशाम्पते ।
उत्तरेतु परिक्रम्य सहितः प्रत्युदीक्षते ॥
(भी. प. ३. १४)

श्यामो ग्रहः प्रज्वलितः सधूमः सहपावकः ।
ऐन्द्रं तेजस्वि नक्षत्रं ज्येष्ठामाक्रम्य तिष्ठति ॥
(भी. प. ३. १५)

- Vyasa names explicitly 12 comets, the earlier translations "dark planet" "white planet" and "cruel planet" do not refer to planets, but to comets and these very names of comets have been listed by the 5th century astronomer Varahamihira.
- Comets are sometimes referred to as "*grahaputras",* for example, *"guruputras" 'sons of Guru'*
- Even in modern astronomy, Comets whose aphelia lie within Jupiter's orbit are referred to as belonging to "Jupiter's family"
- Vyasa also refers to some comets as "sons of Jupiter" "son of Sun", etc.
- But sometimes uses "Jupiter" in the place of "son of Jupiter". This has been done even in RgVeda:

'*rudraa hiraNya vartaniijushaaNo…' RV(5. 75. 3)*

'uta no rudraa cinmruLataa mashvinaa.. RV(10. 93. 7) where *'rudraah'* is used in place of *rudraputrau.* In other places in RV *'rudraah'* is used in place of *'rudraputraah'* for denting *'marudgaNa'* and all this has been commented by SaayaNa.

- Normal usage: Graha-> planet, Grahaputra-> comet. Thus, Shanaishcara-> Saturn, Shaniputra-> comet.
- However, Vyasa uses Graha -> comet. In this case, graha has been used in the place of grahaputra.
- When interpreting, the meaning of graha, whether it refers to planet or comet has to be determined by context , using lakshaNaavriti, whenever the principal meaning is "bhAAdita"

- We have taken 'Shani' and 'angAraka' to mean the planets Saturn and Mars in segment 2 of Bhishmaparvan (as also in Udyoga parvan). This is the primary meaning.
- In segment 3, the meaning of 'graha' is determined by the context, using "lakshaNaavruti" whenever there is 'mukhyaarthabhaada' i.e., the principal meaning, planet, leads to an absurdity.
- Thus "shani" ->"shaniputra"=a comet.

This analysis removes all the ambiguity and confusion and renders the whole account of omens a systematic one in Bhishmaparvan.

- Each of the segments deals with a separate aspect.
- **1st segment**: indicators of an imminent war
- **2nd segment**: Indicators of great harm to the kuru family
- **3rd segment**: Indicators of the calamity to the entire army, all comets.
- **4th segment**: indicators of destruction of the entire population. This is the reference to pair of eclipses within 13 days.
- Only the second segment contains references to planets
- Vyasa gives twelve specific names of comets:
  Shveta, DhUmaketu, MahAgraha, Parusha, Pavaka,
  DhUma, LohitAnga, ShyAma, Ghora, Dhruvaketu,
  Tiivra, Pavakaprabha.

This list can also be found in Brihatsamhita, where Varahamihira summarises the teachings of Garga, Parashara
Asita and Devala, well known characters from the epic.

चतुर्दशीं पञ्चदशीं भूतपूर्वां च शोडशीम् ।
इमांतु नाभिजानामि अमावास्यां त्रयोदशीम् ।।
(भी. प. ३. २८)

चन्द्रसूर्यावुभौ ग्रस्तावेकमासे त्रयोदशीम् ।
अपर्वणि ग्रहावेतौ प्रजाः संक्षपयिष्यतः ।।
(भी. प. ३. २९)

यदितु राहुरुभौ शशिभास्करौ
ग्रसति पक्षमनन्तरमन्ततः ।
पुरुष्शोणित कर्दम वाहिनी
भवति भूर्नच वर्षति माधवः ।।
(अथर्व परिशिष्ठ ५३. ३५)

Important Planetary Positions including those Common to Udyoga and Bhishma parvans

Planet	Position
Saturn	rohini
Mars	Had become retrograde before reaching jyeshtha
Lunar Eclipse	Full moon of Kartika
Solar eclipse	at jyeshtha

- Search for years when Saturn was in conjunction with Rohini from 3500 BCE to 500 CE.

