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From Vedic Science to Vedanta

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Introduction

Vedānta has often been studied without relating it to the Vedic system of knowledge. The reason behind this situation is the fashionable but wrong view that Vedic thought is "pre-scientific" and at best it represents "archaic modes of thought". But recent scholarship has shown that astronomy was one of the bases of the design of Vedic fire altars and an astronomical code has been discovered in the organization of the Ṛgveda. It is now being accepted that the Vedic people knew considerable astronomy that included the knowledge of planet periods. Knowledge of astronomy and the concomitant sciences provides the backdrop in which the development of the science of "self" can be understood. The Vedic system of knowledge is based on equivalences (bandhu-) between the cosmic, the terrestrial, and the physiological. This recursive system of knowledge was represented in terms of altar designs at one level and by the richly symbolic language of the Vedas, where there is a constant allusion to the equivalences, at another level.

Vedic Science And Its Context

If we do not wish to project our own meanings on to the Vedic texts we must use the internal evidence from the texts to validate our interpretations. This is why we will first present a brief review of the Vedic system as known to us from the texts.

The Vedāṅgas, the auxiliary sciences of the Veda, consist of phonetics, ritual, grammar, etymology, meters, and astronomy. But at the same time there are extensive references to a variety of occupations that include ship work, medicine, agriculture, metal working, weaving, animal husbandry, amongst others that would have been based on systematic study or, in other words, the use of corresponding sciences. There is frequent mention of bhiṣaj, physician, in the Ṛgveda. Atharvaveda 10.2 describes the anatomy of the human body in detail and with good accuracy. Clearly the Vedāṅgas do not exhaust the sciences of the Vedic times. Certainly sciences related to the human body, plants, metals, animals existed. Why were not these sciences listed amongst the Vedāṅgas? Because the Veda and its auxiliary sciences deal primarily with the overarching science of the equivalences between the astronomical, terrestrial, and the psychological. Some of the equivalences were by number while some others were only analogies. One can see a plausible basis behind the equivalences. Research has shown that all life comes with its inner clocks. Living organisms have rhythms that are matched to the periods of the sun or the moon. For example, the potato has a variation in its metabolic processes that is matched to the sidereal day, the 23-hour 56-minute period of rotation of the earth relative to the fixed stars. The cicadas come in many species, including ones that appear yearly in mid-summer. The best known amongst the others are those that have 13-year and 17-year periods. There are quite precise biological clocks of 24 hours (according to the day), 24 hours and 50 minutes (according to the lunar day since the moon rises roughly 50 minutes later every day) or its half representing the tides, 29.5 days (the period from one new moon to the next), and the year. Monthly rhythms,

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averaging 29.5 days, are reflected in the reproductive cycles of many marine plants and those of animals. It has been claimed that there are others that correspond to the periods of the planets. There are other biological periodicities of longer durations. In humans the menstrual period has by tradition been taken to correspond to the moon's motion; in fact "menses" means lunar month. New research supports this:[1]

> In a study of a number of women with variable onset of menstrual periods, artificial illumination of the bedroom through the 14th to 17th nights following the onset of menstruation resulted in the regularization of the period, with the period length coming very close to 29.5 days, the natural synodic month. That this period is a biologically significant one for the human species is further suggested by the fact that the average duration of pregnancy (from ovulation to birth) in the human is rather precisely nine 29.53 synodic months.

From the perspective of the ancient Indians, with their emphasis on time-bound rituals and the calendar, it is easy to see that many of the biological periods would have been discovered by them. This would include the menstrual cycle and its connection with the motions of the moon, the life cycles of various plants, and the semi-monthly estrus cycle of sheep, the three-week cycles of cattle and pigs, and the six-month cycle of dogs. It is quite clear that the ancient calendar with its intercalary month every third year was a direct result of the lunar cycles, but it is also possible that further developments in the calendar were inspired by biological rhythms of the kind seen in the deep-sea lily near Japan:[2]

> This echinoderm liberates its sex cells once every year in October at about 3 PM on the day of one of the Moon's quarters. In succeeding years the time of sex cell release changes, among the Moon's two quarters, first-third-first, to progressively slightly earlier dates in October. The triplets are repeated until about the first of the month whereupon the following year it jumps abruptly to near the end of the month to start the advancing triplet progression again. The result is an 18-year cycle, which is essentially the period of regression of the Moon's orbital plane.

