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Archaeo-astronomy and Ancient Indian Chronology

R.N.Iyengar

Centre for Ancient History and Culture

Jain University, Bangalore

(RN.Iyengar@jainuniversity.ac.in)

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Abstract

Investigation of the astronomical content of ancient Vedic texts along with historically constrained texts of the first and second millennium CE shows that the sky pictures of the most ancient period get contrasted with later ones due to the phenomenon of precession of earth's rotational axis. Most important among such observations is the fixed Pole Star, named Abhaya-Dhruva at the tail end of the constellation known as *Śiśumāra* (whale or dolphin) described in the *Taittirīya Āraṇyaka* (II.19) of the Kṛṣṇa-yajurveda branch. With passage of time, in the *Maitrāyaṇīya Āraṇyaka*, a question arises, why even Dhruva moves. The *Brahmāṇḍa Purāṇa* declares that star Dhruva rotates in the same position, like the nave of a potter's wheel. This and a few other Purāṇas extol Dhruva as the fourteenth star on the tail of the constellation *Śiśumāra*, as in the Vedic text.

Al-Biruni (973–1048 CE) mentions that devout Hindus, during his time, believed their Pole Star to be in the constellation that looks like an aquatic animal called, *Śiśumāra*. He further says that this word sounds similar to the Persian *Susumar*, which he equates with the Great Lizard, same as the modern constellation Draco. However Brahmagupta and other astronomers used the word *dhruva* for the pole point of the celestial sphere and named a star group as *Dhruva-matsya* (Polar Fish) with no fixed star at the Pole. Perhaps this situation made Al-Biruni to criticize the Purāṇa for highlighting number fourteen in locating Dhruva, without understanding which star the Purāṇa meant. Modern astronomy tells us that star Thuban (α -Draconis) was the star closest to the North Pole and hence looking fixed, for earth viewers, during 3200-2400 BC. This star was known to the Vedic people as Dhruva (the Fixed), residing at the tail of the *Śiśumāra* constellation. This changed over centuries due to precession with no fixed (*dhruva*) Pole Star during the intervening period, till the present Pole Star (α -U.Minor, Polaris) started creeping to the pole position from around 1000 CE. Dhruva as the North Star getting identified in the mouth of the Polar Fish was observationally correct for *siddhāntic* astronomers. In fact Kamalākara Bhaṭṭa in 1658 CE declared that Polaris should be the *Dhruva-tārā* to be shown in Hindu marriages. But the Vedic schools of Śankara, Rāmānuja and Sāyaṇa held that the Vedic Dhruva should be recognized at the tail end of the *Śiśumāra* with Viṣṇu residing at its heart. Iconic representation of Viṣṇu as *Śiśumāra* with *Dhruva* depicted on the uplifted tail is popular among the followers of the Madhwa School in South India (Fig.1). Observation and celebration of two

distinct Pole Stars spanning four millennia is a unique chronology marker for mapping Indian cultural history.

Introduction

Alberuni (973-1048 CE) in his book on India mentions that devout Hindus held that the North Pole Star was in the constellation that looks like a four-footed aquatic animal called, *Śākvarā* and also as *Śiśumāra*¹. He further says that this name sounds similar to the Persian *Susumar*, which is the constellation of the Lizard, same as the modern Draco. He further adds that “the Hindus tell ludicrous tales about this figure.” By this, he alludes to the Purāṇas that praise people with correct knowledge of the 14 stars making up the constellation to be blessed with an extra 14 years of life. Alberuni, as is well known, was interested in the philosophical and intellectual traditions of India. He translated into Arabic, apart from astronomical texts, the *Yogasūtra* of Patañjali. While explaining the aphorism *dhruve tadgati jñānam* (YS 3.29) Alberuni again discusses the constellation *Śiśumāra* and *Dhruva* the Pole Star, as per the ancient Hindu tradition prevalent during his time². Alberuni had admiration for Indian astronomers for their scientific approach to the subject. But, none of the *siddhānta* texts of the period described any constellation by the name *Śiśumāra*. Curiously enough, they were more interested in establishing the first visibility conditions for the southern star *Agastya* (Canopus). This should not be surprising, since there was no visible star at the North Celestial Pole (NCP) during the first millennium of the Common Era (CE) which was the prime period of mathematical astronomy in India. This situation perhaps prompted Alberuni not to take the Purāṇas seriously as having preserved ancient observations of the Vedic period, in the form of legends and cultural beliefs. However, common people carried in their collective memory the story of the child prince Dhruva, literally *one-who-is-fixed*, as the Pole Star. Furthermore, the Purāṇas had already built up a cosmological model of Meru (as a pole or axis) connecting Earth and Dhruva. The orthodox Vedic tradition of the *vedāntins*, cultivated in parallel also held that Dhruva the Pole Star was located in the constellation *Śiśumāra*. From modern astronomy it is known that such a situation was possible in the remote past *c* 3000 BCE, when α -Draconis (Thuban) was the Pole star. Recognition of this fact has far reaching consequences for understanding the history of ancient India and of Hindu astronomy going back to Vedic times.