  There are 137 such conjunctions in this period.
- Search for Retrograde Mars just before jyeshtha from among this set of 137 conjunction dates.

  There are only 17 dates in which Saturn is near Rohini and Mars is retrograde near jyeshtha

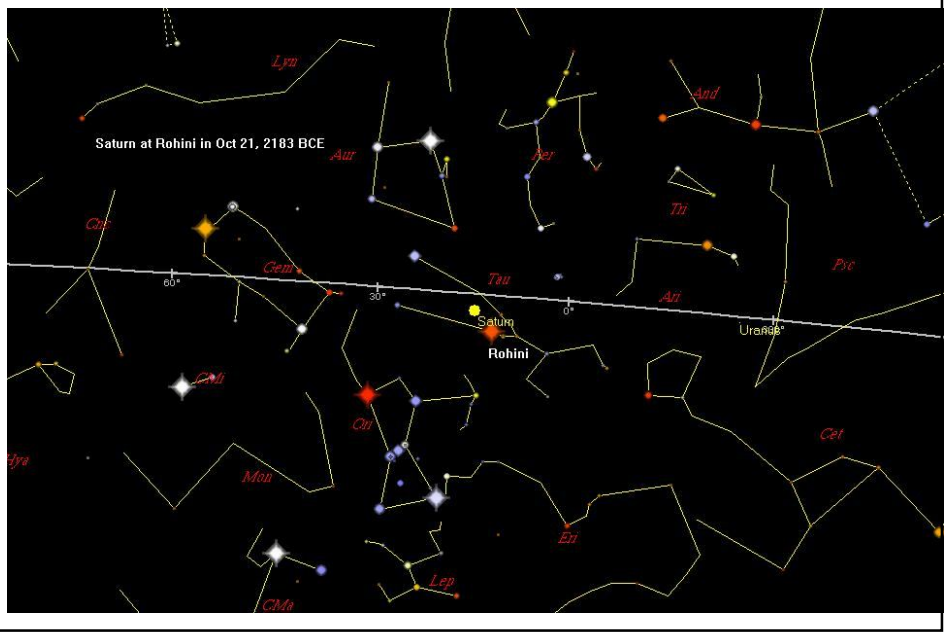
  3271 BCE,3067 BCE, 2830 BCE,2625 BCE, 2388 BCE, 2183 BCE, 1946 BCE, 1741 BCE, 1503 BCE, 1299 BCE, 1061BCE, 857 BCE, 620 BCE, 415 BCE, 28 CE, 233 CE, 470 CE

