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THE VEDIC *NAKṢATRA*-NAMES OF THE MONTHS

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The Vedic *nakṣatra*-names of the months have been derived unambiguously and self-consistently from the *nakṣatras* in which the moon is full in a *yuga* in the calendar of *Vedāṅga Jyotiṣa*.

Key words: Vedic calendar, *Vedāṅga Jyotiṣa*, *Nakṣatras*, Months.

1. Introduction

The lunation – the period defined by the cycle of phases of the moon – is the basis of the month. The month is a well established concept in the earliest Vedic text namely *Ṛgveda Saṃhitā*. For example, the gestation period of a child is given as *daśa māsa* (ten months; *RV*.V.78.8, 9; *RV*.X.184.3; *AV*.V.25.10, *AB*.VII.13, XXXIII.1). In addition, the month is fully incorporated in the Vedic rituals and from the earliest strata of the *Ṛgveda* there are frequent references to nine- and ten-month rites (e.g. *RV*.V.29.12; *RV*.V.45.7). There are also hints in this text that a year was divided into six seasons and each season was allocated two months (*RV*.VIII.68.14; *RV*.I.164.15). In the post-*Ṛgvedic Saṃhitās* and the *Brāhmaṇas* a year is unambiguously divided into six seasons (sometimes five seasons) and each season is of two months duration, that is a year has twelve months (a thirteenth intercalation month is also mentioned in these texts[1]). The names of the months are given in the post-*Ṛgvedic Saṃhitās* and the *Brāhmaṇas* (e.g. *TS*.I.4.14; *TS*.IV.11.1; *VS*.VII.30; *SB*.IV.3.1.14-20) and are reproduced in Table 1 (column #3). These names are not mentioned in *Ṛgveda Saṃhitā* but the names of the first six months are mentioned in the list of *devatā* /gods of *sūkta RV*.II.36. These names of the months are 'descriptive' in the sense

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that they describe the seasons during these months, for example, the spring months are *Madhu* (honey – the usual symbol for fertility and rain in the Vedas) and *Mādhava*, because in spring plants sprout and the trees are brought to ripeness.

The Vedic people abandoned the subjective or phenomenon-based names of the months at some stage and identified the months by the 'presiding' *nakṣatras*. That is, a month was named after the *nakṣatra* with which a full moon of the month was conjoined. Various schemes have been suggested for the choice of the *nakṣatras* after which the months were named. It is shown that these schemes are fundamentally flawed. A scheme based on the *nakṣatras* of the full moon in a *yuga* is suggested.

2. *Nakṣatra*-names of the months

At some stage during the evolution of the Vedic calendar, the Āryas began to identify the months by the *nakṣatras* with which the full moon of the month was conjoined. The *nakṣatra*-names of the months must have been a late development as a list of these names is not given in the *Saṃhitās* and the *Brāhmaṇas* and these names are rather infrequently encountered in these texts. The *nakṣatra*-names of months have to be inferred from passages in the *Saṃhitās*, the *Brāhmaṇas* and the *Sūtras* that specify the times of rites or ceremonies, for example;

- One should get consecrated on the *Phalgunī* full moon day because *Phālguna* full moon is the mouth of the year (*TS*.VII.4.8.).
- Perform the preliminary ceremony on the full moon of *Caitra* (*TB*.3.8.1.).
- Lay down fire on the new moon of the month of *Vaiśakha* (*SB*.XI.1.1.7.).
- Consecrate themselves on one day after the new moon of *Taiṣa*/*Pauṣa* or *Māgha* (*KB.* XIX. 2.).
- Perform the *pañcaśāradīya* in the sixth *śarad* season in the *kārttika* month (*LŚS*.IX.12.13).
- When the herbs appear ……..in (the month of) *Śrāvaṇa* (*ĀGS*.III.5.2.).

The *nakṣatra*-names of the months suggest an evolution in the precision (and reproducibility) with which months and by inference, seasons were determined in the Vedic period. This method of timing ceremonies demands an ability to calculate the day when the full moon will be in conjunction with a specific *nakṣatra.*

This suggests that the Āryas had 'calibrated' the *nakṣatras* with respect to both the seasons and the times of the full moon. The Sanskrit grammarian Pāṇiṇī (about 400 BC) has given rules for deriving the name of the full moon day and the month from the name of the appropriate *nakṣatra* (Pāṇiṇī IV.2.21). These names are also given in Table 1 (column #4). These names of the months, or their variants, have survived for over two thousand years and are in use in most parts of India today.