Taittirīya Āraṇyaka

The word *dhruva* occurs in many places starting from the Ṛgveda. The accepted meaning of this word is *fixed, true, stationary, unchanging* with shades of meaning very similar to these. For example in the Ṛgveda hymns (I.73, IV.5, VI.52, VII.88, X.173) the word is used as an adjective to indicate the *firmness* of objects such as the earth, the mountain, and the sky. In the 10th book the hymn (X.173) extols Varuṇa the King, as being true and steadfast. From the context of the hymn, this appears to be a prayer to a universal force, with the sky and most likely a star in the background. In the Yajurveda and the Atharvaveda, eight and sometimes ten directions are named. In this nomenclature invariably *udīci* stands for north, *ūrdhva* for *above* and *dhruvā dik* refers to the lower direction in the sense of *fixed* earth. However, in the *Taittirīya Āraṇyaka*

¹Sachau E.C. *Alberuni's India: An Account of India About A.D.1030.* (Vols. I & II) London. 1910.

²Pines S. and Gelblum T. Alberuni's Arabic Version of Patanjali's Yogasutra: A Translation of the third chapter and comparison with Related Texts. *Bull. School of Oriental and African Studies, Univ. of London*, 2, pp.258-304, 1983.

(TA) a change in this notation is seen. The phrase *adharāyai diśe* (TA II.20.1) instead of the more common *dhruvāyai diśe*, is used to denote the lower direction.

TA is an accented Vedic text, belonging to the Kṛṣṇa-Yajurveda branch. This text contains several interesting astronomical information that should be of interest to historians of science. The first *praśna* (section) of the text is about the six seasons and how they are recognized taking note of social behavior and some natural changes. Time is explained as flowing out of Sun and that *Time* flows like a river continuously (TA I.2). The text declares, the knowledge of Sun's station to be available to everyone using the four tools; memory, direct observation, history and inference³. Two meteoritic showers spaced at six months interval find place in (TA I.3; I.4) as help in recognizing the two felt seasons *grīṣma* (summer) and the *hemanta* (dewy).

The concept of *mahāmeru* the imaginary mountain-like axis connecting earth with the heavens appears for the first time in Vedic literature in TA. The text alludes to seven suns and one more, the eighth called Kaśyapa, who does not leave *meru* but goes round the *mahāmeru*⁴. This concept of a celestial body going round *meru* (circum-polarity) evolved into a physical cosmological model in the *Brahmāṇḍa Purāṇa*. Equally interesting is the mention that *the Seven Sages and Agastya are living with the stars*⁵. This tradition of naming stars, we may presume, must have started after the earthly sojourn of the eponymous human *ṛṣi*. Hence, it would be of interest to identify such stars by their modern names. Through unbroken tradition, and copious textual citations, *Agastya* can be equated with Canopus. But the same cannot be done with the other seven stars, since the names of the sages are not mentioned in TA except for Atri. The commentators of TA have taken the *Seven Sages* and *Agastya* to be the originators of the *gotra* system, as mentioned in the later *Sūtra* literature⁶. Hence it is not necessary to identify the *Seven Sages* alluded to in TA only with the stars of U. Major. The *Saptarṣi-maṇḍala* is unequivocally identified with U. Major, but the tradition of *ṛṣi*-names of the stars has changed over time⁷. The name of sage *Atri* once again appears in TA as a star in the description of the celestial *Śiśumāra*, a constellation in the form of an aquatic animal (whale or dolphin), with a star named *Abhaya* at its tail end, which over time acquired the legendary name *Dhruva*, due to its property of being fixed in position as seen from earth.

