A Note on The Five-Year Yuga of the Vedaṅga Jyotiṣa

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1 Introduction

Vedaṅga Jyotiṣa (VJ) is the general name by which one refers to the earliest codified texts of astronomy of ancient India, known as the Rṛgjyotiṣa (RJ), the Yājuṣajyotiṣa (YJ), and the Atharvajyotiṣa (AJ). The authorship of the first two is ascribed to Lagadha, whose disciple Śuci composed and preserved the knowledge codified by his celebrated teacher, while the author of the third is unknown. The RJ consists of 36 verses, the YJ of 44 verses and the AJ of 162 verses divided into 14 chapters. The RJ and the YJ recensions are both well known with some variations in readings and have about 30 verses in common. Several scholarly studies of the two recensions have been published, as also detailed comparative tables of the corresponding verses of both the recensions.

In this note we will concentrate only on the RJ, using the general term VJ also to mean only RJ, because, it is the oldest and is of immediate relevance to our purpose. The RJ preserves the Hindu traditional knowledge of astronomy essential for Vedic sacrifices in a codified form akin to the style of the sūtras, easy for memorization but sometimes difficult for understanding. It packs a wide range of astronomical topics in its 36 verses, some of which are quite obscure. It is more like a pocket reference and gives, among other things, the rules for the determination of proper times for the performance of Vedic rituals. In fact, Śuci declares in RJ (verse 2), that he is expounding on the science of time, involving the concept and measurement of time at different levels.

One of the distinguishing features of VJ is the use of a period of five years called yuga, which is different from the much larger period also called yuga, but which came into vogue much later in Indian astronomy in the Sādhánta period. The five-year yuga of VJ consists of 62 candramāsas (synodic months), 1830 days and 1860 tithis (1/30th part of a synodic month) and was taken to commence at the winter solstice. At the time of VJ, winter solstice occurred at the beginning of the first tithi of the śukla pākṣa of the month of Māgha. There are two adhimāsas (intercalary months) in a yuga. The sun and the moon are supposed to occupy the same position at the beginning of each subsequent yuga and all the happenings would be repeated in the subsequent yugas in the same way. The astronomical system of VJ was still being followed in India long after the time of Lagadha, although the winter solstice was placed in Śravaṇa at the time of Jain astronomy.


3In current parlance, one mahāyuga consisting of kṛta, tretā, dvāpara, and kali yugas lasts for 4,320,000 years.

VJ has often been criticized\textsuperscript{4} for using this \textit{yuga} period of five years as being “...extremely crude.” The accuracy of VJ is a much discussed affair and it has been argued\textsuperscript{5} that VJ suffered from two main defects. There are actually 1826.2819 days in a \textit{yuga} of five solar (sidereal) years, and not 1830, as stated in VJ. Therefore, the winter solstice would start four days earlier after each \textit{yuga}. Furthermore, there are 1830.8961 days in a period of 62 lunar months and not 1830. Hence, there would be a deficit of about one \textit{tithi} in a \textit{yuga} of five years. It appears as a mystery why the Indian astronomers continued to use such an absurd system for thousands of years. Is it possible that the ancient Indian astronomers were not aware of these “defects”? Some scholars have indeed assumed just this possibility and have leveled their criticism of VJ, and of Indian astronomy as a whole, on this basis. An extreme example of this type of criticism is found\textsuperscript{6} in the following: “... the acceptance of this cycle by Indians for a period of six or seven centuries or even more demonstrates among other things that they were not interested in performing the simplest acts of observational astronomy.”

This harsh criticism of ancient Indian astronomy in general, and VJ in particular, seems to be a case of uncritical application of current scientific ideas to a work so ancient that some parts of it are still obscure. One may also recall the statement of Whitney regarding VJ: “... and when we come to add that Jyotiṣa (i.e.,VJ) has no definable place in Sanskrit literature or relation to the Vedic ceremonial ... we shall see that this famous datum, which has seemed to promise so much, has caused so much labor and discussion, ... is nothing but a delusive phantom.” This is in spite of the fact that VJ itself declares that it is for the purposes of determining the proper times for the Vedic ritual \textit{yajñī}! One should try to understand VJ in its own contemporary context, i.e., in the context of the actions of the Vedic people, their motivation, and the conceptual background of their work.