Table 1. The Vedic seasons, the seasonal-names and the *nakṣatra*-names of the months. The *nakṣatras* of the first twelve full moons of a *yuga* are given in the last column. The start of the *yuga* is from a new moon at winter solstice

Seasons	**Vedic Seasons**	**Months**	***Nakṣatra* months**	***Nakṣatras* of first 12 full moons of a *yuga***
Cool	*Śiśira*	Tapas	Mâgha	Mâghas
		Tapasya	Phâlguṇa	U. Phâlguṇīs
Spring	*Vasanta*	Madhu	Caitra	Citrâ
		Mâdhava	Vaiśâkha	Anurâḍhâs
Summer	*Grīṣma*	Śukra	Jyaiṣṭha	Mūla
		Śuci	Âṣâḍha	U. Âṣâdhâs
Rains	*Varśâ*	Nabhas	Śrâvaṇa	Śraviṣṭhâs
		Nabhasya	Bhâdrapada	P. Proṣṭhapadâs
Autumn	*Śarad*	Isa	Âśvina	Âsvayujau
		Ūrja	Kârttika	Kṛttikâs
Winter	*Hemanta*	Sahas	Mârgaśīrṣa	Mṛgaśīrṣa
		Sahasya	Pauṣa	Punarvasus

The *nakṣatras* selected to name the months were the *nakṣatras* with which the full moon was in conjunction in a year. In a year, the moon passes twelve times through the twenty-seven *nakṣatras*. Thus in a year the moon will be full when close to twelve *nakṣatras*. But the *nakṣatras* are not separated by equal distances, the moon's orbital motion is not uniform and the moon's sidereal period is not equal to its synodic period, thus the moon will not be full 'besides' the same *nakṣatra* every year. Dikshita (1896)[2] suggested that this nomenclature might have been introduced when vernal equinox was in the month of Caitra. However, he does not give a rationale for the names of the months. To get round the confusion that would have been caused in identifying a month, in different years, from a *nakṣatra*, Sewell and Dikshita (1896)[3] suggested that the months were named after alternate *nakṣatras* in the list of *nakṣatras* in the *Saṃhitās* and

the *Brāhmaṇas*. They allocate sometimes two and sometimes three *nakṣatras* to a month for this purpose. However, they do not explain why they chose these particular groups of *nakṣatras* to identify the months and why the months were named after one specific *nakṣatra* from this group. Vogel (1971)[4] has proposed a similar scheme for grouping (and omitting) *nakṣatras* to obtain the names of the months; his groupings and omissions of *nakṣatras* is different from that of Sewell and Dikshita (1896)[5]. Saha and Lahiri (1992)[6] have suggested that the twelve *nakṣatras* to name the months were selected because they are "approximately at equal intervals". These authors have selected and grouped *nakṣatras* to match the known *nakṣatra*-names of the months or they have 'retrofitted' the *nakṣatras* to the *nakṣatra*-names and not identified the 'causal link' between the *nakṣatras* and the *nakṣatra*-names. Narahari Achar (2000)[7] has suggested that the months were named after *nakṣatras* whose presiding deities can be identified with *Agni*, *Prajāpati* or *Yajña*. These *nakṣatras* just happen to be distributed almost evenly along the path of the sun. The suggested groupings of *nakṣatras* to obtain the *nakṣatra*-names of the months are also illogical, as will be shown below. These authors have also ignored a fundamental aspect of the Vedic calendar, namely intercalation.

The Vedic texts suggest both spring (*vasanta*) and winter (*śiśira*) as likely seasons for start of a Vedic year. The evidence for start of the year in winter is more extensive and will be considered first. The daily observances of the *sattra* of *Gavām ayana* follow the apparent annual motion of the sun. This *sattra* has two foci, the *Viṣuvant* and *Mahāvrata* days and these correspond respectively to the summer and the winter solstice (*KB*.XIX.3). The day of the start of the *sattra* is not given in *KB*.XIX.3 but *AB*.IV.26, XIX.4 prescribes that the *sattra* should commence in the cool season (*śiśira* in the months of *māgha* or *phālguna*), this passage also enjoins against starting the *sattra* in any other season. More definite information on start of the *sattra* is given in *TS*.VII.4.8 and with minor variations in the wording and with additional information, in *PB*.V.9. These passages suggest that the start of a year (at least for some Vedic schools) was in winter. *Vedāṅga* (arm or limb of the Veda) *Jyotiṣa*, a text of the late Vedic period, is the earliest South Asian text devoted exclusively to the calendar. The text is a manual for determining the proper times of Vedic ceremonies. The calendar of this text has an intercalation period of five years (*yuga*) and this period or the *yuga* starts at new moon at (or near) the winter solstice when the moon and the sun are in the *nakṣatra Śraviṣṭhās* (*RJ*.5 – verse #5 in the

