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830TH ORDINARY GENERAL MEETING,
HELD IN COMMITTEE ROOM B, THE CENTRAL HALL,
WESTMINSTER, S.W.1., ON MONDAY, APRIL 24TH, 1939,
AT 4.30 P.M.

MRS. JOHN EVERSHERD, F.R.A.S., IN THE CHAIR.

The Minutes of the previous meeting were read, confirmed and signed and the Hon. Secretary announced the following elections :—As Members : L. G. H. Sarsfield, Esq., D.Sc., M.I.E.E., J. C. Scott, Esq. And as Associates : W. Leon Dale, Esq., the Rev. A. K. Cragg, M.A., and E. W. Battersbey, Esq.

The Chairman then called on Mrs. Walter Maunder, F.R.A.S., to read her paper entitled "The History of India, as Reflected in the Astronomy and Meteorology in the Hymns of the Rig Veda."

The meeting was then thrown open to discussion in which Mr. Sidney Collett, Colonel Skinner and Mr. J. H. Harrison Hill took part.

*THE HISTORY OF INDIA AS REFLECTED IN THE
ASTRONOMY AND METEOROLOGY OF THE HYMNS
OF THE RIG-VEDA.*

By MRS. WALTER MAUNDER, F.R.A.S.

YOU all know what the shape of India looks like—rather like a dilapidated leaf. Its widest part is about 25° N. ; south of that it is bounded on its east, south and west by the Indian Ocean, which itself merges without any land barrier into the Antarctic Ocean. North of 25°, it narrows also, but here it is bounded by mountains, some of them the highest on the earth. These mountains and sea boundaries govern its history and its weather. It can suffer no great invasion by land ; in the ancient days the Âryas must have penetrated peacefully, filtering through the passes of the Suleiman and Hindu Khush ranges in the west. In the east, from Tibet and China, the intercourse was almost wholly commercial. So, too, in the south, the fleets that came to India were for commerce, not for war. Probably Alexander the Great was the first to bring an invading army into India through the ranges ; he returned by way of Baluchistan coastland, both by sea and

land. It was in the way of this return that Alexander died in 323 B.C.; the Persians counted him as ruling over them for fourteen years, and as they kept a continuous record of the regnant years, 323 B.C. gives a sure date from which to reckon back to Frêdûn, the greatest of the kings who ruled over Turan and Iran combined. Thereby it also gives a date when the Âryas divided into Persian and Hindu; the Persians settling west of the Hindu Khush, the Hindus going east, in great numbers, into the Panjâb. Though India was free from outside wars, it was not so from internal strife, as the Mahabharata and Ramayana testify.

Still more definitely does India's shape—its contours, its heights and plains—govern its weather. It lies entirely in the northern hemisphere, but the southern oceans largely influence its air currents. India has its seasons, but *the season* is the south-west Monsoon, for then falls its great rain, which lasts normally from June to September, but has the greatest incidence in July. Then the barometer is at its lowest over N.W. India, and the rain-bearing winds strike almost at right angles across Kathiawar and Sind, and stream over the Panjâb, until they come up against the lofty sides of the Himâlayas, and are forced to rise at least as high as their summits; their moisture is condensed as rain on the plains and as snow on the high hills. In this paper, I take account only of India north of 20°, and of the weather of the Panjâb.

For the astronomy of the Âryas in India, we must take into account that they were a nation of astronomers long before they went into the Panjâb. It was they also who brought two things to the Semites and the Egyptians—the knowledge of the constellations and of the horse. Thus we find in Genesis xxxvii, 9–11, the dream of Joseph, in which he tells his father and brethren that “the sun, moon and eleven stars made obeisance to me.” This was in 1893 B.C., and it is the first mention in the Bible of the zodiacal or any other constellations. For the introduction of the horse into Asia, it was brought by the Âryas, first to Babylonia in the nineteenth century B.C., and to Egypt about fifty years later. Thus we find recorded in the sixteenth and seventeenth years of Ammizaduga (the fourth in descent from Amraphel, one of the five kings who fought with Abraham when Lot was taken prisoner by them), that is in our chronology, 1905 and 1904 B.C.: “disaster of the Manda Hordes”—the

Ummān-Manda, being Âryas, and in later centuries, certainly identified with the Medes. In Egypt, the first mention of horsemen in the Bible is on the occasion of Jacob's funeral in 1853 B.C. I am taking Sir Charles Marston's date for the battle of Jericho as given by him in the *V.I. Transactions* for 1934 April 23, as the standard date from which to reckon.