The Celestial Śiśumāra

The second *prapāṭhaka* of TA known also as the *Svādhyāya Brāhmaṇa*, gives the hymns used in the daily prayers of those initiated into Vedic rites. The nineteenth hymn of this book known as the *Brahmopasthānamantra* is used at the conclusion of the evening meditation. The astronomical part of the text followed by a translation closely following Sāyaṇa is:

....*dharmo mūrdhānam brahmottarāhanuḥ yajño'dharā viṣṇurhṛdayam samvathsaraḥ prajananam aśvinau pūrvapādāvatrirmadhyam mitrāvaruṇavaparapadau agniḥ pucchasya prathamam kāṇḍam tata indrastath prajāpatirabhayam caturtham iti| sa vā eṣa divyaśśākvaraśśiśumāraḥ...* |*dhruvastvamasi*

³ *smṛtiḥ pratyakṣam aitihyam anumānaścatuṣṭayam| etairādityamaṇḍalam sarvaireva vidhāsyate||* TA (I.2.1)

⁴ *kaśyapo 'ṣṭamaḥ sa mahāmerum na jahāti|.....na hi śekumiva mahāmerum gantum iti| apaśyam aham etat sūryamaṇḍalam parivartamānam | gārgyaḥ prāṇatrātaḥ |gacchanta mahāmerum||* TA (I.7.1-3)

⁵ *ṛṣayassaptātriśca yat| sarve' trayo agastyaśca| nakṣatraiśśamkrto 'vasan||*

⁶ *viśvāmitro jamadagnirbhāradvājo 'tha gautamaḥ|atrirvasiṣṭaḥ kaśyapa ityete saptarṣayaḥ | saptānām ṛṣiṇām agastyāṣṭamānām yadapatyam tadgotramityācakaṣate||* (Āśvalāyana Śrauta Sūtra Pariśiṣṭa)

⁷ Mitchiner J.E., *Traditions of the Seven Ṛṣis*, MLBD N.Delhi, 2000.

dhruvasya kṣitamasi tvam bhūtānāmadhipatirasi tvam bhūtānām śreṣṭho'si tvām bhūtānyupaparyāvartante namaste namaḥ.....śiśukumārāya namaḥ|| (TA. II.19.1)

....Dharma is the forehead, Brahma is the upper jaw, Yajña is the lower jaw, Viṣṇu is the heart, Samvatsara is the genital, Aśvins are the forelegs, Atri is the center, Mitra and Varuṇa are the hind legs. Agni is the first stem of the tail, then Indra, then Prajāpati and then **Abhayam** is the fourth. This is the shining celestial **Śiśumāra**.....You are fixed (dhruva), you are the place of **Dhruva**.....You are the Lord of Beings; you are the best among them. (All) Beings go around you. Namaste!..... salutations to you the boy-child.

The commentary of Sāyaṇa mentions that this hymn is to be used in the evening, turning towards the north and looking at the *dhruva-maṇḍala*, for meditating on the Cosmic Brahman⁸.

The above hymn lists fourteen stars, *Dharma, Brahma, Yajña, Viṣṇu, Samvatsara, (Twin) Aśvins, Atri, Mitra, Varuṇa, Agni, Indra, Prajāpati, Abhaya*, along the body of the figure of the *Śiśumāra* unequivocally said to be in the sky. Both Bhatta-bhāskara (10th Cent.) and Sāyaṇa (14th Cent.) describe the esoteric import of the hymn, along with the parts and form of the animal figure in the sky. The former commentator takes *Prajāpati* to be *Kaśyapa* the eighth sun, mentioned previously in TA as not leaving the *meru*⁹. This hints at the circumpolar nature of at least some of the stars of this constellation, which finds prominent mention in the later Purāṇas. The hymn is more about the constellation figure as a group of stars, but the equivalence of *Abhaya* with the Pole Star later known as *Dhruva* is evident from the context. The text of TA is among the special texts to be learnt in the seclusion of a forest, as it contains secret mystical and naturalistic meanings at the same time. The play on the word *Śiśumāra* finally concluded as *śiśukumāra* (boy-child) should have been the inspiration for the Viṣṇu Purāṇa legend of the fear less child Dhruva, placed in the sky as the Pole Star near Viṣṇu, who is the regent deity at the heart of the *Śiśumāra*.

In the accented text *Ekāgni-kāṇḍa*, also belonging to the *Kṛṣṇa-yajurveda*, hymns to be used in Vedic marriage rites are given. The hymn for observing and addressing the Pole Star Dhruva is;

dhruvakṣitiḥ dhruvayoniḥ dhruvamasi dhruvatasthitam | tvam nakṣatrāṇām methyasi sa mām pāhi prtanyataḥ || (*Ekāgnikāṇḍa* I.9)

Here the quality of *Dhruva* as a star is said to be fixed. *Dhruva* is praised as the *methī* or the fixed column to which the *nakṣatras* are bound. The commentator Haradatta explains the word *methī* as *khalevālī*, a thick wooden peg fixed in the ground, to which animals are tied so that they do not stray away¹⁰. This *methī* became the *medhī* a pole or column in the Purāṇas, highlighting the fixity of the star *Dhruva* and the importance of *Meru* in the development of early astronomical models. As we go back in time naturally uncertainties increase, but beyond reasonable doubt the composers of the above Yajurveda texts knew *Abhaya* alias *Dhruva* as the

⁸ *anena manreṇa udamukho bhūtvā dhruvamaṇḍalam paśyan śiśumararūpeṇa tamupatiṣṭhet ||* (Sāyaṇa's Commentary on TA Edited by H.N.Apte, Anandashrama Press, Pune, 1898).

