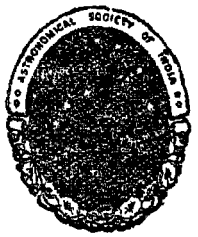

The Journal of the Astronomical Society of India.

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Report of Meeting of the Society held on Tuesday, 27th May 1913.

THE Ordinary Monthly Meeting of the Society was held on Tuesday, the 27th May 1913, in the Imperial Secretariat (Treasury Buildings), at 5 P.M.

Mr. W. J. SIMMONS, B.A., F.R.A.S., *President*, in the Chair.

Mr. C. V. RAMAN, M.A., *Honorary Secretary*.

The minutes of the previous meeting were read and confirmed.

The following presents received since the last meeting were announced, and the President moved that a vote of thanks be passed to the donors of the presents, and he reminded members that the Journals presented are available for use by them :—

1. Monthly Notices of the Royal Astronomical Society, Vol. LXXIII, No. 5.
2. Journal of the British Astronomical Association, Vol. XXIII, No. 6.

3. Revista Di Astronomia, Anno 7, No. 4.
4. Journal of the Royal Astronomical Society of Canada, Vol. VII, No. 1.
5. Monthly Weather Review of the Alipore Observatory for January 1913.
6. Rapport annuel sur l'etat de l'observatoire de Paris pour l'annee 1912.
7. Inaugurazione XVLL Novembre MCMX (Specola Astronomica Vaticana).
8. Catalogue de la collection de meteorites de l'observatoire du Vatican.
9. Catalogue of Paramanand Library of H. H. Maharaj Rana Sir Bhawani Singh, K.C.S.I.
10. "Travel Pictures" by H. H. Maharaj Rana Sir Bhawani Singh, K.C.S.I.

The President asked any members present who had been elected since the last meeting to come up and sign their names.

The President said the next item of business was to have been a paper on the "Construction of a Cheap Telescope" by Mr. Tomkins, who, he regretted to say, was ill and unable to attend the meeting to-day. He hoped they would have his paper at the next meeting. Mr. Tomkins being absent, the President asked the Secretary to read the paper on the "Date of the Mahabharat War" by Prof. J. C. Ray, M.A., of Cuttack. The President observed that this paper was connected with one read here on the 19th November 1912 and which elicited some discussion. That paper appeared in the JOURNAL as usual, and he was glad to say that one of our members had responded to the suggestion made at the November meeting to further discuss the subject brought before the Society by members at Kodaikanal.

(*Reading of Prof. Ray's paper.*)

The President said the paper just read was now under discussion. He trusted none of those present would hesitate to express an opinion on Prof. Ray's note because he was also the author of a book on Hindu Astronomy. Members should not let his position as an author hinder them from making remarks on his paper, which was submitted for criticism and discussion.

Revd. Ridsdale.—May I ask a question with regard to these 27 Nakshatras? Are they constellations, something

corresponding to the constellations of the Zodiac in the West ? Are the 27 Nakshatras a measurement for the ecliptic or are they 27 divisions ?

Mr. Raman.—I think the Nakshatras did not stand for anything representing the Zodiac as they had distinct signs for the latter.

Revd. Ridsdale.—I ask whether in the Hindu Astronomy they mean that the 27 Nakshatras are measurements for the ecliptic as we ourselves have for a great number of years used 12 signs (Zodiac) for measuring out the ecliptic.

The President thought that by the term Nakshatras was really meant the apparent space travelled by the Moon each day. The Moon takes 27 or 28 days to pass round the ecliptic, and there are 27 or 28 Nakshatras which suggested to him what he thought must be meant by a Nakshatra. He confessed that everything in Hindu Astronomy was to him rather difficult to understand. Krishna is said to have taken part in the war described in the Mahabharat. The Bhagabat Gita, which reports a dialogue between Krishna and Arjuna, is one of many interpollated episodes, and is better known to English readers than any other part of the Mahabharat. Prof. Ray's paper, as the President understood it, claims to determine the date of the war from what is stated to have been the position of the equinoctial point at the commencement of the Kali Yuga, which he thus fixes for the year 3001 B.C. The President believed it was considered that the Kali Yuga began at the close of the war of the Mahabharat, *i.e.*, with the death of Krishna, in other words, with the end of Vishnu's incarnation as Krishna.

Revd. Ridsdale.—May I ask you how the writer of this paper knew where the Vernal Equinox was on such and such a day ? How does he compare the Hindu measurements with ours to tell where the Vernal Equinox was ?

The President said he thought Prof. Ray in his paper answered that question in this way (reads part of Prof. Ray's paper). Prof. Ray places the Vernal Equinox in the Pleiades. Mr. Maunders says that the Vernal Equinoctial point was in the Pleiades 4,000 years ago. Deducting 1900 from 4000 brings us to the year 2100 B.C., which by this method of reckoning would fix the beginning of the Kali Yuga and the close of the Mahabharat War as 2100 B.C.