There were four great men associated with *both* the Persian and the Hindu Âryas; two before they separated, and two after. These were: (1) Yama, who was their leader until they came from Europe into Asia by way of the Kirghiz Steppe in lat. 49° N. At this latitude the summer day is twice the length of the summer night, and the Âryas, whether in Europe or Asia, found their latitude by the ratio of the longest to the shortest in days or nights. The "night-day" was thus taken as eighteen "hours" in length, and in the Rig-Veda Hymns we find the night so divided into three divisions of three hours each, called "Yamas" in honour of their first great leader.

(2) Thraêtaona, son of Athwya, was the second. He was the Frêdûn, mentioned earlier, and was famed in both Iran and in the Panjâb for having slain the great snake, Azi-Dahaka. The Panjâb knew him only for this, for he seems never to have entered it, but sent some other leader—possibly Manu, who is counted as the first Hindu man.

(3) Thrîta, the sixth in descent from Thraêtaona, and therefore also an Athwyan; both are named "Trîta Aptya," as meaning "watery," on occasion, but the Hindu Âryas forgot that Athwya was a man, and deemed them sons of world-surrounding Ocean.

(4) The fourth man was Kai Kaus, king of the district just west of the Hindu Khush. He was the grandson of a foundling, adopted by the ruling king and succeeding him. The Hindus knew Kai Kaus as Usanâ Kâvya, and identified him with the planet Venus; he is so identified in the later Rig-Veda hymns. They also identified the planet Jupiter with Brihaspati, the Lord of Prayer or Worship; but so far I have found no records in the hymns of Mercury, Mars or Saturn. We are told in the Iranian genealogies that Kai Usan reigned seventy-five years *before he went to the sky*, and after that he reigned for seventy-five years more. Certainly Kai Usan must have spent much of his lifetime in the Panjâb.

The old forty-seven constellations which we use to-day were originally catalogued at some place of lat. 37° - 38° N., and in the Mediterranean, by men whom Aratos, in his *Phaenomena*, names "The Elder Race." The "Elder Race" was of the descendants of Japhet, *not* of Shem. This fundamental catalogue of stars was made about 2900 B.C., and its object was twofold, both practical. The first was to know the time of year, and especially those times in the year at which God had commanded sacrifices and worship to be offered up to Him. We have a later parallel to this in Exodus xii, when in Egypt, in 1440 B.C., God commanded Moses exactly at what time of the year and the month he should offer up the Passover lambs. The second was to know their whereabouts on the earth when travelling.

The sons of Japhet and of Shem were, equally, the inheritors of God's revelation to man in the first chapters of Genesis. If we, then, find (for example) that there is pictured, in these old constellations, a man strangling a serpent and being stung in his heel by a scorpion, we must not take this as a new and independent revelation from God, but simply as an assurance that the sons of Japhet knew God's promise in Gen. iii, 15.

You all know that because the earth is not a perfectly round globe but has a bulge on the equator, the sun pulls on this bulge and alters slightly the rotation of the earth, so that as the years pass, the equinoctial points "precess" through the stars which are in the sun's wandering path. The spring equinox at one time in the known history of mankind, lay close to the twin stars which we call Castor and Pollux. That method of finding a beginning of the year was used long before the old forty-seven constellations were designed and catalogued; the picture of the Twins, together with the "new moon" setting in the west in spring-time, was probably the method used by Noah, both before and after the Flood. But when the constellations were made the spring equinox lay in the Bull's head, and no longer on the other side of the Milky Way near the Twins. We learn from the Rig-Veda hymns that their authors knew of this older method as well as of the newer. Eventually, they themselves produced a third method (the one used by ourselves to-day), when the equinoctial and solstitial points marked in the Old Catalogue of the Constellations became out of date.