Having seen rhythms matched closely to the principal astronomical periods, it must have been further assumed that there were less obvious cycles that were matched to the motions of the other heavenly bodies. Such equivalences are not to be seen as being caused directly by particular heavenly bodies, but rather as a manifestation of the motions of the body's "inner planets". In the language of evolution theory one would argue that these periods get reflected in the genetic inheritance of the biological system as a result of the advantage over millions of years that they must have provided for survival. One can imagine that just as the Vedic calendar represents the attempt to harmonize the motions of the sun and the moon, yoga would have been the corresponding harmonization of the motions of the "inner planets" of the body. This explains the importance that was given to astrology. The gestation periods for mammals must have provided the basis for singling out certain animals as special symbols. Some of these periods are:

ass	365 days
sacred baboon	183 days
cat	63 days
cow	280 days
dog	61 days
elephant	645 days
goat	151 days
horse	337 days
human	267 days
rabbit	31 days
sheep	148 days

It is no wonder then that the ass is used as a symbol for the year in the Śatapatha Brāhmaṇa. Likewise the horse with its average gestation period only one day off from the nakṣatra year of 336 days (for 28 nakṣatras) is a natural symbol for the year in

the context of the nakṣatras and this we do find in the texts. Likewise the fact that the gestation period for the sacred baboon is exactly half of the solar year is likely to have played a role in the special significance attached to it by the Egyptians. The fact that the gestation periods for the human and the cow are quite close may be another reason for the sacredness assigned to the cow. In other words, knowledge of biological periods appears to have played a role in the choice of some as sacred symbols. The Vedas speak of the equivalences and so presuppose a knowledge of the analytical and the empirical sciences, but their own focus is on a synthesis and the unity.

Astronomy Of The Fire Altars

We now turn to a survey of the astronomical basis to the fire ritual. The details may be found in my book *The Astronomical Code of the Ṛgveda*.[3]

A fire altar, generally made of bricks, is called an agni. Agni is the Vedic god; it also represents time and in sacrifices it represents the year. Agnicayana, or the building of a fire altar, is the symbolic creation of Agni-Prajāpati-Puruṣa.

There are several references to fire altars in the Ṛgveda. RV 1.164.35, 1.170.4, 5.31.12, 7.35.7, 8.19.18 and 10.61.2 are some of the places where the vedi is mentioned. Three places of Agni, which are doubtless gārhapatya, āhavanīya, and dakṣiṇāgni, are mentioned in RV 5.11.2. Taittirīya Saṃhitā 5.2.3 speaks of the gārhapatya being made of 21 bricks. It is also stated that if made for the first time it should be in five layers, for the second time in three layers, and for the third time it should be in one layer.

The books speak of altars of various shapes that provide different benefits. But these objectives are merely etymological or symbolic associations with the shapes chosen. Beneath the superficial associations the logic of the altars was representation of knowledge. This was not only in terms of the intricate geometric constructions that were a part of the ritual of the altars, but also in the oft-repeated claim that only self-knowledge sets one free.

Agnicayana is one of the Soma sacrifices. The altar is generally made in the shape of the falcon, śyena or suparṇa. This construction is in five layers. Altars are made of bricks unless they are constructed symbolically of mantras. Bricks to be used in altar construction are classified into two types: ordinary, lokampṛṇā, and special, yajuṣmatī. Each yajuṣmatī brick is consecrated in a specific manner and each such brick is marked in a unique way. Bricks are built in different shapes to different measurements.