The purpose of this note is to point out that the concept of the five-year \textit{yuga} period is much older than VJ itself and was not chosen by Lagadha\textsuperscript{7}. It is intimately connected with the Vedic ritual, \textit{yajñī}, and is but a reflection of a special significance associated with the number five in the Vedic ritual. There is evidence to suggest that the Indian astronomers were in fact aware of the so called “defects,” and took measures to “correct” them. Astronomical observations were routinely made and there existed a group of professional astronomers. Only the fact that VJ is deep rooted in the Vedic ritual of \textit{yajñī} and is an integral part of the same Vedic lore of five-fold manifestations can account for the continued use of VJ over thousands of years, its popularity declining only after the importance of the Vedic ritual \textit{yajñī} itself had declined.

\textsuperscript{7}Pingree in note 6 seems to think there was an Iranian influence on Lagadha.
**2 The Yuga Concept:**

The yuga period of five years, whose constituent years are called *samvatsara*, *parivatsara*, *idavatsara*, *anuvatsara*, and *idvatsara*, has been in use since Vedic times. For example, in *Rgveda* (RV 7.103.7–8) *samvatsara* and *parivatsara* are mentioned. The *Taittirīya-Saṃhitā* (TS 5.5.1–3), the *Vājasaneyi-Saṃhitā* (VS 27.45 and VS 30.16) and the *Taittirīya-Brāhmaṇa* (TB 3.4.11 and TB 3.10.4) give the names of all the five years, although, there is some variation in the names. The TS calls them *samvatsara*, *parivatsara*, *idavatsara*, *iduvatsara*, and *vatsara*, while the VS and the TB call them *samvatsara*, *parivatsara*, *idavatsara*, *idvatsara*, and *vatsara* respectively.

The length of the solar year was known to be a little more than 365 days, although the year was roughly taken to consist of 12 months of 30 days each (360 days = *sāvana* year). *Taittirīya-Saṃhitā* (TS 7.1.10) says that 5 days more are required over the *sāvana* year to complete the seasons and that 4 days are too short and 6 days are too long. The scheme of adding intercalary months is also of Vedic origin as is evident from *Rgveda* (RV 1.25.8). The two intercalary months in a *yuga* are called *amhaspati* and *saṃsarpa* (TS 1.4.14). It is clear, therefore, that the five-year *yuga* system and the scheme of two intercalary months are much older than RJ and must have been in practice for a long time before they were codified by Lagadha.

It is also evident that the five-year *yuga* system with the associated scheme of two *adhimāsas* continued to be in use in India for a very long time. It also occurs in later texts such as *Mahābhārata* (*pañcama-pañcama varṣe dvau māsāv upajāyate*; MBh 4-47), and *Kautūlya’s Arthāśāstra* (*pañca samvatsaram yugam iti*; ĀŚ 2.20.69.71). Garga-Saṃhitā, and *Paitāmahā-Siddhānta* all refer to the five-year *yuga* period of *VJ*. It has already been noted that the Jain astronomical text, *Sūryaprajñapti*, mentions it (*tā pañca samvaccharā; sūtra* 54). The Buddhist text *Śārdulakārnāvadāna* also refers to the use of the five-year *yuga* of *VJ*.

**3 The Five-year Yuga: Why?**

The answer to this question can be found in *VJ*, its Vedic sources, and in the close connection between *jyotiṣa* and *yajña*. The purpose of *VJ* is described in the verses:

> kālajñānam pravaksyāmi ... yajñārthakhilasiddhaye (RJ 2–3)

“I shall describe [systematically] the science of time for the purpose of determining the appropriate time for [different] *yajña*.”