Here I want to state as emphatically as words can make it that this fundamental star catalogue—the basis of those we use to-day—is not to be considered and used as a cryptogram, or in any other way, so as to try to foretell God's future purposes. To do that is nothing less than sorcery and divination, things forbidden of God. I not only speak this for myself, but also for my husband, who often declared this, his opinion also, to me.

Thraêtaona brought the tribes to the seventh "Good Land," mentioned in the Persian Sacred Books of the East. This is "Vaekereta of the evil shadows," which is supposed to be the Kabul Pass. The Iranians remained west of the Hindu Khush; the Hindu Âryas went into the "Good Land" of the Seven Rivers. But before they separated, Thraêtaona made observations at the summer solstice of the midnight stars. The date of this was near 1600 B.C., for the stars he noted were the constellations near the Milky Way, from its rising-point to its setting-point, for this date and time. We know this is what he did, because some five or six centuries later his descendant, Thrita, made his plaint that the times of these constellations at the summer solstice were out of keeping with it by several days.

I, cv, 4. "I ask this last of sacrifice . . . where is the ancient law divine? Who is its new diffuser now?"

5. "What is your firm support of law? What Varuna's observant eye? How may we pass the wicked on the path of mighty Aryaman?"

The Path of Mighty Aryaman is the Milky Way—that way along which the "Fathers" travel to their lucid realm of light, in which they dwell until the Resurrection. Such was the belief in Rig-Veda times; in the hymns there is no trace of the doctrine of Reincarnation.

For the third man, Thrita, I can only give an approximate date, but he must have been living in the Panjâb, probably near the Kabul Pass, for his more famous son, Keresaspa, was killed in the Pisin Valley, south of Kabul. Keresaspa was a contemporary of Ušanâ Kâvya, to whom the Persian genealogies give the date 955 B.C., that being (probably) his accession to the throne. We may therefore put Thrita about a century earlier, and this agrees with the change in position of the Milky Way from the time of Thraêtaona.

In the Helمند district, in 955 B.C., Kai Usan succeeded to the throne. In India, about 60 miles S.W. of Allahabad, in the same year, 955 B.C., on October 4th, a Brahman, Atri Bhauma, was offering up the Noon Oblation, and a total solar eclipse occurred. The Brahman was greatly disturbed, but he offered up the three usual prayers. Then he prayed a fourth prayer, and Sūrya, the Sun, recovered its brightness. Disturbed though he was, yet he looked up to the darkened but starry sky, and he saw there near where the dark circle (light-rimmed, however) that *had* been the sun, stood above Sagittarius, the Man-horse, there was a light brighter than any star. For the planet Venus was blazing at her greatest brilliancy.

I can enter into Atri Bhauma's feelings, for I, too, have seen an eclipse of the sun in India, and not so very far from where Atri Bhauma saw his. I too saw Venus, though *not* at her greatest brilliancy—and even so she dwarfed the glory of the silvery coronal streamer that stretched out in her direction.

The eclipse of 955 B.C., October 4th is the first exact date—exact even to the hour which was noon—that I have found for any Rig-Veda hymn. But it gives us more information than that, for its shadow track had passed over the Murghab and Helمند rivers, and half-way between Kabul and Kandahar, a little after mid-morning, before it entered India. This was the country governed by Kai Usan, and this was the very year of his accession: may we hazard the guess that it was also the day and hour; and that it was this that made him, when seventy-five years later “he went to the sky,” go as the Planet Venus?

Atri Bhauma not only wrote the eclipse hymn, but several others, mostly about the weather, which it seems was much of the thunderstorm type. I will quote a hymn, addressed to Varuṇa, that is to the God of the starry heavens, the Encompasser. It was probably written in the month of May.

V. lxxxv, 3. “Varuṇa lets the big cask, opening downward, flow through heaven and earth and air's mid-region. Therewith the Universe's Sovran waters earth as the showers of rain bedews the barley.

5. “I will declare this mighty deed of magic, of glorious Varuṇa the Lord Immortal, who standing in the firmament hath meted the earth out with the sun as with a measure.