ŚB 10.4.3.14-20 describes the total number of yajuṣmatī bricks to be 396. This was to be taken as 360 days of the year and 36 additional (including one being the fillings between the bricks) as the days of the intercalary month. By layers, the first has 98, the second has 41, the third has 71, the fourth has 47, and the fifth has 138 (ŚB 10.4.3.14-18). The sum of the bricks in the fourth and the fifth layers refer to the 186 (together with the one space filling) tithis in the half-year. The number of bricks in the third and the fourth layers equals the integer nearest to one third the number of days in the lunar year. The number of bricks in the third layer equals the integer nearest to one fifth of the number of days in the lunar year. The number of bricks in the second and the third layers equals one third the number of days in a nakṣatra year of 28 x 12 = 336 days. Once the basic number of 21 is subtracted from the number of bricks in the first layer, the sum of the remainder together with the bricks in the second layer are once again the integer nearest one third the number of days in the lunar year.

The total lumber of lokampṛṇā bricks is 10,800 which equals the number of muhūrtas in a year (1 day = 30 muhūrtas), or equivalently the number of days in 30 years. Of these 21 go into the gārhapatya, 78 into the eight dhiṣṇya hearths, and the rest go into the āhavanīya altar.

The fire altars are surrounded by 360 enclosing stones (pariśrita), of these 21 are around the gārhapatya, 78 around the dhiṣṇya, and 261 around the āhavanīya (ŚB 10.4.3.13). The āhavanīya includes the dhiṣṇya, therefore the number of days assigned exclusively to the āhavanīya is 261 - 78 = 183 days, which is equal to the days in the uttarāyaṇa of a 366-day year. The choice of the 21 days for the gārhapatya is from the unique symbolism of this number. It is also the sum of the first six integers. Once the numbers 21 and 183 are chosen the number 78 becomes the only choice for the dhiṣṇya. This number 78 is the sum of the first twelve integers.

ŚB 10.3.1 describes how the altar can also be constructed symbolically by the meters. The altar is made with gāyatrī (24 syllables) as the breath, uṣṇiḥ (28 syllables) as the eye, anuṣṭubh (32 syllables) as the voice, bṛhatī (36 syllables) as the mind, paṅkti (40 syllables) as the ear, triṣṭubh (44 syllables) as the generative breath, and the jagatī (48 syllables) as the downward breathing. Kāṭhaka Saṃhitā Brāhmaṇa speaks of the gāyatrī altar being up to the level of the knees, the triṣṭubh one up to the level of the navel and the jagatī upto the level of man's height. Clearly there were correspondences acknowledged between the altars of meters and that of bricks.

In summary, then, there is considerable direct evidence from archaeology, altar designs, and texts that speaks of a tradition of careful observation of nature. These observations are perfectly in accord with the central emphasis placed on ṛtā, order, in the Vedas.

A Science of the Universe and its Cognition

What is remarkable about Vedic science is that it went beyond an examination of the outer reality and studied the cognitive process and consciousness. We see this in the early emphasis on *parā* or the knowledge of the self. Clearly, it was believed that complementing the task of understanding the detailed order in nature, was the task of unifying this knowledge. However this unifying principle could not be described as any formula and so symbols and metaphors, *pratīka*, were used instead. This principle was named *Brahman*.

Chandogya U. speaks of prāṇa, manas, āditya, ākāśa and so on as symbols of Brahman. Kauṣītaki U. 3 says that Brahman is to be sought in consciousness prajñā and presents the equation: prāṇa = prajñā. Ch. U. 4.10.5 presents prāṇa = kaṃ (ānanda) = khaṃ (ākāśa). Bṛhadāraṇyaka U. 2.3 presents two forms of Brahman: one material and the other immaterial. In the outer world, the sky and the (cosmic) wind are immaterial whereas in the body prāṇa and the ether are immaterial. The essence of what is immaterial in the space is the puruṣa in the sun whereas what is immaterial in the body is the puruṣa in the right eye. Brahman is defined as *neti neti*, not this nor that, and as *satyasya satyam*, the essence of existence.

Elsewhere Brahman is defined as bliss and knowledge, as satyaṃ, prajñā, and ānanda or as saccidānanda (sat, cit, ānanda), existence, consciousness, and bliss. Brahman is also defined in terms of opposites such as sat and asat, existence and non-existence and so on, or in negatives as being timeless, spaceless, and independent of causality. In other words, the principle of Brahman is used to denote an essential unity of things.