⁹ *Taittirīya Āraṇyaka with the Commentary of Bhaṭṭabhāskara Miśra* (Edited by A.M.Shastri and K.Rangacharya. Mysore 1900).

¹⁰ *Ekāgnikāṇḍa with the Commentary of Haradatta* (Edited by L.Srinivasacharya). G.O.L.Mysore 1902

Pole Star; that is a central star farthest in the sky, to which other celestial bodies were tied and kept in their path.

The *Śiśumāra*, which we meet again in the Purāṇas, based on the vivid description of the position of the 14 stars and the importance attached to its form, can be identified with the constellation Draco. It follows; *Dhruva* in its earliest nomenclature as *Abhaya* has to be equated with Thuban or α -Draconis. By back computations it is known that α -Draconis was the Pole Star during 3200-2400 BCE. In this long period, the declination of this star varied from $87^{\circ} 56'$ to $87^{\circ} 36'$, reaching nearest to NCP with $89^{\circ} 53'$ in 2830 BCE. The naming of the Vedic star *Abhaya* (No-fear) as *Dhruva* (Fixed, Certain) in the *Śiśumāra* should have happened during the above period, which provides an important chronological footprint not only for the Vedic culture but also for the roots of Hindu astronomy. By 1900 BCE the separation of *Dhruva* from NCP increased to 5° and the circumpolar nature of the star would have been evident to observers of the night sky. The declination changed to nearly 82° by 1500 BCE and the drift of the star away from the NCP should have been glaringly evident for observers in India. In the *Maitrāyaṇī Āraṇyaka Upaniṣat* (aka *Maitrī Upaniṣat*, MAU) one of the important question posed by King Bṛhadratha to Sage Śākāyanya was, *why Dhruva moves, why the air strings holding the celestial bodies dip*¹¹. Implicit in this question is the statement: *the North Star understood by us as fixed changes its position*; an unmistakable reference to the effect of precession as noticed by King Bṛhadratha. The diurnal motion of the Pole Star describing a small circle around the NCP must have been visible to the naked eye. This Yajurvedic text also contains astronomical statements to the effect that the northern course of *Sun* started at the middle of the *dhaniṣṭhā* star division¹². This corresponds to a few centuries before the Vedāṅga Jyotiṣa of Lagadha which states that the winter solstice coincided with sun at the beginning of star *dhaniṣṭhā*. This is a well discussed topic with the said observation dateable to *c* 1400 BCE¹³. The amount of precession between the two observations amounts to six to seven degrees. Thus, the movement of the Pole Star seen by King Bṛhadratha is broadly consistent with 1900-1800 BCE.

Reference to *Śiśumāra* as a celestial body, in contrast to that word meaning an aquatic animal, is wide spread in Vedic literature. In the first book of the Ṛgveda (I.116.18) we come across Aśvins bringing riches to Divodāsa in a cart to which were yoked a *śiśumāra* and a *vṛṣabha*. Griffith famous as the translator of RV, overlooking the astronomical culture of the Vedas, has translated this literally to mean a *cart drawn by a porpoise and a bull yoked together*¹⁴. In the commentary of Sāyaṇa, the word *śiśumāra* is identified as a variant of the word *śiśumāra*. Sāyaṇa also recognizes the impossibility of an aquatic animal and a land animal yoked together to drag a cart on earth and explains this as the special act of the *divine twins* the Aśvins exhibiting their

¹¹ *kimetaivārnyānām śosanam mahārnāvānām śikharinām prapatanam dhruvasya pracalanam vraścanam vātarajjunām nimajjanam prthivyāh sthānādapasaranam...*|| MAU (I.4)

¹² *sūryo yonirvai kālasya|tasyaitadrūpam yannimesādikālāt sambhṛtam dvādaśātmakam vatsarasya āgneyamardhamardham vāruṇam maghādyaṃ śravisthārdhamāgneyam|krameṇotkramena sārpadyaṃ śraviṣṭhārdhāntam saumyam*|| MAU (VI.14)

¹³ *Vedāṅga Jyotiṣa of Lagadha* (Ed. by T.S.K.Sastry) IJHS, 19.4. Supplement, 1-74. N.Delhi. 1984.