6. "None, verily, hath ever let or hindered, this the most wise God's mighty deed of magic, *whereby with all their flood, the lucid rivers fill not one sea wherein they pour their waters.*

7. "If we have sinned against the man who loves us, have ever wronged a brother, friend or comrade, the neighbour ever with us, or a stranger, O Varuṇa remove from us the trespass.

8. "If we, as gamesters, cheat at play, have cheated, done wrong unwittingly or sinned of purpose, cast all these sins away like loosened fetters, and Varuṇa, let us be thine beloved."

Atri Bhauma observed the solar eclipse of 955 B.C. King Solomon began the building of the Temple at Jerusalem in 960 B.C. They were therefore contemporaries. And King Solomon also observed the meteorological conditions of his time. I quote from the Septuagint version of the book of Ecclesiastes, since Greek and Sanskrit are languages of the same family: Eccl. i, 3. "What advantage is there to a man in all his labour that he takes under the sun . . . 5. And the sun arises and the sun goes down and draws forward to its place. 6. The wind goes round and round and the wind returns to its circuit. 7. *All the rivers run into the sea; and yet the sea is not filled: to the place whence the rivers come, thither they return again.* . . . 18. *In the abundance of wisdom is abundance of knowledge, and he that increases knowledge will increase sorrow.*"

Truly the very same observation of facts was made by the two men, but the conclusions they drew from them were poles apart.

As there was peace in Palestine in King Solomon's days, so there seems to have been peace, also, in the Panjâb in the time of Atri Bhauma. And so indeed for the next 300 years in India there must have been peace and prosperity, else there would have been more Hymns of Prayer. As the poet sings :

"Lips say, 'God be Pitiful,'
Who ne'er said, 'God be Praised.'"

Then suddenly, a few years before 700 B.C., there came upon the land a great evil thing named the Vṛitra. Even in Atri Bhauma's days the god Indra was famed as "the best vṛitra-

slayer," but such small vṛitras were nothing to trouble about. What then is a vṛitra? The Indian commentators say that it is a demon of drought, and that meteorologically it means a "dark overhanging cloud" in which the rain streams are concealed. But this Great Vṛitra is described in scores of hymns, variously—as something that can have its "joints rent as an ox is dissevered" or that can be "rolled in the midst of never-ceasing currents . . . the waters bear off Vṛitra's nameless body." How could such things happen to a cloud? In my opinion, the Vṛitra was an enormous glacier, which obstructed the rivers of the Panjâb near their source, and that source is up in the Himâlayas. On a small scale, such an obstruction was the Shyok Dam, in 1926; such a glacier could be well described as an "engirdling rock," as one of the hymns describes Vṛitra.

How long Vṛitra took to grow to his full length I do not know, but his destruction (for which Indra was famed) was very shortly before 700 B.C. Meteorologically, his destruction might be described as a "sudden change from drought to deluge." Such a sudden change in the Alps would mean a catastrophe; in the Panjâb it was just the opposite, for India needs rain rather than sunshine. At this very epoch such a catastrophe *did* occur in the Alps. And about 700 B.C. the weather all over the world was out of the common.

But because of the long drought that preceded the deluge accompanying the destruction of Vṛitra, there was brought about that change in the calendar of which I have written at length in my paper on "Early Hindu Astronomy" (read here on April 9th, 1934), to which I must refer you. I did not know then what had induced the Ribhus brothers to reform the calendar, but I am glad to say that, nevertheless, my dating of it was correct. I can now give some precise dates for this period of the seventh century before our era.

The Ṛishi Kutsa was a kinsman of the three brother astronomers, and he fought two battles against the Dâsas, that is the aboriginal tribes; in both battles the sun was eclipsed, annularly. The dates on which these battles were fought were 690 and 680 B.C. We therefore know their shadow tracks, and one curious circumstance was that the earlier was of the setting sun on the banks of the river Jumna; the later shadow track also crossed the Jumna, at mid-morning, and almost at the very spot crossed by the earlier shadow track. Kutsa fought on

the Jumna in the earlier battle, but on the banks of the " Vipâs " river nearly at dawn in the later battle. From this later battle we learn an important fact as to the change of channel of this river Vipâs, which we now know as the Beâs, and as a tributary of the Sutlej, which now joins the Indus much farther south. In 680 B.C. the Beâs must have joined the Indus at a lower point than either the Chenâb or the Sutlej joins it now, and it was then, according to one Rishi, " the most maternal of rivers."