  Search for a lunar eclipse in Kartika

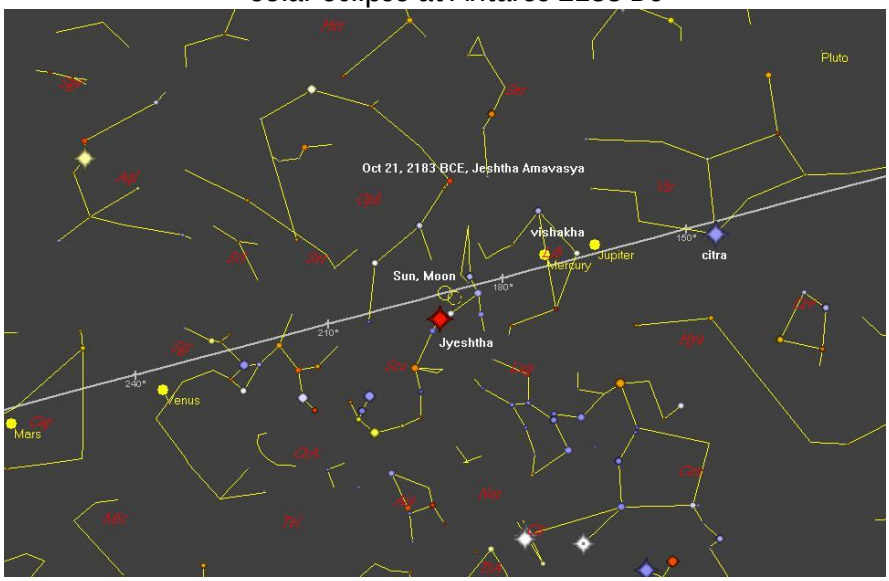
  Only two dates: 3067 BCE and 2183 BCE

  In both of these years, there is also a solar eclipse at Jyeshtha

Saturn at Rohini, Oct 21, 2183 BCE



Solar eclipse at Antares 2183 BC



- Two important events: Amavasya **at Jyeshtha**
- Bhishma's expiry on **Rohini,** Magha shukla ashthami
- War takes place between these two nakshtras.
- Two events one at **Jyeshtha** and another at **Rohini.** Interval :
- 13 days.
- 40 days =(13+27)
- 67 days =(13+27+27)
- 94 days= (13+27+27+27)
- First two ruled out
- 67 days corresponds to 2183 BCE
- 94 days corresponds to 3067 BCE
- For 2183 BCE, war should begin on an amavasya
- For 3067 BCE war ends on an amavasya.
- War could not have taken place much before 3000 BCE
- War could not have taken place much later than 2000 BCE.

Some Recent Works and Projected Dates
Based on Astronomical Data

•	**SenGupta**	**Ancient Indian Chronology(1947)**	**2449BCE**
•	**Raghavan**	**The Date of the Mahabharata War(1969)**	**3067BCE**
•	**Kochhar**	**The Vedic People (1997)**	**955 BCE**
•	**Siddharth**	**The Celestial Key to the Vedas (1999)**	**1311BCE**
•	**Balakrishna**	**Simulations Planetarium software(2003)**	**2559BCE**
		Only eclipses; proposed date eclipse not on jyeshtha	
•	**Iyengar**	**Simulations Planetarium software(2003)**	**1478BCE**
		Solar eclipse near purvashadha and not jyeshtha	
		lunar eclipse not on kartika pornima, but on margashira pornima.	
	Sharma	**Simulations(2004)**	
	3022BCE		
		Solar eclipse at Mula; Saturn at Mula, not rohini	
•	**Achar**	**Simulations (2000-2004)**	**3067BCE**
	Raghavan and Achar	**: practically Every event agrees!!**	

CONCLUSIONS

Astronomical references in the Epic are very consistent.

The word 'graha' refers mostly to comets, this is especially clear by the description of 'hairy graha' some of which extend over three nakshatras in the sky.

There is no inconsistency in planetary positions.

The references to planetary positions, which are common to both udyoga and Bhishma parvans lead to a unique date for the war.