¹⁴ *When to his house ye came, to Divodāsa, hasting to Bharadvāja, O ye Aśvins,*

The car that came with you brought splendid riches: a porpoise and a bull were yoked together. (RV I.116.18; Translation by Griffith R.T.)

extraordinary powers¹⁵, which obviously makes the locus of the cart to be in the visible sky. Even if Divodāsa were to be a human king, favouring whom the above is mentioned, it should not be difficult to recognize that the verse alludes to an event in the sky in which the constellations Draco and a group of stars resembling the head of a bull, most likely Taurus, were meant by the poet.

The *Pañcaviṃśa Brāhmaṇa* of the Sāmaveda has an interesting story about the cosmography behind the name *Śiśumāra*. It is said that originally this was a *Rṣi* or seer of the same name in the terrestrial ocean. He did not praise Indra fully and hence got stranded on the sands. After having praised Indra fully by the *śarkara sāman* song he could get into the waters again. Later he attained the sky as a constellation of the same name. The word *śarkara* means constellation which is a variant of the word *śākvara* as in TA. The text further says that the *śarkara sāman* chant is meant for crossing the oceans¹⁶. This has to be taken as a reference to the circumpolar nature of the bright stars of the *Śiśumāra* constellation which must have helped ancient mariners in navigating the seas. The Jaiminīya Brāhmaṇa text also has a similar legend about the constellation *Śiśumāra*. The Gṛhya Sūtra texts which were fixed much later than the accented core Vedic texts are prescriptive in nature about religious rites and customs to be followed by the orthodox. The religious practices of different Vedic clans which must have been prevalent since the most ancient times are codified in the formulaic *Sūtra* literature, not only canonizing the hymns to be used in the rites, but also fixing the actions to be followed by the main performers, participants and the priests. There are several different Sūtra texts attached to the four Vedas demonstrating not only their lateness, but also their spatial spread in accounting for the variation in the practices. However, the common feature of all these texts, in the historical context, is their memory of *Dhruva* as a fixed star to be invoked, seen and shown to the bride in the marriage rite. In all cases, the hymn for addressing *Dhruva* is same as or very similar to the one in the *Ekāgni-kāṇḍa* (I.9) mentioned above. The *Hiraṇyakeśi Gṛhya Sūtra*, in particular, prescribes worship of stars *Arundhatī*, *Saptaṛṣi*, and *Dhruva* even during the first kindling of the fire used in Vedic sacrifices. This text extols the Pole Star as, Brahman, fixed, non-slipping, non-shaking and as the centre of the universe.

It is noted that the Vedic people had direct knowledge of the northern constellation resembling in its outline an aquatic animal known as *Śiśumāra*, the 14th star counted from the head and placed on its tail being the fixed *Dhruva* or the Pole Star. The effect of precession on the sky picture was also felt as recorded in the Maitrāyaṇīya text, where *Dhruva* was observed to have moved away from its original position. Notwithstanding such natural effects, the formality of showing the star *Dhruva* has continued in Hindu marriages over centuries coming down in the same form to this day as a ritual, even though everyone may not know which star was originally invoked in the prescribed hymns.

Brahmāṇḍa Purāṇa (BP)

This tradition of observing *Śiśumāra* and *Dhruva* was not restricted to the closed Vedic groups but was available to everyone as depicted in the Purāṇas, which have preserved such observational knowledge in the form of cultural astronomy. The story of the young boy *Dhruva*,

¹⁵ *tasmai divodāsāya prāpayāmāsa | apica tasmin rathe vṛṣabhaḥ anaḍvān śiśumāraḥ grāha ca paraspara viruddhāvapi svasāmarthya prakāṣanāya yuktā vāhanatayā samyuktāvāstām ||* (Commentary of Sāyaṇa, RV I.1.16)

¹⁶ Caland W. English Translation of the *Pañcaviṃśa-Brāhmaṇa*, Bibliotheca Indica Series, 255, Calcutta, 1932.

who by his penance got the boon of being fixed in the north as the Pole Star, is a popular legend widely known all over India. The origin of this story can be traced to the Viṣṇu Purāṇa (VP) and repeated in several other texts. However, the related background astronomy is preserved in the Brahmāṇḍa Purāṇa without mythological embellishments. Since the word Dhruva means *fixed, certain, unchanging*, it is implicit that the boy Dhruva was identified with the eponymous Pole Star. This fact becomes interesting since BP, VP and several other texts not only provide cogent information on its location in the sky but also mention the observable daily self-rotation of Dhruva as the driving force for other celestial bodies to move around the NCP. This theory of Dhruva, takes us to the most ancient form of Indian astronomy which was *dhruva-centric*, or *meru-centric*. It is known that no absolute dates can be put forth for any of the eighteen Purāṇa texts, which have grown over time with bulky additions. But, several of them retain the story of *Dhruva* as the Pole Star with variant readings. This is a clear indication of the branching of the Purāṇas from a nucleus which lies in the Vedic texts such as the TA and the *ekāgni-kāṇḍa* which knew the prominent constellation *Śiśumāra* with 14 stars, the fixed *Dhruva* and the *Meru* connecting the earth with the NCP. Among the Purāṇas it is in BP we find matter of fact statements about *Dhruva*. As far as ancient astronomy and cosmology are concerned, BP preserves the original concepts, out of which the Viṣṇu, Vāyu, Liṅga and Matsya Purāṇa have bifurcated with further variations.

