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

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हरि: ओं
श्री गुरुभ्यो नमः
परम गुरुभ्यो नमः
श्रीमदशाचार्य गुरुभ्यो नमः
शुक्लांबरधरं विष्णुं शाशिवर्णं चतुर्भुजं
प्रसन्नवदनं ध्यायेत् सर्वविद्योपशान्तवे//
नारायणाय परिपूर्णगुणार्णवाय
विश्वोदयस्तिथिलयोश्रियतिप्रदायः
ज्ञानप्रदाय विभुदासुरसौख्यदुःख
सत्कारणाय वितताय नमो नमस्ते//
नारायणं नमस्कृत्य नरंचैव नरोत्तमं/
देवीं सरस्वतीचैव ततो जयमुदीर्घेतुः//
व्यासाय विष्णुरुपाय व्यासरुपाय विष्णवे
नमोवै ब्रह्मानिधिये 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_
"The war between the kuru and pandava armies took place at the samanta pancaka region at the junction of kali and dvapara yogas"

-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
- Archaeological 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 War  BC Years  (+/-250 years)

Number of Authors

- 0
- 10
- 20
- 30
- 40
- 50
- 60

<5000  3000  2000  1000
Date of the Mahabharata War based on Astronomy

Number of Authors promoting it

Date of the War BC Years (+/- 250 years)

Number of Authors

- <5000
- 3000
- 2000
- 1000
- 0

Bar chart showing the number of authors promoting the date of the Mahabharata War based on astronomy.
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
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

![Graph showing the distribution of astronomical references among the Parvans.](image-url)
• 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)  2449 BCE
- Raghavan  The Date of the Mahabharata War (1969)  3067 BCE
- Kochhar  The Vedic People (1997)  955 BCE
- Siddharth  The Celestial Key to the Vedas (1999)  1311 BCE
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
- 4\textsuperscript{th} 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 benchmark 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 benchmark events.
Raghavan’s Chronology 3067 BCE

- Krishna’s departure for Hastinapura (revati nakshatra)  Sept. 26
- Krishna reaches Hastinapura (Bharani)  Sept. 28
- Lunar eclipse on Kartika Pornima  Sept. 29
- Krishna 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)  Jan 17, 3066 BCE (magha shukla ashtami)
Lunar Eclipse on Sept 29, 3067 BCE
Krishna Rides with Karna
Oct 8, 3067 BCE
saptamchchapi divasad amavasya
14th Day of war: Moon rises early in the morning
The Mahābhārata: What is not here is nowhere else
(Yānnehāśī na Tadhyacī)

Edited by
T.S. Rukmani
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>
<thead>
<tr>
<th>Body</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td><strong>Sun</strong></td>
<td>a) In opposition to the moon, in between δ-Scorpi (Anuradha) and τ-Librae (vishakha)</td>
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<td>b) Aldebaran or Antares (Rohini)</td>
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<tr>
<td><strong>Moon</strong></td>
<td>a) Pleiades, (krittika) Lunar eclipse</td>
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<tr>
<td></td>
<td>b) Aldebaran or Antares (Rohini), near the sun; Solar eclipse.</td>
</tr>
<tr>
<td><strong>Mercury</strong> (Dark Planet)</td>
<td>a) Antares (Jyeshtha) b) Spica (Chitra)</td>
</tr>
<tr>
<td><strong>Venus</strong>  (White Planet)</td>
<td>a) Between α-Pegasi and α-Andromedae, retrograde (purva bhadraa and uttarabhadra) b) Spica (chitra)</td>
</tr>
<tr>
<td><strong>Mars</strong></td>
<td>a) Regulus, (Makha) retrograde</td>
</tr>
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<td></td>
<td>b) Altair, (shravana) retrograde</td>
</tr>
<tr>
<td><strong>Saturn</strong></td>
<td>a) Aldebaran (Rohini)</td>
</tr>
<tr>
<td></td>
<td>b) Near τ-Librae (vishakha) for one year together with Jupiter</td>
</tr>
<tr>
<td></td>
<td>c) δ-Leonis (purva Phalguni)</td>
</tr>
<tr>
<td><strong>Jupiter</strong></td>
<td>a) Altair (shravana)</td>
</tr>
<tr>
<td></td>
<td>b) Near τ-Librae for one year together with Saturn (Vishakha)</td>
</tr>
<tr>
<td><strong>Rahu or Ketu</strong> (Cruel Planet)</td>
<td>a) Approaching the Sun b) Between Spica and Arcturus (chitra and swati) c) Pleiades (krittika)</td>
</tr>
</tbody>
</table>
• Aldeberan (Rohini) and Antares (Jyesthha) 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. उत्पातलक्षणम