Solstice

Ṛgvedic recension of *VJ* and *YJ*.6 – verse #6 in the *Yājuṣa* recension of *VJ*) [8]. A *yuga* is sixty-two synodic months long and in a *yuga* the synodic year is synchronized with the seasons by intercalating one synodic month after thirty synodic months of a *yuga* and a second synodic month after sixty-one synodic months of a *yuga*. Similar scheme of intercalation is also described in *MS*.I.10.8[9]. From the *nakṣatra* of the new moon at the start of a *yuga*, the *nakṣatra* of every full moon and new moon in a *yuga* can be determined [10,11] as follows;

In a *yuga* (the five year Vedic intercalation period) there are 62 lunations or lunar months

67 sidereal months (both these numbers are given in the *VJ*)

Therefore, in 1 lunation there are 67÷62 sidereal months

Or 1 lunation = $1^{5}/_{62}$ sidereal months

In a sidereal month the moon passes by 27 *nakṣatras*

Therefore, in 1 lunation the moon passes by $27\times1^{5}/_{62}$ *nakṣatras* = $29^{22}/_{124}$ *nakṣatras*

Thus the separation of successive new (or full) moons is $29^{22}/_{124}$ *nakṣatras*

And the separation between a new and full (or full and new) moon (or a *pakṣa*) is $14^{73}/_{124}$ *nakṣatras*

Starting with the new moon in the *nakṣatra Śraviṣṭhās*; the *nakṣatras* of the first twelve full moons of a *yuga* are given in column #5 of Table 1. The positions (ecliptic longitude and latitude) of these full moons were calculated with the currently available orbital parameters of the earth and the moon and the origin of the coordinate system was assumed to be at the first point of Aries.

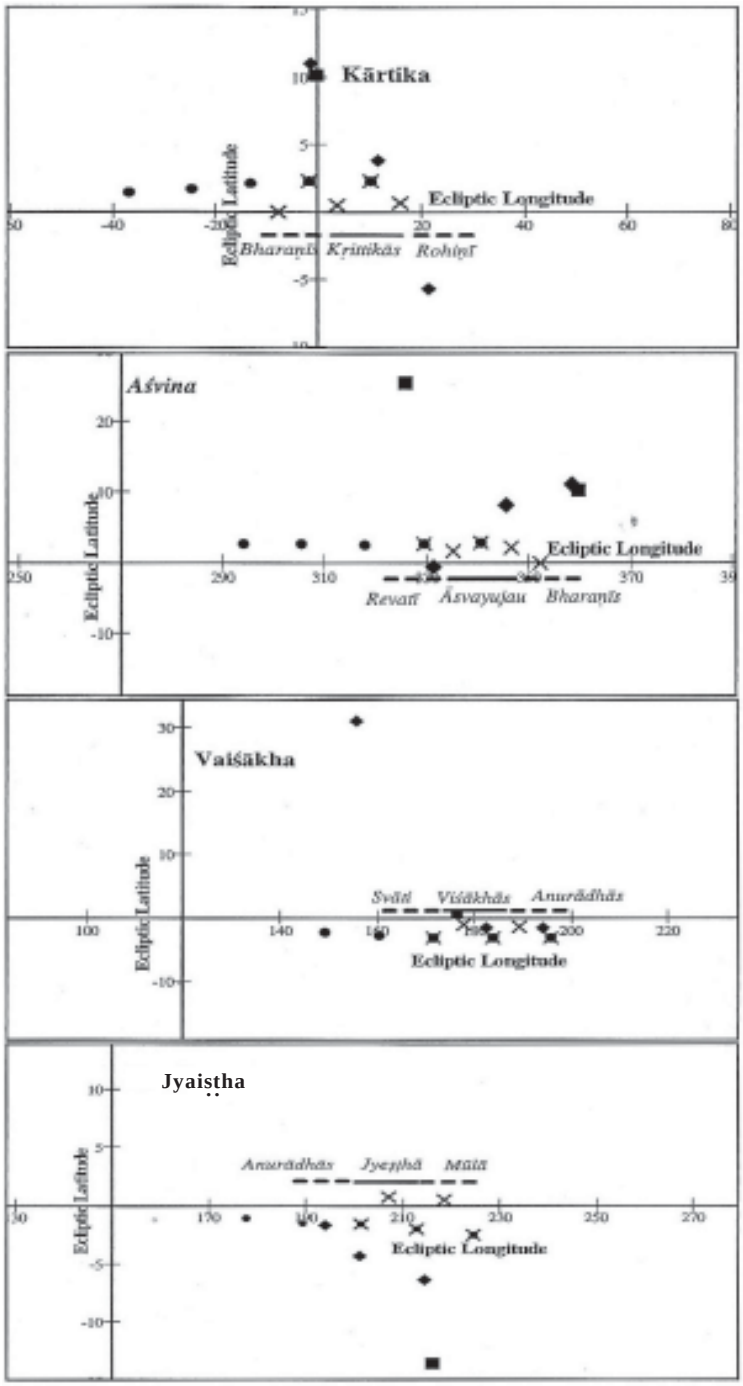
The epoch of the *nakṣatras* in which the moon is full can be determined from the *Cāturmāsya* (or seasonal) sacrifices. The *nakṣatra Kṛittikās* have been unambiguously identified with the Pleiades. The *Cāturmāsya* sacrifices prescribe that the sacrifice of *Sākamedha* should be performed when the full moon is in *Kṛttikās* (*KŚS* 5.6.1.). This is the autumn sacrifice and for *Kṛttikās*/Pleiades to conjoin a full moon in autumn, it is necessary to have precess of the stars (or the *yogatārā*) of this asterism to about 1400 BC**. The