There are many records in the Hymns of these two eclipses, and when I put these records together I was struck by the fact that somewhere or other in each hymn there was a mention of Uṣanâ Kāvya, and also of the serpent demon Ṣushṇa. Moreover, at the eclipse of 690 B.C., mention was made that Bṛihaspati had come to Indra's aid in winning the battle, as also in both battles it was Uṣanâ who helped the god. So I found what planets as well as stars were visible during these eclipses, and in both Venus was very near her superior conjunction, therefore fully illuminated and bright; in the earlier battle Jupiter was in opposition and low down on the horizon, just below the star Regulus, the chief star in the Lion. These Hindu Âryas, even in a fight, could be unafraid though the sun was eclipsed. They could look to see what stars and planets were visible.

In the days of Solomon and Atri Bhauma there was great peace. Not so in the days of Hezekiah and Kutsa. Again I must refer you to another paper I have read before you on " The Shadow Returning on the Dial of Ahaz," on February 22nd, 1932. These were the years when from Tiglath-Pileser to Assurpanipal (745-626 B.C.) Assyria was fighting on all sides for world dominion, until the nation was bled white, and then for the first time, I think, we find the Âryas (the Medes in this case) taking part in a world war. At this time the Persian Âryas were taking some part, but not a massed one, in the Hindu Âryas' battles. And the Hindu Âryas never at any time seemed disposed to take a part in warfare outside their own country.

From this time on there was plenty of fighting in India itself. These two eclipse battles were fought by Âryas against the Dâsas, and the Rishi Vamadeva in a Hymn to India says:—

IV, xxx, 20. " For Divodâsa, him who brought oblations, Indra overthrew a hundred fortresses of stone.

21. "The thirty thousand Dâsas he with magic power and weapons sent to slumber, for Dabhiti's sake."

But only a couple of verses earlier he also says :—

IV, xxx, 18. "Ar̥ṇa and Chitraratha, both Âryas, thou, Indra, slewest swift on yonder side of Saraju."

From this time, also, we find not only wars against the Dâsas, but civil wars between the Ârya tribes, with (probably) the Dâsas aiding one side or the other. Especially the "Five-fold People" warred with each other. These five tribes were descended from Yayati, a famous king, who ruled over most of the Panjâb, and was a contemporary of Usanâ Kâvya. His sons were Yadu and Turvasa, by his first wife Devajani, daughter of Ušanâ, and Anu, Druhyu and Puru, the sons of his second wife Sarmishtha, daughter of King Vrishaparvan. Yayati left the central part of his kingdom (the "Central Regions of the Earth," he named it) to his youngest son Puru, and the outlying regions to his brothers.

I do not think that the Âryas had, at this time, conquered the aboriginal tribes east of the Ganges, though certainly they held the whole country in the northern Panjâb, right up the Himâlayas and the River Saraju—that is the modern Sarju, which rises on the eastern side of the Himâlayas. The Âryas, Ar̥ṇa and Chitraratha, mentioned by Vamadeva as being slain by Indra on yonder side of Saraju, were perhaps guilty of merging into the Dâsas both in habits of life and of religion.

In the Rig-Veda Hymns, the great R̥ishi and astronomer, Vasishṭha, gives an account of two great wars waged by the Âryas whom he served as counsellor and priest. The first of these he terms the Battle of the Ten Kings, fought and won by King Sûdas, the son of that Divodâsa mentioned by Vamadeva in his eclipse hymn, a friend and ally of Kutsa. Five of these ten kings were Âryas, five were aborigines. Again a second battle was fought and won on the banks of the Jumna by the same young king, aided by Vasishṭha.