Mr. Lee.—It does not seem clear to me how the intersections of the ecliptic and equinox passed through the Pleiades.

President.—Prof. Ray seems to assume that, but he also admits that these arrangements of the stars were made for a fixed purpose, namely, to indicate an evil time from an astrological point of view.

Mr. Lee.—My point was I still doubt how he can locate the point of the Equinox accurately.

The President said he regarded it as extremely doubtful if the Hindus knew anything definite about the Equinoctial points before they came in contact with the Greeks. Hipparchus discovered the Precession of the Equinoxes, and he is believed to have developed astronomical information which he got not from Indian, but from Chaldean, sources. The President would remind the meeting of what he had told them at the November meeting, *viz.*, that the Greeks were in close intercourse with India from the date of Alexander's invasion till about 161 B.C. The Greeks knew Buddhist India, and the President was of opinion that the great influence exercised by Greek thought on India has not been sufficiently recognized by the Indians themselves. The President agreed with what Sir Henry Maine says in one of his books, *viz.*, " Except the blind forces of nature, nothing moves in this world which is not Greek in its origin." It is now considered that both Indian and Chinese, astrology and astronomy are largely reflections of Greek theories and speculations. The history of astrology can be traced back to Babylonian history, and to about the year 3000 B.C. It must not be forgotten that the earliest Indian works on astronomy date only from about 300 A.C. and, therefore, from a period when Indian thinkers had been under Greek influence for six centuries.

Revd. Ridsdale.—I do not see how they point the relation between the date of the war and the Equinox.

Mr. Lee.—I still very greatly doubt how they could locate the place of the Equinox at that time.

Mr. Raman.—The ancients were no doubt quite familiar with the annual apparent motion of the Sun among the stars. The Sun rises due east and sets due west when at the Equinoxes, and the particular constellation in which it lay at the time could no doubt be seen or at any rate inferred with a fair amount of accuracy. Even the phenomenon of the variation of the length of days and nights in Northern India must have been noticed and furnished an indication.

Revd. Ridsdale.—It seems a general sort of statement. The length of the day and the night is a very small foundation to build up such a big theory and fix the date as 2400 B.C. It

seems to me if they judged by the length of the day and night it would only be a fanciful attempt to find out the date of the Mahabharat War.

Mr. Raman.—Assuming the account of Bishma's passing, in which it is stated that he waited to die till the Sun turned north, is based on a substratum of facts, it seems clear that the position of the Sun at any time among the signs of the Zodiac and its relation to the time and place of the Sun's rising were familiar in ancient India, and the place of the Equinoxes follows readily from this.

The President observed that Mr. Dutt in his "Civilization of Ancient India" referred to the age of the Kurus and Pandavas as 1400 to 1200 B.C. Assuming that to be the age of the war it was not necessarily the age of the Mahabharat. At the November meeting he had pointed out that the Mahabharat was added to as the years went by. Originally limited to 8,000 slokas (couplets), it now reached 110,000 slokas.

The President, after asking if there were any further remarks, said that on closing the discussion he would point out that the Indians like the Greeks had four ages. The Hindu ages were (1) the Satya Yuga, (2) The Treta Yuga, (3) the Dwapur Yuga, (4) the Kali Yuga which still endures. The Greeks had (1) the golden age, (2) the silver age, (3) the bronze age, (4) the iron age, which corresponds to the Kali Yuga. Another noteworthy point was that according to Prof. Ray at that time of the history of India the Moon was worshipped as a God. This was important, because it gave a clue to the phase of civilization which had then been reached. The Moon-God is par excellence the God of Nomadic races. It is easy to see why this would be. The Nomadic peoples concerned inhabited hot countries, and travelled much by night, and to them the Moon was a veritable God-send! The Sun was worshipped as a God by peoples who had advanced to the agricultural stage of civilization, when simultaneously the Moon ceased to be a God, and became a Goddess as we know it at this day. The Ancient Indian did not stand alone in worshipping the Moon as a God, not as a Goddess. The Moon was worshipped as a God by the Ancient Arabians and Babylonians, and was by them called Sin. The worship of the Moon as a God gave its name to Mount Sinai in Northern Arabia. Ur of the Chaldees, in Southern Babylonia, was another centre of Moon-God worship. In passing the President observed that the Pleiades (according to Mr. Maunders) have some unexplained relation to the worship of the Dead. Mr. Maunders points out that

in the month of November when the Pleiades are above the horizon all night, festivals connected with the worship of the Dead are observed, and he mentions All Souls' and All Saints' Days amongst them. The President reminded his hearers that the coincidence of the commencement of the Kali Yuga with the Vernal Equinox in the Pleiades was one of the points made by Prof. Ray in his paper, in which he had further shown that the authors of the Mahabharat had a set purpose in arranging the stars to indicate an evil time. This circumstance obviously made it necessary to be chary in using the astrological data appearing in the Epic for the purpose of fixing dates. However, whatever differences of opinion might exist as to the conclusiveness of Mr. Ray's paper, or the views expressed by himself, the President was certain all present would join in a hearty vote of thanks to Mr. Ray for a paper which had elicited discussion from so many of those present. He would also thank Messrs. Ridsdale, Raman and Lee for the active part they had taken in the discussion.