** Proper motion of the *yogatārās* has not been included, as the small change in the position that this will cause will not affect the conclusions reached here.

yogatārās[12,13] of the twelve *nakṣatras* of the first twelve full moons of a *yuga* have been precessed to this epoch. This brings the *nakṣatras* (or *yogatārās* of) *Uttara-Phalgunīs* and *Uttara-Aṣāḍhās* close to the full moon in the seasons of *vasanta* and *grīṣma* as required by the *Cāturmāsya* sacrifices (*KŚS* 5.1.1 and *KŚS* 5.6.1 respectively).

In the montage of Fig. 1 are shown the positions of the *yogatārās* of the *nakṣatras Bharaṇīs*, *Kṛttikās* and *Rohiṇī* and the positions of the tenth (the autumn) full moon in the five years of a *yuga*. These positions of the moon are shown both before (dots in Fig. 1) and after intercalation (crosses in Fig. 1). In a *yuga*, each year the position of the same full moon will "shift to the left" or its ecliptic longitude will decrease because the synodic year is shorter (by about eleven days) than the seasonal/tropical year. After intercalation the positions of the full moons in the third, fourth and the fifth year of a *yuga* will be "shifted to the right" or to the higher ecliptic longitude relative to the uncorrected positions. Judging from the positions of the full moon on successive years of a *yuga* it would have been more logical to group *Bharaṇīs* and *Kṛttikās* rather than *Kṛttikās* and *Rohiṇī* as suggested by Sewell and Dikshita (1896)[14]. But, as can be seen from this Fig. 1, there is really no need to group *Kṛttikās* (from which the name of the tenth month is derived) with the adjacent *nakṣatras* as, during a *yuga*, the tenth (autumn) full moon will 'cluster' in this *nakṣatra* when intercalation is included. Similarly, there is no need to group the *nakṣatras Revatī*, *Āsvayujau* and *Bharaṇīs*[15] because in a *yuga* the ninth full moon, after intercalation, clusters around the *nakṣatra Āsvayujau* as shown in Fig. 1. It can be seen from Table 1 that the *nakṣatra*-names of eight months of a year can be derived unambiguously from the *nakṣatras* in which the moon is full during the first year of a *yuga*. With intercalation, at least three full moons of these months will cluster around these *nakṣatras* in successive years of a *yuga* as shown for the months of *Kārttika* and *Āśvina* in Fig. 1. Thus, the same *nakṣatra*-names can be used for these months every year, as indeed they have been. However, the *nakṣatra*-names of the remaining four months of a year cannot be derived from the *nakṣatras* in which the moon is full in the first year of a *yuga* (Table 1) and it is worth looking at these in detail.