This Vasishṭha, author of the one hundred and four hymns of the Seventh Book of the Rig-Veda, also wrote (amongst others) a treatise on the sun, called the Sûrya Siddhanta, and a part of this has come down to us almost unaltered. He was an observer of the stars as well as a calculator. He lived between 600 and 700 B.C. I cannot find, however, any hymns of which

I can be sure that they were written as late as 500 B.C., or even fifty years earlier. In the later centuries, the Purus, descendants of Yayati's youngest son, warred among themselves; especially we find the five Pandavas fighting with their cousins for the ancestral kingdom; also at times with their more distant cousins, the Yadavas, Anus, Druhyus and Turvasa. These battles are related in the MahaBharata, and are in the Panjâb. The battles in the south of India for the conquest of the aboriginal tribes are related in the Ramayana. For these, also, as yet, I can give no precise dating.

The Chairman (Mrs. JOHN EVERSLED) said: I have been asked to introduce our lecturer, Mrs. Maunder, but surely this is quite unnecessary. The Victoria Institute and Mrs. Maunder are old friends; and five years ago, in April, 1934, I listened here with you to her paper on "Early Hindu Astronomy." But I should like to remind you that she is not only an authority on ancient astronomy (and the number of historical facts which are clear in her mind and at her finger-tips is amazing) but also a practical astronomer, who has added to our knowledge of sunspots and of the solar corona which she has photographed at eclipses. Together, in Norway, we failed to see a total solar eclipse, because of clouds; and together in Algiers we saw a beautiful one. I was not in India when Mrs. Maunder achieved her memorable success of photographing the longest coronal ray ever seen or photographed at that time, but my husband was there.

Mrs. Maunder has pursued her studies, in English translations, of the Rig-Veda (the oldest sacred book of India); and she finds that events in Indian history can be dated by eclipses described in the hymns contained in that book. Eclipses are very useful in this way, as you probably know; because astronomers know so well the movements of sun and moon that they can calculate eclipse dates backwards through the centuries, and also the narrow track on the earth along which each of them should have been visible. If therefore ancient records describe a total solar eclipse, as seen in any given place, and also an historical event, such as a battle or the death of a king, which happened at the same time, the date of this event can often be very accurately determined.

Mrs. Maunder will tell us how by this and other methods she has

tried to fix the dates of some of the hymns in the Rig-Veda. I will ask her to read to us her paper on "The History of India as Reflected in the Astronomy and Meteorology of the Hymns of the Rig-Veda."

DISCUSSION.

Col. SKINNER said : I am sure Mrs. Maunder will bear gently with the ignorant and unlearned in seeking further enlightenment, for I know nothing of the Rig-Veda beyond what I have gleaned from her most interesting papers.

On page 149 are quoted six verses of Atri Bhauma's hymn to Varuna, the god of the starry heavens, which I gather would have been written not far short of 1000 B.C. These verses appear to embody such purity of thought and devotion towards a being with attributes clearly divine, viz., all power, wisdom, compassion and love, that one is constrained to learn more both of the worshipper and of the object of his worship.

Can our author kindly say, from her fuller knowledge, if this divine being, Varuna, was Bhauma's only object of worship, or if Varuna was only one among a plurality of gods? The hymn by itself seems to suggest a worship of one God, so wholehearted and unreserved, that one is loth to entertain the thought of a worshipper so pure minded being other than single in his allegiance.

If this be a correct appreciation, then would not the antiquity of the hymn afford strong support to the belief that monotheism preceded polytheism in place of being a derivative therefrom, since here we have side evidence of a pure worship of God in other than Hebrew tradition?

AUTHOR'S REPLY.

Varuna means heaven, and judging by the high quality of the hymns addressed to Varuna, it means our "Father which art in Heaven." I have no doubt that the Âryas were in their early times the worshippers of One God, as their father Japhet had been. But the One God had many attributes, and He was addressed sometimes by one name and sometimes by another. Very gradually, but with increasing speed in later times, these attributes became minor gods, and especially in India, where the monsoon is of vital importance, the weather gods assumed predominance until in later Rig-Vedic times Indra, with all his faults of pride and terror, became the greatest of the gods and ousted Varuna from his lawful place.