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778TH ORDINARY GENERAL MEETING,

HELD IN COMMITTEE ROOM B, THE CENTRAL HALL, WESTMINSTER, S.W.1, ON MONDAY, APRIL 9TH, 1934, AT 4.30 P.M.

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

The Minutes of the previous Meeting were read, confirmed, and signed, and the HON. SECRETARY announced the election of Mrs. A. H. Murray, M.B.R., Lady Lubbock, M.A., and the Rev. T. E. R. Phillips, M.A., F.R.A.S., as Associates.

The CHAIRMAN then called on the HON. SECRETARY, who, on account of Mrs. Maunder's recent illness, had kindly undertaken to read her paper on "Early Hindu Astronomy."

EARLY HINDU ASTRONOMY.

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

SOMETIME about 2000 B.C., the Indo-European nations were migrating to the South, East and West. Amongst those who crossed the Hindu Kush into the Panjab were the "Aryans," a name which the immigrants, both into Hindustan and (later) into Persia, ascribed to themselves. It is with the former Aryans that my present paper deals, and I will call them the "Hindu Aryans" to distinguish them from the aboriginal inhabitants of the Land of the Seven Rivers. The other tribe I will call the "Persian Aryans," but I want here to state that during part, at least, of the period covered by my paper, I have more than a suspicion that both Aryan tribes were living together in the Panjab.

Concerning early "Hindu Aryan" astronomy I must attempt to answer three questions: (1) How much did the immigrants learn from the people of the land? ; (2) How much did they bring with them? ; (3) How much did they work out for themselves when established in the Panjab? Three years ago, I could have made no answer to the first and but little to the third. But

since then Sir John Marshall has published the results of the excavations at Mohenjo-daro on the Indus. This town ceased to be, from meteorological reasons, about 2500 B.C., but its seven distinct strata must have reached back many centuries; its history was continuous and showed through one or more millenniums an almost unchanging condition of high material culture, wealth and luxury, with evidence of extensive trading with other countries, not only over the Indian Peninsula but also towards the N.W. and S.W. of Asia, yet there was no evidence of war, offensive or defensive; they were peaceful unarmed traders, a Chalcolithic people whom Sir John Marshall considers essentially similar to the contemporaneous Chalcolithic nations in Sumer and Egypt, both in culture, in religion and in philosophy. I have searched through all the figures, impressed or painted, on the Mohenjo-daro seals, pottery or picture-writing,* and I have not found even so simple and obvious an astronomical symbol as a crescent moon or a stellate figure, though as a great trading nation they must represent a wider civilization than their own. There is only this: their main streets were oriented to the cardinal points; they ran due north and south, or due east and west; just as the Ziggurats of Ur were so oriented as far back as 5000 B.C., and in Egypt the pyramids (here with marvellous accuracy) were so oriented at 3000 B.C. or earlier. I should indeed be grateful for indubitable evidence of astronomy, other than this, in any of these three countries. We must take it, therefore, that the Hindu Aryans brought their astronomy with them. What astronomy did exist before 2000 B.C. ?

(1) The earliest *reproduction* of an astronomical symbol of which I know, so far, is on the victory stele of Naram Sin,† but its original must go back much earlier than this, since it could have served as the sign of the new year from 4000 B.C. It is the picture of the Spring New Moon (lying on its back like a dish or chalice) in a line with and beside the Twin Stars that we now call Castor and Pollux. This Triad was for that early time (from 4000 to 2000 B.C.) the simplest means for recognizing the beginning of the year, and it gave a luni-solar one of 12 or 13 months. Gradually the Triad drew away from the spring equinox through precession, falling later until about 2000 B.C. it was a month late.

* As given in Sir John Marshall's *Mohenjo-daro and the Indus Civilization* (Arthur Probstain, London, 1931).

† Naram Sin, of the Dynasty of Agade, reigned from 2671 to 2634 B.C.

As accident served, the place of the Twins could then be taken by Capella,* "the Goat-Star" carried on the shoulder of the Charioteer.

(2) Professor Stephen Langdon and Dr. J. K. Fotheringham, in their "Venus Texts of Ammizaduga"† give what may be taken as a sample of the extensive observation of planets about 2000 B.C. in Mesopotamia. I may, however, note here that in the period of Early Hindu Astronomy within the limits of my paper, I find no certain reference to any planet.