In Fig. 1 are shown the ecliptic longitude and latitude of the *yogatārās* of the *nakṣatras*;


Kārtika
Ecliptic Latitude
Ecliptic Longitude
Bharaṇīs Kṛttikās Rohiṇī
Aśvina
Ecliptic Latitude
Ecliptic Longitude
Revatī Āśvayujau Bharaṇīs
Vaiśākha
Ecliptic Latitude
Svāti Viśākhās Anurādhās
Ecliptic Longitude
Jyaiṣṭha
Ecliptic Latitude
Anurādhās Jyeṣṭhā Mūlā
Ecliptic Longitude

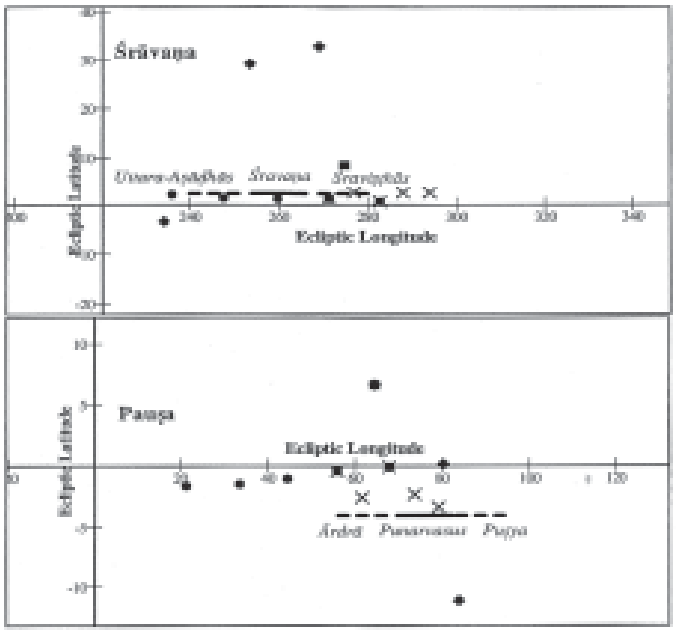


Fig. 1. Shows coincidence of full moons in a *yuga* with *nakṣatras* and *nakṣatra*-sectors. The positions of the full moon without and with intercalation are shown as full dots and crosses respectively. The *yogatārās* from the list of Pingree and Morrissey (1989)[12] are shown as diamonds and those from the list of Abhyankar (1991)[13] are shown as squares. The *yogatārās* have been precessed to 1400 BC. The 'monthly' *nakṣatra*-sector is shown by full line and the adjoining sectors are shown by dotted line.

- *Svāti, Viśākhās* and *Anurādhās*
- *Anurādhās, Jyaiṣṭhā* and *Mūlā*
- *Uttara-Aṣāḍhās, Śravaṇa* and *Śraviṣṭhās*
- *Ārdrā, Punarvasus* and *Puṣya*

These are the *nakṣatras* of the four 'discrepant' months in Table 1 and the adjacent *nakṣatras*. The fourth full moon in the first year of a *yuga* is in the *nakṣatra Anurādhās* but in the following years the full moon for this month moves into the *nakṣatra Viśākhās* and *Svāti*. After intercalation, three of the five full moons of a *yuga* for this month cluster by the *nakṣatra Viśākhās*. It is because of this preferred clustering of full moons that this month is named after the *nakṣatra Viśākhās* and not *Anurādhās*. This is also true of the month of

Jyaiṣṭhā as three of the five full moons of a *yuga* for this month (that is the fifth full moon) cluster by the *nakṣatra Jyaiṣṭhā* (Fig. 1) after intercalation. However, this is not true of the seventh month of a *yuga*, this month is *Śrāvaṇa* but the intercalated full moons for this month cluster by the *nakṣatra Śraviṣṭhās* (Fig. 1.) and the *nakṣatra*-name of this month should have been derived from this *nakṣatra*. Similarly, the name of the twelfth month is derived from the *nakṣatra Puṣya* but after intercalation, three full moons in a *yuga* for this month cluster by the *nakṣatra Punarvasus* (Fig. 1.) and this month could have been better named after this *nakṣatra*. The Vedic texts provide no clues for alternative names for the months of *Śrāvaṇa* and *Pauṣa* and it has not been possible to determine the reasons for the discrepancy in the *nakṣatra*-names of these two months when the *nakṣatra*-names of ten months of a year can be derived unambiguously by the scheme proposed here.