(*Mr. Mitchell's note.*)

President.—These notes are also under discussion.

A Member.—With what size of telescope were these satellites seen ?

President.—Mr. Mitchell's is a 5″ refracting telescope, and he has the advantage of a more favourable atmosphere at Bankura than we get in Calcutta.

Mr. Raman.—I take it that the satellites of Jupiter must have cooled down and solidified and also lost much of their atmospheres, and this would have some relation to the relative brightness of the planet and its satellites.

Capt. Urquhart.—May I ask whether there is any technical theory about the dark spots in Jupiter ?

The President believed it is presumed that these dark spots are breaks in the planet's atmosphere.

Revd. Ridsdale.—It is very strange that a satellite which has no atmosphere should be brighter than Jupiter which has a beautiful atmosphere.

Mr. Raman.—I think the problem of the scattering of light by a planetary body is not altogether an easy one and there may be room for further investigation here. Mr. King's recent paper in the Phil. Trans. is very suggestive.

The President asked the meeting to return a vote of thanks to Mr. Mitchell for his notes which he considered are of great value to the Society. The President now asked Capt. Urquhart to read his paper on the Moon.

(*Capt. Urquhart's paper.*)

The President said that Capt. Urquhart in his paper used the analogical argument in its connection with astronomical research. He shows us how to produce phenomena which represent in some degree the phenomena observed in the Moon. Does not the Meteoric theory better explain the formation of walled plains than of coned craters ? A walled plain slopes inward like a saucer, a formation which might be produced by some body from outside falling on the Moon's surface ; but how did it explain a volcanic formation like a crater cone ?

Capt. Urquhart.—In looking at the Moon I see that all craters which show a cone in the middle are similar to those which I described as the result of firing hardened bullets into a solid block of lead. The saucer-shaped depressions which formed were three or four times the diameter of the bullet itself. The nose of the bullet opened on all sides, while the base was left almost intact in the middle. It seems to me a possible explanation that the cone in the middle of the crater is a remnant of the missile left in it. On the other hand, it may be due merely to something analogous to the splash effect in a semi-liquid plastic substance which rapidly solidified subsequently.

Mr. Lee.—Would not the great size of the walled plains observed on the Moon be a serious difficulty ? It would have required enormous missiles to produce anything like them.

Capt. Urquhart.—When bullets are fired into a bath of molten lead on which a solid crust has formed, the depressions produced are many times the size of the missile. This would meet the difficulty.

Mr. Lee.—I do not quite see how the suggestion that the meteorites were shot out of the Earth disposes of the possibility of oblique impacts. The problem is a mathematical one, but it seems that some of the meteorites would strike the Moon obliquely or might even go round it.

Capt. Urquhart.—The suggestion is that the meteorites practically fell on the Moon in consequence of the latter's attraction, their velocity when shot out being sufficient to carry them near enough the Moon for this to take place.

Revd. Ridsdale.—I think the meteorite hypothesis is rather a fanciful one with which to account for the craters, etc., on the Moon. Bearing in mind the fact that gravity on the Moon is much weaker than on the Earth, and that therefore volcanic activity would have more violent effects, the craters, the walled plains, and the crater cones on the Moon all readily become intelligible as the results of volcanic action.

At the conclusion of the discussion the President moved a cordial vote of thanks to Capt. Urquhart for his paper and the meeting was then adjourned.

The Date of the Mahabharat War.

BY

PROF. JOGES CHANDRA RAY.

THE President of the Society having invited discussion on the subject (J. Vol. III, No. 2) I collect below the references, both internal and external, from which the date of the war may be conjectured. The importance of the question has led many to inquire into it, and, years ago I, like many others, attempted to come to a satisfactory conclusion from the astronomical data found in the Mahâbhârat. The result was not conclusive, and there is yet room for further research.

There is, however, some difficulty in presenting the evidence to my European readers, as its discussion involves some knowledge of Hindu astronomy and its gradual development to its present condition. I shall, therefore, content myself with an outline of the evidence, briefly indicating the lines along which the inquiry may be pushed and the pit-falls of bias and hasty conclusion which renders laudable efforts futile.

It may be well to note here the nature of the astronomical evidence sometimes found in Sanskrit works. It is rarely, if at all, the position of the planets which can be depended upon for the purpose of determining the required date. When such positions are found, and they are found in comparatively later writings, they are mostly of astrological significance as in the example quoted and discussed by Dr. T. Royds and Mr. S. Sitaramaiya (J. Vol. III, No. 2), and it is no wonder if they find the positions inconsistent, at least in the case of Venus. There are at least three places in the Mahâbhârat (Calcutta