(3) The constellations were devised about 2900 B.C. by unknown astronomers whom Aratōs‡ calls "the Elder Race"; they were designed for the purely astronomical purpose of giving place-names to the chief naked-eye stars, and they constitute the earliest star catalogue. They serve their original purpose to-day.

In the "Phænomena of Aratōs," with respect to the Zodiac there are given, 20 consellations north of it; 12 constellations in it; and 15 constellations south of it—47 in all. Ptolemy also gives the same three series, but with two important variations: 21 constellations north of the Zodiac, the extra one being a Horse's Head which is placed as a double to the head of Pegasus; 12 in the Zodiac, but a Balance instead of the Scorpion's Mighty Claws; and 15 south—48 in all. It is evident that these two constellational schemes are variants of the same original, and were handed down independently through Aratōs and through Ptolemy. I may add that the Elder Race astronomers who compiled the original star catalogue were neither Semitic nor Egyptian, but were members of the Indo-European peoples before ever they separated into their European and Asiatic divisions. I could give you strong evidence for this, but it does not come within the scope of my paper.

Nineteen years ago, to-day, I gave you an address in which I showed that the Persian Aryans had, at some time, resided within the Arctic Circle ("the best of all lands" to them). From this point of view they conceived of "three worlds"—Heaven, the Earthly Paradise, and Hell—one of which was circled out

* This method of determining the first day of Spring, with Capella as indicator, is actually described on a Babylonian tablet.

† Ammizaduga of the Babylonian Dynast, reigned from 1921 to 1901 B.C.

‡ Aratōs: *Phænomena*, line 16.

in the sky by the seven Plough Oxen, the next was circled on the earth by the rampart of the Arezur mountains and contained Yîma's* four-cornered Varena where the Heroes live, and the third was Hell hanging below the northern horizon like a dark reflexion of Heaven; all three meeting on the northern ridge of Arezur "at the gate of hell where they always hold the concourse of the demons." The king of these Persian Aryans in the Arctic land was Yîma who brought his people south again in three great migrations—he made the world three times greater than before. The Persian Aryans noted a latitude† where the winter night is twice the length of the winter day, and the division thus made of the period "dawn to dawn" was a division not of 12 hours (as in Mesopotamia) or of 24 hours (as in later Egypt) but of 18 hours. At the equinoxes this would mean nine hours of the day and nine hours of the night. I then made the suggestion that this latitude marked the limit of Yîma's third wide stride.

I want you to go back with me to an encampment of those old "Aryans" (our great uncles if not our forefathers) so far within the Arctic Circle that the sun remained below the horizon at the winter solstice for a month or six weeks; and at an epoch about 4,500 years ago. The mid-winter sun was then in the constellation Aquarius which was therefore below the horizon all the year round. (We have some reason to believe that at this epoch these weeks of mid-winter darkness enjoyed mild and "fair bright weather.") Where such was the case, these old Aryans could see all 20 constellations north of the Zodiac (or 21 if they reckoned the number as Ptolemy did) with the Dragon‡ twined round the two Wains, almost overhead; 11 out of the 12 Zodiacal constellations; and one constellation, only, south of the Zodiac, namely, Hydra, the long-drawn out Watersnake§ skirting the horizon round and round just below the constellation Leo. In all they could see 32 of the 47 constellations if they reckoned with Aratōs, or 33 of the 48, if they reckoned with Ptolemy.

The Persian Aryans certainly witnessed these when in that far north region. Did the Hindu Aryans ever experience this

* Yîma the Glorious is the Jamshyd of the later Persians and the Yama of the Hindus.

† North Latitude 49°.

‡ *Ahibudnya:* "Dragon of the Deep."

§ I think *Aja-Ekapod:* "the Unborn One-footed One" is an apt description of this.

sight also? There is some tradition among them of a colder, more northerly home; the two tribes had heroes in common. Yîma always remained a man; Yama became, to the Hindu Aryans, the god who ruled over the dead Fathers. A mysterious being, Trita Aptya, who inhabited the northern sky of the Hindu Aryans, is Thraetona, son of Âthwya, of the Persian Aryans. But keep this in mind:—to the Hindu, Yama and Trita Aptya were gods or at least demi-gods; to the Persians, Yîma, Âthwya, and Thraetona or Thrita were men, though heroic men.