*VJ* is not a mere civil calendar, but one whose purpose is a highly religious one, that of determining the proper times for Vedic rituals. The importance of the Vedic ritual itself is described in the following verse:

> vedā hi yajñārtham abhipravruttāḥ ... yo jyotisāṃ veda sa veda yajñān (RJ 36)

“The Vedas have indeed been revealed for the purpose of the performance of *yajñas*. [But the *yajñas* are to be performed in different segments of time as appropriate.] Therefore, only he who knows [the science of time, namely] *jyotiṣa*, understands fully the [performance of] *yajñas*. ”
Thus VJ not only specifies the role of *jyotisha* in the ritual *yajña*, but describes the interdependence of *jyotisha* and *yajña* also. It also points to a strong connection between the five-year *yuga* concept and the ritual *yajña*.

### 4 Every Thing is Five-fold

The ritual of *yajña* is central to the Vedas. The basic premise of *yajña* is to establish explicit equivalence between two different objects by means of ritual action. For example, in Agnicayana, a huge altar consisting of five layers is constructed in the general shape of a falcon, for, “he who is desirous of heaven may construct a falcon-shaped altar.” By ritual action, the equivalence of the following are established: falcon = altar, sacrifice = altar, and finally, sacrificer = altar. Therefore, sacrificer = falcon and hence the sacrificer can fly to heaven. However, if the falcon is not well made the bird will not fly. Altars are constructed according to strict geometrical principles as explained in *śulbasūtras*. There exists another set of equivalence principles related to astronomical concepts. For example, in Agnicayana, Prajāpati, the Lord of Creation, is identified with time, in fact, the year (*prajāpatir eva saṃvatsaraḥ*, JB II.393; and: *sa eṣa praśāmatī r eva saṃvatsaraḥ*, KB VI.15). Hence, it takes a year from the moment the *yajamāna* has generated *agni* in a special pot called *ukhā* (which he carries around with him), to the culmination in a twelve-day ritual at the end. The altar as well as the *yajña* is identified with Prajāpati. It is this identification of Prajāpati with time on the one hand and the ritual *yajña* on the other that holds the secret of the five-year *yuga* period. The very first verse of RJ invokes Prajāpati in the following terms:

> pañcasamānviṣatarmanyaṃ yugādyakṣaṃ praṇāpatiṇī dinavatvayanaṁśāgaṇaṃ praṇāmya śirasā śucih ... (RJ 1)

> “(I,) Śuci, salute with a bowed head, Prajāpati, who is the embodiment of the five-year period and who presides over the *yuga*, and who has for his limbs, time segments like the day, the seasons, the [northerly and the southerly] courses of the Sun, and the month...”

This characterization of Prajāpati by a five-fold embodiment in time, is also reflected in the five-layer structure of the altar which is also identified with him. In fact, the five brick layers of the altar in Agnicayana have the same names as the years in a five-year *yuga* period. A five-fold characterization is a preferred way of discussing items with reference to the ritual *yajña* (i.e., *adhiyajña*). There are five *yajñas*: *bhūtyajña*, *manusyayajña*, *pitṛyajña*, *devayajña*, and *brahmajayña*. The altars can also be five in number: *gārhatya*, *āhavaṇīya*, *dakṣaṇūgni*, *sabhya*, and *āvasatīhya*. There are five requisite materials for the *yajña*, which are described in *ŚB* (SB 1.1.1–8), and it is said there that the sacrificer gathers these five materials (“pañcasamaṃbhārāṃ saṃbhāratā”).

The five-fold nature goes beyond the ritual (referred to by *adhiyajña*) to the material world (referred to by *adhibhūta*) and also to the Self (referred to by *adhyātmā*). This is all described in TU beginning with the following declaration:

> athātāḥ saṃhitāyā upaniṣadaṃ vyākhyaśyāmāṇaḥ pañcasa adhikaraṇeṣu (TU 1.3.1)

> “Now we shall explain the *upaniṣad* of the *smāhitā* under five headings”
It is said in (TU 1.7.1):

prthivy antarikṣaṁ dyauṁ dīṣo 'vāntaradiśaḥ agnir vāyur ādityaś candramā nakṣatrāṇi āpa oṣadhayau vanaspataya ākāśā ātmā ity adhibhūtaṁ

“The earth, the sky (antarikṣa), the heaven, the main quarters and the intermediate quarters (which constitute the set of five worlds); fire, air, sun, moon and the stars (the set of five-devatās); water, plants, trees, ether and the ātman (the set of five living beings); thus with regard to the material existence.”