Since the physical universe is apprehended by consciousness the latter is rooted in unity. Muṇḍaka U. 1.1.3 says that ātman "is that with the knowledge of which the entire universe becomes known". Further on Brahman is defined as being beyond all descriptions, as "that which cannot be seen, nor seized, which has no family and no class, no eyes no ears, no hands no feet, the eternal, the omnipresent and imperishable". This provides justification for the slogan: "ahaṃ brahma asmi" (Bṛ. U. 1.4.10).

Tantra in Vedic Texts

Tantra represents a theory of the structure of

consciousness. We encounter details of such theories only in the literature from the medieval times. These medieval texts do speak of a continuity with early traditions and we do find evidence for the existence of tantra in the Vedic books if the earliest interpretations of the Brāhmaṇas and of Yāska[4] are used.

The theory of the bandhu- or equivalences implies that the structure of consciousness has parallels with the outer reality. It appears certain that Vedic tantra used planets, the sun, and the moon as internal categories to describe the nature of the mind. But the task of interpreting the Vedic texts from this point of view has just begun.

Below is a quick summary of the tantric or yogic concepts that we come across in early Vedic texts.

Ṛgveda places great emphasis on *Vāc* the Word. Thus Book 10 hymn 71 is dedicated to Bṛhaspati, the lord of the sacred mantra, where the knowledge of the origin and secrets of Vāc is described. What is significant here is the comparison with Bṛhaspati who likewise guides the planets and the sun and the moon on their divine courses. In hymn 10.125 Vāc is glorified as the supreme power that supports Varuṇa and Mitra, bears Indra and Agni, and pervades heaven and earth. Elsewhere "the gods created Vāc, whom all kinds of animals speak" (8.100.11); "Brahman expanded as large as the Word" (10.114.8). Aitareya Brāhmaṇa 4.21.1 proclaims: *brahma vai vāk*, Brahman is the Word.

Atharvaveda 4.1.5 divinizes Vāc as Bṛhaspati; in 19.9.3 Vāc is called "most exalted goddess, sharpened by brahman". A full account of these Vedic references may be found in the book *Vāc* by Andre Padoux.[5]

Chāndogya U. 2.23 says:

> Prajāpati brooded over the worlds. From the worlds issued forth the three-fold knowledge. Brooding on it arose the syllables: *bhūr, bhuvaḥ, svar*. He brooded over them; therefrom arose the name *oṃ, (oṃkāra)*. As leaves are held together by the stalk, so all the words merge into *oṃkara*. The sound *oṃ* is the whole universe.

Ch. U. 2.22 says that the inner nature of the vowels (svara) is Indra, that of sibilants (ūsman) is Prajāpati, and that of the consonants (sparśa) is Mṛtyu.

Taittirīya U. 1.8 says that "oṃ is brahman". Māṇḍūkya U. begins by saying: "Hari is oṃ. This syllable is this whole. The past, the present, the future – everything is just the phoneme oṃ."

Maitrāyaṇa U. speaks of a six-limbed *ṣaḍāṅga* yoga. In 6.18 these are called prāṇāyāma, pratyāhāra, dhyāna, dhāraṇā, tarka, and samādhī. In 6.21 is explained how suṣumṇā, going upward from the heart to the Brahmarandhra, serving as the passage of the prāṇa, is divided at the palate. Śaunaka's Ṛgvidhāna describes tapas and yoga.[6]

Thus in Upaniṣadic times, not only was an equivalence of the universe and the body, in its structural forms, proclaimed but that the details of the structural equivalence were also described.

A Recursive System of Knowledge

Once one sees that the Vedic knowledge was defined in a recursive fashion, it becomes easy to see Vedānta, tantra and yoga, as well as Vedic ritual as different aspects of this system. In this system the equivalences were sometimes defined only by number, as in the equivalences of 360 days of the civil year to the 360 bones of the body. The equivalences between the 72,000 nāḍīs in the human body and one third the number of muhūrtas in twenty years, or that of 21 organs in the middle body and the number signifying the earth are of a similar nature. At other times the equivalences were more metaphorical. The eyes are the sun and the moon, likewise one can speak of the planets (graha) inside the body; nevertheless, here a numerical connection in terms of planet periods and body processes might have been meant.