The *dhruva-centric* model of the sky can be best appreciated in the BP as an outcome of direct observation. We consider here BP first and later look at variant information from a few other texts. In the first chapter of BP a list of the contents to be covered is provided. This promises astronomy related to Dhruva as,

*sūryādīnām syandanānām dhruvādeva pravartanam |
kīrtiyate śiśumāraśca yasya pucche dhruvaḥ stithaḥ ||* (BP; I.1.84)

The movement of sun and other moving celestial bodies is explained as induced by Dhruva only. The constellation Śiśumāra, at the tail of which Dhruva stays, is also described.

This theory is further elaborated in chapters 21-24, totaling 520 verses, with many ancient concepts about Sun, Moon, eclipses and planets. Here, we restrict our attention only to a few important statements concerning *Śiśumāra* and *Dhruva*.

*tatomandataram nābhyām cakram bhramati vai tathā |
mrtpiṇḍa iva madhyastho dhruvo bhramati vai tathā ||
trimśanmuhūrtānevāhuḥ ahorātram dhruvo bhraman |
ubhayorkāśṣṭhayormadhye bhramte maṇḍalāni tu ||
kulāla cakranābhiśca yathā tatraiva vartate |
dhruvastathāhi vijñeyastatraiva parivartate ||* (BP; I 21. 94, 95, 96)

Like a lump of clay at the middle of the potter's wheel moves slowly sitting at the navel, Dhruva rotates. Dhruva moves in circles, day and night consisting of 30 muhūrtas, at the middle of the two directions (north and south). Like the nave of the potter's wheel stays in the same place, so also Dhruva should be known to be rotating there itself.

Chapter 21 containing 176 verses gives an account of sun's motion, with definitions of seasons, equinox and solstice. It introduces the cosmography of *Mt. Meru* connecting the earth and the heavens like a vertical pole in the north, around which all celestial bodies are modeled to move in circular paths. The star *Dhruva* is said to be at the tip of the *Meru*. The starry space in the sky between the *Nakṣatras* of *ajaveethi* and star *Agastya* (Canopus) is said to be the *pitrloka* (abode of manes), whereas the corresponding region in the north between *nakṣatras* of *nāgaveethi* and *Saptaṛṣi* (U.Major) is the *devaloka* (abode of gods)¹⁷. The chapter ends by declaring the famous third step of *Viṣṇu* to be in the north above the *Saptaṛṣi* wherein *Dhruva*, *Dharma* and others are located¹⁸.

Chapter 22 starts with a description of the position of *Dhruva* as

*bhūtasammohanam hyetad vadato me nibodhata |
pratykṣamapi drśyam ca sammohayati yat prajāḥ||
yo 'yam caturdaśarkṣeṣu śaiśumāre vyavasthitaḥ |
uttānapādaputro 'sau meḍhībhūto dhruvo divi||
sa vai bhrāmayate nityam candrādityau grahaiḥ saha |
bhramantamanugacchanti nakṣatrāṇi ca cakravat||* (BP; I. 22. 5, 6, 7)

Listen to this explanation of mine which is real and observable but mystifying people. He, who is at the tail of the 14 stars looking like a śaiśumāra; Dhruva the son of Uttānapāda, has become the main pivot of the pole in the sky. Verily, he rotates the sun, the moon and the planets continuously. The stars follow him who is himself circling like a wheel.