१. १. परिचयः यह उपदेश अद्वितीय और उच्चता के अनुसार है।
२. २-३. उत्पात की परिभाषाओं और उसका वर्गीकरण।
३. ४-५. भूकम्प और बचन।
४. ६-७. १. गनधर्म नगर।
५. १-२. ५. राजा और राश्रों के विनाश की सूचना देने वाले अपशकुन।
६. ६-७. ५. दुभिक्ष-सूचक लक्षण।
७. ५-५. १. चुक-सूचक लक्षण।
८. ३-४. ५. गर्भ के अनुसार राजा और राश्रों के विनाश की सूचना देने वाले लक्षण।
९. ६-५. २. चढ़ात होने वाले ग्राम या नगर के ठिक दोहरान विषय के सूत्र शकुन।
१०. ६-४. विभिन्न जातियों के विनाश का सूचक शकुन।

१। १-२. बुख्ष लक्षण।
२। ६-५. सर्व और सेडक लक्षण।
३। ६-४. ऐसे शकुन जो कुछ नहीं होते हैं। वे श्लोक वृहसप्तिवर्णक और बाद में भी आते हैं जहाँ-जहाँ तक हो जाता है इनका प्रेम, कहा गया है।
४। यहाँ उल्लेखनीय है कि सूची का आरम्भ 'शिशि' से होता है।
५। २-३. विषिष्टों, वालकों और श्रियों के लक्षण।
६। ६-५. शकुनों द्वारा उत्पात हो सकने वाले प्रभाव।
७। ६-४. शकुनों के प्रगट होने पर राजा को महाशान्ति का रूद्रि प्रकार सम्प्रे चाहिए।
इह युङे महाराज भविष्यति महान्त्वः 
यथेष्मानि निमित्तानि भयायधोपलक्ष्यते
(भी.प. २.१६)

उभे पूर्वपरे सन्थे नित्यः पश्चायभि भारतः
उद्यासाने सूर्यं कबन्धे: परिवारितः
(भी. प. २. २०)

श्रेत्तलोहित पर्यन्ता: कृष्णग्रीवा: सविद्युतः
सौवर्णः: परिधाः सन्त्यो भागुमायावपन्तुतः
(भी. प. २. २१)

ज्वलितार्केन्द्रु नक्षत्रं निर्विशेष दिनक्षणपम्
अहृत्यें मयाृहे तत्क्षयय भविष्यति
(भी. प. २. २२)

अलौक्यं: प्रभवाहिनः पौर्णमासीऽवच कार्तिकीम्
चन्द्रोभूतैनपन्नेव समवर्णः नभस्थले
(भी. प. २. २३)

अर्क्तुद्ध परिवारींनां परिवेचोकक चन्द्रौयोः
लाभालोहितथः सत्वारुः विचारणः
(अधवबिद परिशिष्ट ६४.५.७)

नीललोहितपर्वतानां कृष्णग्रीवं सविद्युतं
(अधवबिद परिशिष्ट ६६.१.१४)