Described above are three sets of five members each as external and gross embodiment of the Supreme. This is followed in (TU 1.7.2) by:

athādyātmam prāṇaṁ vyānaṁ pāṇiṁ udānaṁ samānaṁ ca kṣuṇaṁ śrotāṁ mano vāk ṛvācaṁ māṃsāṁ svāvāstiḥ maṣjā

“Now, to the self; prāṇa, vyāna, apāna, udāna, and samāna (the set of five vital airs), eyes, ears, mind, speech, and touch (the set of five senses), skin, flesh, muscle, bone, and marrow (the set of five constituent elements of the body).”

This enumerates the three sets of five objects each, which are internal and subtle embodiment of the Supreme. Again, in (TU 1.7.3):

etad adhivyādyāḥ rśir avacat pāṅktaṁ vā idaṁ sarvaṁ pāṅktenaiva pāṅktaṁ sparṇoti

“After having analyzed all this the sage declared: all this is verily pāṅkta (five-fold); by the pāṅkta, indeed, does one secure the pāṅkta”

Thus the TU declares every thing as having a five-fold nature and later, goes on to describe the five kośas (sheaths) that cover the Self as the annamaya, prāṇamaya, manomaya, vijñānamaya, and ānandamaya kośas. This is also echoed in BU (BU 1.4.17):

sa esa pāṅkto yajñaṁ pāṅktaḥ paśavaḥ pāṅktaḥ puruṣaḥ pāṅktaṁ idaṁ sarvaṁ yad idaṁ kiśca

“so this yajña is five-fold, five-fold are the animals, five-fold is the person, five-fold is all this world, whatever there is.”

Thus śṛuti declares that there is a five-fold principle that pervades the entire universe and that the principle is manifest in the external and gross aspects as well as in the internal and subtle aspects.

5 Time Units in VJ

While the main attention so far has been focused on the five-year yuga period, there are other intervals of time, such as cāndramāsa, tithi, kalā, muhūrta, and kāsthā that are referred to in RJ. The relationships among these time units can also be found in RJ.
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124 kāsthās = 1 kalā
20 and 1/10 kalās = 1 muhūrta
30 muhūrtas = 1 ahorātra (day and night)
2 parvans = 1 cāndramāsa
2 months = 1 ṛtu
2 ayanas = 1 year.

It is interesting to note that the smallest unit of time, kāsthā, is given in terms of the duration of five akṣaras:

kāsthā paṇcāksaraḥ smṛtāḥ (RJ 18)

The same five-fold principle is operating both at the subtle (kāsthā) and at the gross (yuga) level of measurement of time and time itself may be regarded as “pāṅkta”. This idea is strengthened in view of the paṇkti-meter consisting of five pādas of eight syllables each. The śruti declares, “five-footed is the paṇkti-meter and yajña is a ‘pāṅkta.’” It may be noted in passing that according to Śatapatha-Brāhmaṇa (ŚB 10.4.2.23), the number of paṇktis in Rgveda is equal to 10800; this is equal to the number of muhūrtas in a year and also to the number of bricks in the altar. The five-year yuga is simply another manifestation of “pāṅktam idam sarvam.” and it is this strong dictum of the śruti that perpetuated the use of the five-year yuga period for such a long time.