To solve these questions we must go to the oldest Hymns of the Hindu Aryans, 1,028 in number, contained in 10 Maṇḍalas (or Circles) or Books. The Hindus were polytheists, worshipping the gods of the sky, of mid-air, and of the Earth. It is especially the gods of the sky that concern us now: these and Indra who was both the god of the country and of the seasons.

I read the *Rig-Veda* through several times before it was forced upon me that neither the Ten Books, nor the 1,028 Hymns individually were in any sort of chronological order. It seemed impossible to guess which were early and which late, and the authorities were as much in the dark as I was; the limits of dates suggested were from 2000 to 500 B.C.; the probable error of these limits was summed up in Clayton's statement: "there is not sufficient evidence to show the exact occasion of any single hymn in the whole collection."*

In this matter, therefore, I have had virgin soil to work on. In most of the Hymns there is no hint as to who made them, but the name of each Hymn's author is preserved in the *Anukramaṇī*, or Index to the Contents of each Veda, handed down from very ancient times. Some of the begetters of the Hymns sang whole Maṇḍalas, some only a few, or may be a single one. To start with, it mattered nothing to me, who made which Hymn, as all names were alike unknown, but they served to bind together a fair amount of material composed presumably within the life-time of a single man. The knowledge from one such series at an epoch could be compared with the knowledge at another epoch, and a relative chronological order suggested. It was only at first, however, that the authors mattered nothing, for soon the uncouth and unfamiliar names gathered personal interest and sentiment. I began to have prejudices; to like

* *The Rig-Veda and the Vedic Religion*, by A. C. Clayton, p. 39.

and admire or pity; to dislike and condemn or pity those real men and women—even the demi-gods and goddesses; I took sides in their petitions and their quarrels; I judged their gods by the characters of the men who worshipped them; I blamed the gods who played them false; I watched Indra grow from a mere Clerk of the Weather to be the supreme god of the Panjab, to be the very king over the Lords of Pride, until when I went on to read the *Māhābhārata*, I was fully prepared for his overthrow by Śiva, for that very pride. No Hymn was dull when I knew who begat it, and to what deity it was addressed.

I will try to show you how I set about getting the Hymns of these old Rishis into a sort of relative chronological order. My rules are so simple as to be almost platitudinous. Where two Rishis stand in the relation of father to son or grandson, I assume that the father was at least several years the senior of his descendant; where two Rishis each mention the other, I assume that they are contemporaries; where only one mentions the other, I take it that the former is later or at most contemporary of the latter. In a similar fashion I treat the men, places, deities, subjects and such like where mentioned by Rishis. Especially I take account of the subject when astronomical—whether it is observational or mythical, traditional, or of necessity late in its epoch. By this simple "trial and error" method I got the Hymns, or rather the Rishis who made them, into a rough chronological order; and each new subject gave me matter for a better rearrangement of the order.

I will begin with the Rishi Śunaḥśepa* though he may not be the earliest. "Bound to three pillars, captured Śunaḥśepa" prays: "O Varuṇa,† Wise Asura, thou king of wide dominion . . . loosen the bonds above, between, and under." Varuṇa hath made a "pathway for the sun to travel"; whither by day depart the constellations that shine by night set high in heaven above us? Varuṇa's holy laws remain unweakened, and through the night the Moon moves on in splendour; and "True to his holy law, he knows the 12 moons with their progeny: he knows the moon of later birth"; "Varuṇa, wearing golden mail, hath clad him in a shining robe; his spies‡ are seated round

* *Rig-Veda.* Book I, Hymns 24–30.

† Varuṇa means "heaven" or the night sky, wise Asura being a literal rendering of *Ahura-Mazda* of the Zoroastrians.

‡ The stars are the rivets of his golden mail and also the "spies" which look out upon unrighteousness.

about"; "Now see I him whom all may see. I saw his car above the earth; he hath accepted these my songs." This Hymn is to Varuṇa, and the next is to the Aṣvins, the Twin Horsemen: "Come Aṣvins . . . your chariot yoked for both alike, immortal, ye of mighty acts, travels, O Aṣvins, in the sea. High on the forehead of the Bull, one chariot wheel ye ever keep, the other round the sky revolves."