This recursion worked for other concepts as well. Thus agnihotra was replaced by prāṇa-agnihotra. The fires of the altar have the parallel in the fires inside the body. A sacrifice, yajña, is a recursive system: any given level is based on a transcendence of the lower level. This is to be seen not only in life but also within the mind, which was viewed as a hierarchical system with systems of the gross body, prāṇa, manas, vijñāna, and ānanda.

In analysis a dynamic balance between three fundamental categories was postulated. Śvetāśvatara U. 4.5 speaks of a balance between red, white, and black made conscious by puruṣa; this is repeated in the rajas, sattva, and tamas of prakṛti in Sāṅkhya. Clearly, the regions of atmosphere, sky, and earth correspond to these three. In Vedic society also there is mention of an original single class that divided into the three brāhmaṇa, rājanya, and vaiśya. The altars are made in five layers to represent the three regions and the two intermediate spaces where atmosphere and earth and also atmosphere and sky meet. Parallelling this later a fourth class of śūdra was added to the societal classes to represent the new "foundation" against which the other classes were defined; the fifth class of "sages", who transcended class categories, was described only indirectly. The texts themselves do not speak with this directness about the parallels but these are easy enough to infer.

Bṛ. U. 1.2.2 speaks of three primary constituents. Later like the expansion of the altar from three to five layers, we come across five primary elements, pancabhūtas, earth, water, fire, air, and ether. The three doṣas or dhātus (humours) vāta, pitta, and kapha in the human body likewise define a basic tripartite model. But each of these dhātus is taken to have five types.

Concluding Remarks

Owing to a variety of reasons Vedic studies in the academy have not been subjected to the same scrutiny that other fields of scholarship face routinely. Considerations such as an overarching framework of biblical chronology, speculative theories about movements of pre-historic peoples, and a Eurocentric view of the rise of science led to a hasty dismissal of traditional interpretations with long-standing textual support. For example, Śatapatha Brāhmaṇa and the Śulba Sūtras state that the syllable count of the Vedic texts has an astronomical basis, but until recently no one thought it worthwhile to examine this issue.

The resistance to new ideas, which in many cases are the old explanations, is not surprising since shifts in understanding are met by similar response in other disciplines as well. Relativity and quantum theories were not accepted by many of the older scientists of their times. The decipherments of the Egyptian hieroglyphs and in our times that of the Mayan writing have been challenged by the establishment.

The Vedic system is based on the theory of the equivalence between the ādhidaivika, the ādhibhautika, and the ādhyātmika. These equivalences were represented in terms of the designs of the Vedic altars. This is the reason the Vedic gods could represent either the stars and the planets as well as the psycho-physiological centres within the body, or even the bricks in the altar. The correct interpretation can only be obtained from the context. As description of the psycho-physiological structure, Vedic knowledge could be of relevance to the emerging science of consciousness. New theories propose that consciousness is characterized by 40 cycles per second oscillations inside the brain. But oscillations in themselves do not explain how consciousness arises and even if this theory is correct, the oscillations may just be a result rather than the cause. Oscillations are in later tantras represented as śakti or as spanda. The Vedic view of consciousness goes beyond the notion of spanda and it represents a unity. This is why Vedic ideas find rich resonance in quantum theory which is also a theory of wholes.[7]

It is this rational basis that provides the explanation for the strength of the Vedic tradition. Viewed in this perspective, it becomes clear that the division of society into three or four social classes is not a fundamental basis of the system, but rather an attempt to see a system in symmetry with corresponding categories in the outer and the inner worlds. The *Puruṣasūkta* hymn (RV 10.90) of the Ṛgveda that describes the four varṇas created from different parts of the body of puruṣa, the primeval man, can also be interpreted as one where each person has aspects of all the four varṇas within him since the puruṣa resides within each person. On the other hand, in Mahābhārata, the fifth Veda, it is clearly stated[8] that a person's nature alone defines his varṇa. These and other conflicting accounts show that social categories were not the basis on which the Vedic system of the knowledge was constructed.

Notes

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8. Mahābhārata, Vana Parva, the dialogue between Yudhiṣṭhira and Yakṣa.