6 “Accuracy” of VJ

It must have been known even in those early days that 62 synodic months take almost a day more than the 1830 days given in VJ, because at the end of one yuga, must have been observed to occur on the day next to the 1830th. Observation at the end of the next yuga would have clearly shown this (because of the cumulative error), the moon would have been well up in the sky at sunrise showing the day to be caturdaśī or even trayodaśi, so that amāvāsyā would occur one or two days later. The priests would never have failed to notice this, because, it was their duty to observe the last disappearance of the old moon and the first appearance of the new moon. This is connected with the “upavasatha” and referred to in the following verse:

caturdaśīm upavasahas tathābhave yathodito dinam upaiti candramāḥ māghaśuklāṁniko yunkte śraviṣṭhayāṃ ca vārṣikīṁ (RJ 34)

“That caturdaśī tithī on which the moon rises [almost] as the sun rises is the upavasatha. [Any characteristic of] the first day of the bright fortnight of the month of Māgha links [the nakṣatra of] the last day of the previous year [Śravana] with śraviṣṭha [i.e., it is common to both].”

The upavasatha day is the day of pīṇḍapitryajña, and the day previous to that is ādhāna or dīkṣā day and the next day is the īṣṭi day. Moon rising almost at sunrise indicates that the

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8This is based on the syllable count of 432000, given in the ŚB; but, the actual number of syllables in the canonical text is far less. A full discussion of this point, however, is beyond the scope of the present paper.
time is near new moon. By contrast, if the moon rises well before the sun rises, it is technically called *uddṛṣṭa*, and all excepting Vājasaneyīs and Baudhāyanas have to perform an expiatory rite, or *prāyaścitta*, to nullify the evil that will accrue and perform *punarādhāna*, if the *ādhāna* had already been done the previous day. This shows that the priests had to be very careful to avoid such a happening and they must have had rules formed from observations over a long time to fix the calendar. The fact that the Vedic priests did indeed make observations is evident from the statement in the verse RJ 24 regarding ascertaining calculations by observations (*ity upāya samuddeśah* ...). The fact that there were astronomers who made observations is attested to by the reference to *naksatradarśa*, an observer of stars, in VS (VS 30.10) and to *naksatravidyā*, the discipline of astronomy, in Chāndogya-Upaniṣad (CU 7.1.2; CU 7.7.1).

It has been suggested that a day could have been tacitly added to the *yuga* after its end (just as we add a day in the leap year) and not counted in the calculation. This would certainly avoid the most patent discrepancy. However, as 62 synodic months = 1830.8965 days, another type of error will accumulate and an intercalary month would have to be dropped after 6 yugas and another intercalary month after 7 yugas, and this has to be repeated. It may be noted that it is not necessary to know this rule to drop the intercalation. Mere observation of the moon in the śraviṣṭha region of the sky would have shown the need for an intercalation. 

7 Conclusions

We have clearly demonstrated that the five-year *yuga* cycle of VJ is much older than VJ and was not selected by Lagadha. It continued to be in use for a very long time after VJ, its popularity is due to the Vedic dictum of being *pāṅktta*. Vedic priests did make observations and must have formulated rules for overcoming, as far as possible, whatever calendrical shortcomings a five-year cycle might imply. This would have been necessary to avoid penalties in obeying the requirements of *upavasatha*. The Vedic dictum of *pāṅktta* would thus explain the enigma of the five-year *yuga* which has puzzled the scholars of VJ for over a century. When viewed in the light of “*pāṅktta*” dictum, the criticism of Pingree would not appear to be valid.

List of Abbreviations

AJ Atharva-Jyotiṣa
AS Arthaśāstra of Kauṭilya
BU Bṛhadāraṇyaka-Upaniṣad
JB Jaiminīya-Brāhmaṇa
KB Kauṣitaki-Brāhmaṇa
MB Mahābhārata

9Sastry, T. S. K. 1985; in fact, Muslims do so even today by observing the crescent moon.
RJ Ṛgīyotiṣa
RV Ṛgveda
TB Taittirīya-Brāhmaṇa
TS Taittirīya-Saṃhitā
TU Taittirīya-Upaniṣad
VJ Vedāṅga-Jyotiṣa, here also used for RJ
VS Vājasaneyi-Saṃhitā
YJ Yājuṣajyotiṣa
ŚB Śatapatha-Brāhmaṇa