In the above the narrator (*Sūta*) is appealing to people to observe the sky and understand the ancient theory of *Dhruva* as the controller of the motion of the celestial bodies. Since *Dhruva* as a north star is said to be in a figure looking like *śaiśumāra*, this group of stars should be same as the constellation meant by the Vedic texts discussed already. BP further elaborates the self-circling motion of *Dhruva* and that of the stars (*tārāḥ*) and the *nakṣatras* around the NCP. The point to be noted is the differentiation between the general stars and the *nakṣatras*. The latter are the 27 ecliptic asterisms and *Dhruva* was never one among them. There are 84 verses in this chapter, presenting a physical model for the motion of sun seen in the day but, linked to *Dhruva* seen only in the night. The northern and southern sojourn of the sun also had to be explained within this model. Without going into the details, we note that Sun's chariot is said to have only one wheel the axle of which is connected to *Dhruva* by two strings of light which take care of the change in the orbit of sun around the earth. We speculate that the older analogy of the potter's wheel was unable to mimic the observed apparent motion of the sun and hence the two axle model and connection to *Dhruva* with two unseen strings was proposed to simulate action at a distance. This change is also seen in the example of the animal driven oil mill proposed as another physical model for understanding the motion of the stars around *Dhruva*.

¹⁷ *uttaram yadagastyasya hyajaveethyāśca dakṣiṇam|pitryānaḥ savai panthāḥ vaiśvanarapathādbahiḥ||* (I.21.156)
nāgavītyuttaroyaśca saptarṣigaṇadakṣiṇaḥ|uttaraḥ savituḥ panthā devayānaśca sa smṛtaḥ || (I.21.168)

¹⁸ *ūrdhvottaram ṛṣibhyastu dhruvo yatra savai smṛtaḥ | etadviṣṇupadam divyam trīyam vyomni bhāsvaram ||
yatra gatvā na śocanti tadviṣṇoḥ paramam padam | Dharmadhruvādyāḥ tiṣṭanthe yatra te lokasādhakāḥ ||* (I. 21.175, 176)

*yāvatyāścaiva tārāśca tāvanto vātaraśmayah |
sarvā dhruve nibaddhāśca bhramantyo bhrāmayanti tāḥ ||
tailapīḍā yathā cakram bhramanto bhrāmayanti ha |
tathā bhramanti jyotīmṣi vātabaddhāni sarvaśaḥ ||* (BP; I. 23.96,97)

There are as many air-strings as there are stars. All (strings) are bound to Dhruva; themselves rotating; they make the stars to go round. As in an oil press, the wheel goes round and makes the other (the pole) rotate; so do the luminaries held by the air-strings, revolve.

In the oil mill, the central pole is rotated by the motive force provided by one or more bullocks moving in a circular path. In the Purāṇic sky model, the roles are reversed, such that the locally spinning Dhruva can make the celestial bodies at a distance to move around in their circular path, the connection being through strings (or rays) of wind (or light).

Chapter 23 of BP is indispensable to anyone interested in the history of Indian astronomy as it explains the astronomical symbolism behind the legend of 3339 gods drinking *soma*, first appearing in the R̥gveda. Towards the end of this chapter the text describes the location of *Dhruva* along with other companion stars making up the animal figure *Śiśumāra*.

*evam dhruva nibaddho 'sau sarpate jyotiṣāṅgaṇaḥ |
saiṣa tārāmayah proktaḥ śiśumāro dhruvo divi ||
yadahnā kurute pāpam dṛṣṭvā tanniśi muñcate |
yāvatyāścaiva tārāstāḥ śiśumārāśritā divi ||
tāvantyaiva tu varṣāni jīvitābhyadhikāni tu |
sākāraḥ śiśumāraśca vijñeyaḥ pravibhāgaśaḥ ||* (BP; I. 23. 99, 101b)

Thus, centered in Dhruva, the circle of luminaries revolves. And this Śiśumāra, fixed in the sky, is to be understood as made of stars. Whatever sin one commits during day, one is divested of it upon seeing Śiśumāra in the night. As many stars as there are associated with Śiśumāra in the sky, so many years more, does one live on. (For this) the form of the Śiśumāra should be known in terms of its parts.

The chapter ends with a good description of the *Śiśumāra* constellation enumerating the constituent stars numbering fourteen. This is perhaps the earliest example of a star group being represented and named by an animal figure.

*uttānapādestasyātha vijñeyaḥ sottarā hanuḥ |
yajño 'dharastu vijñeyo dharmo mūrdhānamāśritah ||
hr̥di nārāyaṇaḥ sādhyo aśvinou pūrvapādayoḥ |
varuṇaścaryamācaiva paścime tasya sakthinī ||
śiśnam samvatsarastasya mitraścapānamāśritah |
pucche agniścamahendraśca mārīcaḥ kaśyapo dhruvaḥ ||
tārakāḥ śiśumārasya nāstam yāti catuṣṭayam ||
agnīndra kaśyapānam to caramo 'sau dhruvaḥ smṛtaḥ ||* (BP; I. 23. 102-104, 105b, 107b)

His (Śiśumāra's) upper jaw should be understood as Uttānapāda. Yajña (Kratu) is known as the lower jaw and Dharma as the head. At the heart is Nārāyaṇa (Sādhya). The twin Aśvins occupy the forelegs while Varuṇa and Aryamā are at the hind legs. Samvatsara is the genital and Mitra occupies the seat. In the tail are Agni, Mahendra, Mārīca-Kaśyapa and Dhruva. These (previous) four stars of the Śiśumāra never set. It is remembered that Dhruva is the last star after Agni, Indra and Kaśyapa.