We infer from the astronomical statements in these two songs that the luni-solar year and the method of the Triad were still in use in the time of Ṣunaḥṣepa: The *Twin stars*, themselves, are fixed on the forehead of the Bull in the night sky, but the third member of the Triad, the Moon, revolves round the heavens each month.

Next I take Atri Bhauma,* a Brahmin or praying priest. He was, once, offering up the noon-day libation to Soma at the proper season (at the latter end of June) when the Soma stalks are swept down the swollen rivers. But at that very moment the Sun was blotted out by "Svarbhani's magic,"† and by his fourth sacred prayer, Atri "discovered Surya‡ concealed in gloom that stayed his function." This is obviously an account of a solar eclipse, and the Hymn is addressed to Indra (the god of the seasons), to Surya (the Sun), and to Atri (the Rishi's ancestor). Atri Bhauma, like the Zoroastrians of later date, was apt to magnify qualities or attributes into personalities, as for example: *Urvasi* or "Fervour"; *Vâja* or "the strong"; *Ribhukshan* or "the Lord of the skilful ones":—"May the House-friends, the cunning-handed Artists, the Streams carved out by *Vibhvan* . . . befriend us." All these in a Hymn to the Visvadevas,§ and the idea is that of a Master Carpenter fabricating, for *Vibhvatashtân* means a "Master's hand hath fashioned" and *Ribhum* means "handy." From this it came about that Indra (now or later) annexed the title of *Ribhukshan*.

In Atri Bhauma's Hymns there is no hint that the ancient time method or calendar was getting out of reckoning with the monsoon season; perhaps he assumed that all things must be going right since the gods had answered his "fourth sacred prayer."

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* Book V, Hymn 43.
† Svarbhanu is said to be the "Asura's Descendant."
‡ Surya: the Sun.
§ Book V, Hymn 42; the *Visvedevas* are the "All-Gods."

It was otherwise with Trita.* In the Hôm-yast,† it is related that *Homa*‡ came to Zoroaster and told him that the first *man* who prepared *homa* for the incarnate world was *Vivanghvaṇt*, and for this a son, Yîma, was born to him; that the second *man* was *Âthwya*, and to him was a son, *Thraêtona*; that the third *man* was *Thrita*. In the *Rig-Veda* we find both *Trita Aptya*, who is a *god*, and *Tritā*, who is a Rishi, and it is this latter who prays: "O never may that light, ye gods, fall from its station in the sky, ne'er fail us one like Soma sweet, the spring of our felicity . . . where is the ancient law divine? Who is its new diffuser now? Ye gods who yonder have your home in the three lucid realms of heaven, what count ye truth and what untruth? . . . What is your firm support of law? What Varuṇa's observant eye? How may we pass the wicked on the path§ of mighty Aryaman? I am the man who sang of old full many a laud when Soma flowed, yet torturing cares consume me as the wolf‖ assails the thirsty deer . . . where those *seven rays*¶ are shining thence my home and family extend. This Trita Aptya** knoweth well, and speaketh out of brotherhood. May those five Bulls†† which stand on high—full in the midst of mighty heaven . . . return. High in the mid-ascent of heaven, those Birds‡‡ of beauteous pinion sit . . . Back from his path they drive the wolf‖ as he would cross the restless floods . . . The flowing of the floods is law . . . that pathway of the Sun in heaven . . . is not to be transgressed O Gods. O Mortals ye behold it not . . . a ruddy wolf‖ beheld me once, as I was faring on my path. He like a carpenter§§ whose back is aching crouched and slunk away."

* Book I, Hymn 105.

† The *Yasna* is the Chief liturgy of the Zoroastrians, and the *Hôm-yast* is *Yasna IX*.

‡ Homa is the "Zend" word, cognate of the Sanskrit *Soma*. In the *Rig-Veda*, *Soma* is both the name for the Moon, and for the *Amrita* or sacred drink that confers immortality on gods and men.

§ The Milky Way.

‖ Lupus.

¶ The Seven Plough Stars.

** Trita Aptya, according to the Hindu Aryans "a mythical being who dwells in the remotest part of the heaven," and the Rishi Trita recalls his ancient northern home.

†† Cassiopeia.