Apart from the start of the *yuga* at winter solstice, described above, the Vedic texts also suggest a start of the year when the spring full moon is in the *nakṣatra* (*Uttra*-)*Phalgunī*s (*TS*.VII.4.8, *KB*.IV.4, *KB*.V.1, *SB*.VI.2.2.18, *PB*.V.9.8). The procedure described above can be repeated to obtain the *nakṣatras* of the full moons in a year starting with the spring full moon in *Uttra-Phalgunī*s. From this sequence of *nakṣatras* of the full moons, the names of only three months can be derived. In this scheme, the remaining nine months would have *nakṣatra*-names different from those known at present.

In the description of the coincidence of the *nakṣatras* and the full moons in a *yuga* (Fig. 1), the *yogatārās* of the *nakṣatras* have been precessed to 1400 BC. This coincidence between (*yogatārās* of the) *nakṣatras* and the 'monthly full moons' will be maintained for about 300 years either side of 1400 BC. Beyond these limits, it would be necessary to assign new names to the months because the *nakṣatras* considered here would precess away from the 'monthly full moons' and the 'monthly full moons' would conjoin a different set of *nakṣatras*. In the Vedic texts, there is no evidence of renaming the months.

In the calendar of *Vedāṅga Jyotiṣa*, a *nakṣatra* does not mean a star or an asterism (as it does in the earlier Vedic texts) but it means a sector of the ecliptic (or the path of the moon). These *nakṣatra*-sectors are a significant aspect of *VJ* and the algorithms of *VJ* enable the position of the sun and the moon to be determined within these sectors. The locations on the ecliptic of these twenty-

seven *nakṣatra*-sectors can be determined from the "*jāvādi* (*jau ādi* beginning with *jau*)" arrangement of *nakṣatras* (*RJ*.14 and *YJ*.18) in *VJ*[16]; this has been discussed in detail by Gondhalekar (2009)[17]. The positions of these sectors are invariant, that is, unlike the *nakṣatras* they do not change with precession of the equinox. These *nakṣatra*-sectors are shown in the montage of Fig. 1; the full black bars denote the *nakṣatra*-sectors in which the moon is full in the first year of a *yuga* and the dashed bars denote the adjacent *nakṣatra*-sectors. It is possible that at their inception, the *nakṣatra*-sectors were identified by the *nakṣatras* (stars and asterisms) and these names were retained after the *nakṣatras* (stars and asterisms) had precessed away from the sectors. The monthly full moon will be close to the same *nakṣatra*-sector every year and a month will therefore have the same *nakṣatra*-name. The longevity of the *nakṣatra*-names of the months suggests that after the *nakṣatras* (stars and asterisms) had precessed away from their respective sectors, a month was identified by the *nakṣatra*-sector in which the moon was full in a *yuga*. It should be stressed that intercalation of the synodic months has to be included even if the *nakṣatra*-names of the months are derived from the names of *nakṣatra*-sectors

3. Conclusions

For over a hundred years the Vedic *nakṣatra*-names of the months have been explained by matching the names of the *nakṣatras* to the known *nakṣatra*-names of the months. It is shown that if a *yuga* starts near winter solstice when the new moon is in the *nakṣatra Śraviṣṭhās* (as prescribed in *Vedāṅga Jyotiṣa*) then the *nakṣatra*-names of the months can be derived unambiguously and self-consistently from the *nakṣatras* in which the moon is full in a *yuga*. If the *nakṣatras* are assumed to be stars or asterisms then the *yogatārās* of the *nakṣatras* have to be precessed to 1400 BC for the spring, summer and autumn full moons to conjoin the *nakṣatras* prescribed for the performance of the *Cāturmāsya* sacrifices.

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Abbreviations

Ṛgveda Saṃhitā – RV
Maitrāyaṇīya Saṃhitā – MS
Vājasaneyī Saṃhitā – VS
Kauṣītakī Brāhmaṇa – KB
Śatapatha Brāhmaṇa – SB
Kātyāyana Śrauta Sūtra – KŚS
Āṣvalāyana Gṛhya Sūtra – ĀGS
Atharvaveda Saṃhitā – AV
Taittirīya Saṃhitā – TS
Aitareya Brāhmaṇa – AB
Pañcaviṃśa Brāhmaṇa – PB
Taittirīya Brāhmaṇa – TB
Lāṭyāyana Śrauta Sūtra – LŚS
Vedāṅga Jyotiṣa – VJ

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