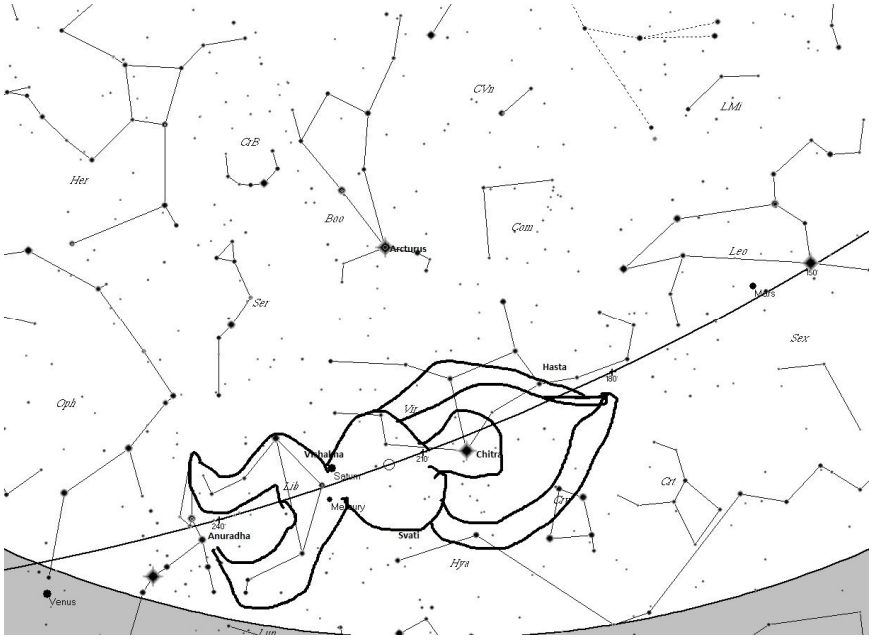
Date based on data from within the Epic

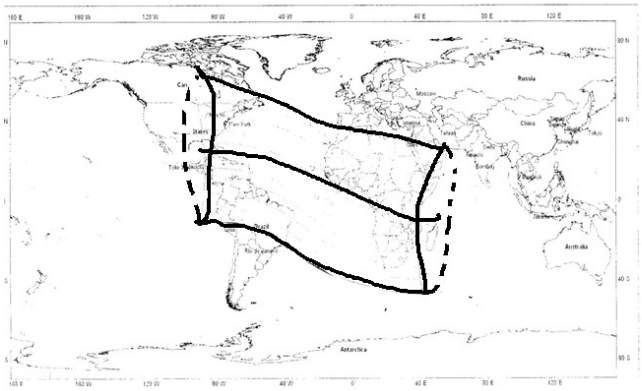
Date of the Mahabharata War 3067 BCE.

This date should form the basis of chronology of Bharat

Nak&atras	No. of stars	Identification of the Principal star		Presiding Deity
		RCRC	Present	
krittika	6	h-Tau	h-Tau	Agni
rohini	1	a-Tau	a-Tau	prajapati
mrgashira	3	l-Ori	b-Tau*	Soma
Ardra	1	a-Ori	g-Gem*	Rudra
punarvasu	2	b-Gem	b-Gem	Aditi
pushya	1	d-Cnc	d-Cnc	Brhaspati
Aslesha	6	z-Hya	z-Hya	Sarpa
makha	6	a-Leo	a-Leo	Pitru
purvaphalguni	2	d-Leo	d-Leo	aryama
uttaraphalguni	2	b-Leo	b-Leo	Bhaga
hasta	5	d-Crv	g-Vir*	savitr
citra	1	a-Vir	a-Vir	Indra

Nak&atra	No of stars	RCRC	Present	Presiding Deity
svati	1	a-Boo	p-Hya*	vayu
vishakha	2	a-Lib	a_2-Lib	indrani
anuradha	4	d-Sco	d-Sco	Mitra
Jyeshtha	1	a-Sco	a-Sco	Indra
mula	7	l-Sco	l-Sco	Pitr
purvashadha	4	d-Sgr	d-Sgr	apah*
uttarashadha	4	s-Sgr	s-Sgr	Viisvedevah*
shravana	3	a-Aql	b-Cap*	Vishnu
dhanishtha	5	b-Del	d-Cap*	Vasu
shatabhisha	1	l-Aqr	l-Aqr	Indra
purvabhadra	2	b-Peg	a-Peg	ajaekapat
uttarabhadra	2	g-Peg	g-Peg	Ahirbudhnya
revati	1	z-Pis	z-Pis	Pushan
ashvini	2	b-Ari	b-Ari	Ashvin
bharani	3	41-Ari	d-Ari	yama

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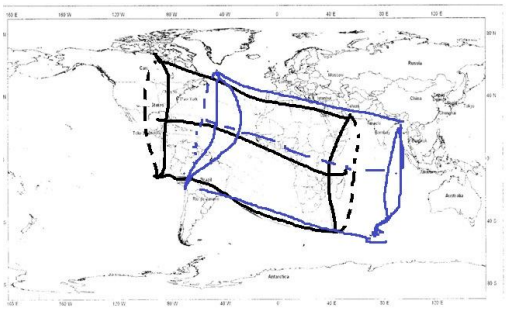
Tokyo
Shanghai
Australia
Antarctica


Russia
China
Australia
Antarctica

REDSHIFT 7

search settings | time interval

General circumstances of the eclipse | From: 3067 BC To: 3067 BC

LUNAR ECLIPSES

Eclipse type: Annular
Eclipse character: Central

	Date (Local time)	
Eclipse begins	Apr 20, 3067BC 00:25	09°48'S 159°34'E
Greatest eclipse	Apr 20, 3067BC 03:27	14°18'N 160°16'W
Eclipse ends	Apr 20, 3067BC 06:28	26°59'N 110°33'W
Magnitude of the eclipse	0.9427	