त्रिवर्णं परिवेचयो त्रिवर्णं धर्मान
उद्यासानमभयावार्दे सूर्यं विद्याचान
(अधवबिद परिशिष्ट ६६.१.१५)

पूर्वाधिकां राजवस्माः महान्त्वमुपस्थितम्
(अधवबिद परिशिष्ट ६६. १.१६)

तासां भवति शास्त्राय रूक्षं भवति मुल्ये
धृष्टवर्णः सविद्युः ग्रामाग्रे मन्त्रव्यः
(अधवबिद परिशिष्ट ५३. ५. १२)
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.
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 tamrarunashikho prajvalitau’
‘The two grahas blazing with red coppery hair’
Only comets have “hair”! (comet is from the greek for hair)
• Comets in Bhishma P.

धूमकेतुर्मात्राय: पुष्यमात्राय तिष्ठति ॥
(भी. प. ३. १२)

सेन्योरशिवं घोरं काँप्यं महाग्रहं ।
मागस्विन्यासों वकः श्रवणेच बुहस्पति: ॥
(भी. प. ३. १३)

भार्य नक्षत्रभाग कुरुक्षेत्रप्रमाण धूमकेतुरिव स्थित: ॥
शुभं: प्रोणधियो: पूर्वसंत: समावेर: विशाल्यान् ।
उत्तरेण परित्र्य: सहित: प्रत्युदीक्षते ॥
(भी. प. ३. १४)

श्यामो ग्रहं प्रज्वलित: सधूम: सहपावक: ।
ऐदु: तरंगान्त: नैष्ठान्याराह: 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 “lakshaNaavruiti” whenever there is ‘mukhyaarthaabhaada’ 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 भूतपूर्व पच शोडशीम् ।
इमां नामिनाजानामि अमावास्यां त्रयोदशीम् ॥
(भी. प. ३. २८)

चन्द्रसूयःवुभू ग्रहावेकमासे त्रयोदशीम् ।
अपर्वणि प्रहावेतौ प्रजा: संक्षपपविष्यतः ॥
(भी. प. ३. २९)

यदितु राहुभू शशिभास्करौ
ग्रस्ति पक्षमन्तरस्मिन्तः ।
पुरुष्णोणित कर्म वाहिनी
भवति भूर्णच वर्षति माधवः ॥
(अथर्व. परिशिष्ट ५३. ३५)
Important Planetary Positions including those Common to Udyoga and Bhishma parvans

<table>
<thead>
<tr>
<th>Planet</th>
<th>Position</th>
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<tr>
<td>Saturn</td>
<td>rohini</td>
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<tr>
<td>Mars</td>
<td>Had become retrograde before reaching jyeshtha</td>
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<tr>
<td>Lunar Eclipse</td>
<td>Full moon of Kartika</td>
</tr>
<tr>
<td>Solar eclipse</td>
<td>at jyeshtha</td>
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</table>
• 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, 1061 BCE, 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 ashtami
• 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) 2449 BCE
• Raghavan The Date of the Mahabharata War (1969) 3067 BCE
• Kochhar The Vedic People (1997) 955 BCE
• Siddharth The Celestial Key to the Vedas (1999) 1311 BCE
• Balakrishna Simulations Planetarium software (2003) 2559 BCE
  Only eclipses; proposed date eclipse not on jyeshtha
• Iyengar Simulations Planetarium software (2003) 1478 BCE
  Solar eclipse near purvashadha and not jyeshtha
  lunar eclipse not on kartika pornima, but on margashira pornima.
• Sharma Simulations (2004) 3022 BCE
  Solar eclipse at Mula; Saturn at Mula, not rohini
• Achar Simulations (2000-2004) 3067 BCE
  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
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<tr>
<th>Nak&amp;atras</th>
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Did a meteorite strike Kutch 5,000 years ago?

By Prashant Rupare/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 Gadhi 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.

Gadhi adds that such black coloured fragments of iron-rich rocks have pits 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 2008 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 metres 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.