‡‡ Aquila, Vega, Cygnus and perhaps also Pegasus as being winged.

§§ Tvashtar the ancient artificer of the gods who had shaped the Aṣvins three-fellied car; he has now become like an old, worn-out Carpenter.

The astronomical interpretation is this: Trita calls upon the gods to witness that the flowing of the floods is law, yet that law on Earth is no longer in accord with the ancient law in the sky. The Soma in the rivers is not now to be gathered at the time told by the stars of old.

Next I take the Rishi Hiranyastupa (though strictly speaking he should come later), because in his Hymns he embodies several of the old traditions. To Savitar, the sun who revives all things, he says:* "Three heavens there are; two Savitar's, adjacent: in Yama's world is one, the home of heroes. As on a linch-pin, firm, rest things immortal; he who has known it, let him here declare it." But these three worlds are just those whose nature I had so laboriously assembled from various ancient Persian books, 19 years ago. And Hiranyastupa's description is not laboured, it is a gem of concise poetry.

In his hymn to the Aṣvins:† "Three are the fellies in your honey-bearing car, that travels after Soma's loved one as all know." This is the Triad of the Twin Aṣvins and the Moon like a dish or chalice. Soma is the name both of the Moon, and of the Moon's loved one, *Amrita*. Hiranyastupa clings to the old Aṣvins tradition, and the Aṣvins have a peculiar title *Nâsatyas*, derived by Indian commentators from *na* + *asatya*; "not untrue." This title they had borne at least since the 14th century B.C., and I think owes its derivation to the counter assertion of the faithful to those who said that the Aṣvins-cum-Moon calender was become inaccurate. So, too, Hiranyastupa sings:‡ "Come, O Nâsatyas with the Thrice-Eleven Gods; Come, O ye Aṣvins to the drinking of the meath. Make long our life, and wipe out all our sins: ward off our enemies; be with us evermore." We find not only in Hiranyastupa but in the Hymns of other Rishis, the "All-Gods," sometimes given the title of the "thrice-eleven" sometimes of the "three and thirty gods." Such a precise number together with the fact that the Aṣvins acted as the leaders, forces us to see in these gods of the heavens, the "universal gods" those 33 constellations seen by their ancestors when within the Arctic Circle. And the tradition that they brought with them was the one which has reached us through Ptolemy, and not that through Aratōs.

* Book I, Hymn 35, verse 6.
† Book I, Hymn 34, verse 3.
‡ *Ibid*, verse 11.

I was much confirmed in my judgment of 19 years ago when I learnt from Hiranyastupa that he knew of the three worlds of Yîma known to the Persian Aryans. But I was wholly taken by surprise when I also found a confirmation that the day with 18 divisions had been made by Yama. Two Rishis refer to it: Gauriviti writes :* "Man's worship of the gods hath three great lustres" or *tryâryamâs* = three *yamas* or night watches of three hours each. So to Brahmatithi, says of the Aṣvins† "wherewith the three wide distances and all the lights that are in heaven ye traverse, and *three times of night*"; again the three yamas of three hours each.

To return to the "33 gods" we find that the Rishi Gotama‡ says of the great god Indra :§ "He, searching for the Horse's Head, removed among the mountains found at Saryanâvân‖ what he sought. Then verily they recognized the essential form of Tvashṭar's Bull, here in the mansion of the Moon." It was this passage that brought me up all standing, for it was long before I could bring myself to believe that here, early in Book I of the *Rig-Veda*, a Rishi was taking for granted, almost casually, the biggest revolution in astronomy that had occurred since the constellations themselves were devised. It was longer still before I came to the conclusion that this astronomical revolution which took place very nearly at the date 700 B.C., was itself the work of Hindu Aryan astronomers. It amounted to a *re-discovery* of precession; the first (perhaps) discovery of it was when the constellations were devised; the third discovery was by Hipparchus in 128 B.C. This great work of the¶ Hindu Aryan astronomers was the division of the Zodiac into 27 *equal* parts. called nakshatras or stations (mansions) of the moon; the division of the Zodiac into constellations in 2900 B.C. was a very irregular division as regards the size of the parts. Now in the nakshatras thus devised in 700 B.C., the first nakshatra was named *Aṣvini*

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* Book V, Hymn 29, verse 1.