Eclipse type: Annular-total
Eclipse character: Central

	Date (Local time)	
Eclipse begins	Oct 14, 3067BC 15:53	21°03'N 073°33'W
Greatest eclipse	Oct 14, 3067BC 18:37	04°46'N 023°05'W
Eclipse ends	Oct 14, 3067BC 21:22	15°54'S 024°17'E
Magnitude of the eclipse	0.9992	

REDSHIFT 7

search settings | time interval

General circumstances of the eclipse | From: 3067 BC To: 3067 BC

LUNAR ECLIPSES

Eclipse type: Penumbral — **Date (Local time)**

Middle of eclipse:	Apr 05, 3067BC 19:47
Radius of Earth umbral cone:	4791 km
Radius of Earth penumbral cone:	8125 km

Eclipse type: Partial — **Date (Local time)**

Moon enters umbra:	May 05, 3067BC 02:10
Middle of eclipse:	May 05, 3067BC 02:36
Moon leaves umbra:	May 05, 3067BC 03:01
Radius of Earth umbral cone:	4818 km
Radius of Earth penumbral cone:	8098 km
Magnitude of the eclipse:	0.05691

Eclipse type: Penumbral — **Date (Local time)**

Middle of eclipse:	Sep 29, 3067BC 03:31
Radius of Earth umbral cone:	4624 km
Radius of Earth penumbral cone:	8292 km

Eclipse type: Penumbral — **Date (Local time)**

Middle of eclipse:	Oct 28, 3067BC 20:28
Radius of Earth umbral cone:	4571 km
Radius of Earth penumbral cone:	8346 km

JARAT May 22, 2006 The Times of India, Ahmedabad

Did a meteorite strike Kutch 5,000 years ago?

By Prashant Rupera/TNN

Vadodara: Did a meteorite strike Luna in Banni region of Kutch 5,000 years ago? Geologists in Vadodara have found fragments of iron-rich rocks that they say are the first evidence of a meteorite strike.

Earlier, scientists with Indian Space Research Organisation (ISRO) and Indian Institute of Science (IISc), Bangalore, had hinted that a meteorite had struck Kutch around 5,000 years ago. Now, geologists in Vadodara are upbeat as they have recovered fragments of rocks from the circular depression of Luna which indicate that a meteorite had struck in the region.

Professor R V Karanth and his PhD student Mahendra Gadhvi have identified the meteorite impact site and have sent the rock to National Geophysical Research Institute (NGRI), Hyderabad, for a detailed report. Scientists will try to find which solar system the meteorite came from and whether it affected human settlement in the region.

"Earlier, Dr P S Thakkar of ISRO had stated that the circular depression in Luna is evidence of a meteorite strike. During our visit, we found that the crater formed due to the strike was one kilometre in diameter. We have also recovered dark coloured heavy iron-rich rocks, which are fragments of a meteorite," says Karanth.

Gadhvi adds that such black coloured fragments of iron-rich rocks have pits and are also magnetic. "Interestingly, the region of Banni is not formed of hard rocks. That itself provides enough evidence that such an activity occurred at the site," says Gadhvi.

Karanth adds that some meteorites are silicates (formed of silica rocks), while others are iron-nickel meteorites, which are known as metallic meteorites. "The one found in Luna is a metallic meteorite. The fragments are found in the periphery of the crater," he says.

Moreover, the water collected in crater during monsoon is drinkable against salty water in other areas of Banni. Quoting research done by IISc's retired professor R N Iyengar, Karanth says the 'Skanda Purana' also mentions a natural disaster which struck western India.

Iyengar in his paper on 'Profile of a natural disaster in ancient Sanskrit Literature' published in 2003 in Indian Journal of History of Science has stated that the huge light and explosion mentioned in the 'Purana' is actually a meteorite strike.

"While we have to scientifically establish the dating of the fragment, Iyengar's paper states that the disaster had struck some 5,000 years ago," says Karanth.

Presently, the crater created by the meteorite strike is two to three metre deep. But scientists feel that the crater might be seven to eight metres deep in the past, which got filled up due to deposition of sediments. The scientists add that pockets of Harappan civilisation existed in Luna some 4,000 years back. In fact, Luna was discovered as a Harappan site by renowned archaeologist S R Rao.

The circular depression in Luna region (above). The fragmented rock (left).