† Book VIII, Hymn 5, verse 8.

‡ Gotama is not the Buddha Gotama of the Buddist faith, but he may have been his ancestor.

§ Book I, Hymn 84, verses 14 and 15.

‖ A lake and district near Delhi.

¶ *See* "The Sothic Cycle or the Nakshatras" by A. S. D. Maunder, F.R.A.S., *British Astronomical Association Journal*, Vol. 43, No. 3, p. 121 When I wrote this paper I did not know who these Hindu Aryan Astronomers were.

and it was figured as a Horse's Head. The new method thereby seems to intimate that it was a reformation of the ancient and now inaccurate Triad, rather than a negation of it.

Though, evidently, the Rishi Gotama lived soon after the event, he does not name the astronomers, but his sons, the Rishis Nodhas and Vamadeva do. These great astronomers were the three sons of Sudhanvan. It was, however, the Hymn of a blind Rishi Dirghatamas of a later date (I think) that so haunted me by its metre and its content, that I could get no rest until I had solved its riddle.

*1. Why hath the Best, why hath the youngest† come to us ? Upon what Embassy comes he ? What have we said ? We have not blamed the Chalice of illustrious birth. We, brother Agni, praised the goodness of the wood.

2. The Chalice that is single made ye four; thus have the gods commanded; therefore am I come. If, O Sudhanvan's Children, ye will do this thing, ye shall participate in sacrifice with Gods . . .

4. Then Tvashṭar‡ when he viewed the four wrought chalices, concealed himself among the Consorts of the Gods.

5. As Tvashṭar thus had spoken, Let us slay these men who have reviled the chalice, drinking-cup of Gods: They gave themselves new names when Soma juice was shed, and under these new names the Maiden§ welcomed them.

6. Indra hath yoked his bays, the Aṣvins car is horsed, Brihaspati|| hath brought the cow of every hue. Ye went as Ṛibhu, Vibhvan, Vâja to the Gods, and skilled in war, obtained your share of sacrifice.

8. Drink ye this water were the words ye spake to them; or drink ye this the rinsing of the Munja-Grass. If ye approve not even this, Sudhanvan's sons, then at the third libation¶ gladden ye yourselves.

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* Book I, Hymn 161.

† Agni, the God Fire.

‡ Tvashṭar was the artificer of the Gods who had made (like a Carpenter) the Aṣvins' Car.

§ The Maiden is Ushas the Dawn, in this case, the first dawn of the year.

|| *Brihaspati:* "Lord of Prayer" in later times identified with the planet Jupiter.

¶ The third libation or evening one at which Soma was offered to the new made Gods, Ṛibhu, Vâja, Vibhvau.

I have no doubt that the new names—Ṛibhu, Vâja, Vibhvan—which these astronomers took, were from Atri Bhauma's Hymn,* and by these names they were deified. Indra became their Lord, and under the name of *Indra Ṛibhukshan*, he waxed exceedingly mighty until, even in *Rig-Veda* times, he was acknowledged as the supreme god.

But concerning the acts of the Ṛibhus (as they were called collectively), the Rishi Vamadeva has interesting information† to give :—

5. Two beakers let us make—thus said the eldest. Let us make three—this was the youngest's sentence. Four beakers let us make—thus spoke the youngest. Tvashṭar approved this rede of yours O Ṛibhus.
6. The men spake truth and even so they acted: This godlike way of theirs the Ṛibhus followed. And Tvashṭar when he looked on the four beakers, resplendent as the day, was moved to envy.
7. When for 12 days the Ṛibhus joyed reposing as guests of him who never may be hidden; they made fair fertile fields, they brought the rivers. Plants spread o'er deserts, waters filled the hollows."

Ṛibhu proposed two beakers—that is the moon's chalice near the summer and winter solstices. Vâja hankered after the old tradition of three—make, said he, a reformed Triad. Vibhvan, the Master Architect said four beakers—two at the solstices, two at the equinoxes.

More interesting still " the Ṛibhus joyed reposing as guests " of Savitar the sun. In other words, they dropped 12 days out of the calendar of a particular year, just as we dropped 11 days between September 2 and 14 in 1752. If (as we must suppose) the dropping of 12 days took place near the date 700 B.C., and so the calendar was brought into line with the actual seasons, it involves that the Hindu Aryans must have established themselves in the Panjab, about 900 years earlier, that is to say the tribes were crossing the Hindu Kush into the land of the Seven Rivers shortly before 1600 B.C.

I have answered the three questions that I set myself, and have told of early Hindu astronomy down to the great work of the

* Book V, Hymn 42.

† Book IV, Hymn 33, v. 5 *et seq.*

sons of Sudhanvan in 700 B.C. I have only dealt with less than a dozen of the Hymns. Some before, some after that crucial date. I have indeed just picked out some that afford astronomical information. It is not to be thought for a moment that the *Rig-Veda* is an astronomical compilation; the vast majority of the Hymns are later than 700 B.C., and concern themselves with intertribal battles, and forays in the Panjab, or incursions into the Dasyu land east of the Jumna up to the Ganges. A few precise dates—were these to be found—would bring the whole of the past from 700 B.C. into line *as history.*

It is always a joyous thing to find faults in the work of one's predecessors; thereby progress is made. And when—as in the present case—my predecessor is myself, then—to use a frequent expression in the Rāmāyāna—I "experienced an excess of delight." For this is a passage from blind Dirghatamas: "Dirghatamas* the son of Mamatá hath come to length of days in the tenth age of human kind. He is the Brahman of the waters as they strove to reach their end and aim: their Charioteer is he."

Here is the Zoroastrian "12 ages of mankind" put back to some time between 700 and 500 B.C. and in Hindustan:—the "Time was 12,000 years" which in my paper of 19 years ago, I put into our own era as due to a misapprehension of Hipparchus' discovery of precession in 128 B.C. Moreover, we must remember that the Tenth Age† was ushered in by "the coming of the religion," that is when Zoroaster brought in the Faith, and here we have Dirghatamas who was almost a contemporary of the Persian Sage, singing his Hymn. Truly, the period 700–500 B.C. was one of intense interest all the world over—and a troublous one.

Discussion.

The Chairman (Mrs. M. A. Evershed, F.R.A.S.), in introducing Mrs. Maunder, said she was already known to the Victoria Institute, even as she was known to astronomers all over the world by her sunspot observations, her valuable and varied work for the British Astronomical Association, and her research into the beginnings of astronomy.

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* Book I, Hymn 158, verse 6.

† The Tenth Age begun very nearly at 600 B.C.

Astronomy (the Chairman continued) has its beginnings always and everywhere, for sun, moon and stars are our time-keepers, our calendars and our guides by land and sea. The races lowest in the scale of civilization study the movements of moon and sun, and know and name some of the brightest stars : the ancient civilizations mapped out the whole sky into star-groups. Egypt had her constellations, but they are not ours ; China has hers, but they are not ours ; Babylonia had hers, and they are ours, for we have them through the Greeks. But did Babylonia invent them or receive them from elsewhere ? We shall follow Mrs. Maunder's paper better to-day if we recall how she and Mr. Maunder laid a sure foundation for investigating this problem.

Mr. and Mrs. Maunder showed—what Proctor had already suggested—that the 48 ancient constellations tell us themselves where and when they were invented. They have a southern limit, beyond which obviously the observers could not see, and this limit, which is roughly a circle of latitude, gives us the latitude in which the observers lived. They lived at about 40° north. Further, the circle is lop-sided round the present celestial pole, but symmetrical to the pole of about 3000 B.C. So the constellations were formed about 3000 B.C.

This latitude seems to rule out Babylonia, and Mrs. Maunder began to look elsewhere. Years ago she gave you the results of her search into ancient Persian and Hebrew books. Later she studied the Vedas of India, and I will ask that we may now hear about this study and its results.

The Chairman thanked Mrs. Maunder heartily for her very interesting paper, and also returned thanks to the Hon. Secretary for reading it.

The Chairman then commented briefly on the paper, noting what an immense amount of work it represented, and how ingenious were some of the interpretations of the extracts from the Rig Veda. She was particularly interested in the suggestion that the Hindu Aryans had at one time lived within the Arctic Circle, because she had already heard this many years ago in India. An assistant at Kodaikanal Observatory, Mr. Sitarama Aiyar, who read the Vedas in the original Sanscrit, had said to her that from them he understood that his ancestors had come from the Polar Regions.