This listing of stars on the body of the Śiśumāra is same as in TA except for minor variations in the names, but the geometrical picture of the animal figure is same as in TA. The “addition of 14 years of life” which Alberuni found ridiculous, was a ploy of the narrator when BP was still orally transmitted, for encouraging people to observe and preserve the names of the constituent stars and the form of the constellation accurately.

Viṣṇu Purāṇa (VP)

The *Viṣṇu Purāṇa* one of the important religious texts relates the earthly story of Dhruva with poetic embellishments and devotional fervour. In the BP the boon for Dhruva to be in the sky as the Pole Star is given by Brahma, where as in the VP, Viṣṇu is said to give the boon. Interesting astral information provided in the VP is that Dhruva's mother Sunīti stays near him in the sky as a companion star. This provides another constraint on the identification of Dhruva in the Śiśumāra constellation. In the description of the stars making up the constellation fourteen are mentioned as in BP. The only difference being the word *mārīcaḥ* qualifying Kaśyapa is missing in VP. The cosmological functions assigned to Dhruva in the VP are same as in BP. Both mention Dhruva as the fourth after Agni and that the last four stars ending with Dhruva do not set. The Matsya and the Vāyu Purāṇa repeat similar astral information with a few deletions, about Dhruva and Śiśumāra.

Bhāgavata and Devībhāgavata

The *Bhāgavata Purāṇa* is a highly respected text mainly extolling devotion to Viṣṇu and his incarnations. Many of the statements in this text about Dhruva that are in prose form (BookV.Ch 23) are same as in VP but not all the fourteen stars of the Śiśumāra are named. Dhruva is initially associated with stars Agni, Indra, Prajāpati, Kaśyapa and Dharma and is compared to a fixed object or pillar around which heavenly bodies rotate driven by *Time*. Dhruva's rotation as the driving force is conspicuously absent in this text. Further the text quite categorically states that *some people* meditate on the figure of Śiśumāra as the body of Vāsudeva. These people are said to think of Dhruva at the end of the tail; Prajāpati, Indra, Agni and Dharma on the trunk of the tail, Dhāta at the root of the tail and Saptarṣi (U.Major) at the waist. The text further describes how the coiled figure has to be imagined with sun, moon, stars and all the planets at the various places of its universal body¹⁹. In the *Devī Bhāgavata* the description of Dhruva is an exact restatement of the Bhāgavata in verse form. Here also *some people* are said to imagine the Śiśumāra constellation in an extended form to cover the whole sky as the divine body of Viṣṇu (8.18; v. 11-26). Whatever may be the inspiration for this extension, it is easy to observe that these texts lack the care and detail with which BP describes its *dhruva-centric* astronomy. The texts that are liberal with religious concepts at the cost of astronomical pictures can be easily

¹⁹ *kecanaiḥ tajjyotiḥ anīkam śiśumāra samsthānena bhagavato vāsudevasya yogadhāraṇāyām anuvārṇayanti* || (Bhā. V, Ch.23)

recognized as being chronologically later, when due to precession the original *Dhruva* was not at the NCP.

The Constellation

The constellation of *Śiśumāra* consisting of fourteen observable stars that make up a figure like a dolphin (whale or porpoise or alligator) is well preserved in the Vedic and the Purāṇa texts. The Pañcavimśa Brāhmaṇa of the Sāmaveda already discussed indicates that the circumpolar property of the bright stars of this constellation was of help in navigation. The celestial ocean in which the constellation is said to rise and move can be recognized as the Milky Way, which BP calls *viyadgaṅgā* or the heavenly Gaṅgā River. With all the above details, recognition of this constellation as the modern Draco should be obvious. However, Allen²⁰ in his classical book on star names gives two meanings to *Śiśumāra* namely, Draco and Delphinus, the latter meaning attested nowhere in the ancient literature. The reason for this can be traced to the faulty rendering of original Sanskrit texts in popular translations. For example the vulgate Matsya Purāṇa has a footnote that makes *Śiśumāra* to mean *the zodiac personified and no other than the child Viṣṇu*²¹. Dutt²² in his translation of the *Viṣṇu Purāṇa*, takes fancifully *Śiśumāra* in one place as the stellar sphere. Even the modern translation of the *Brahmāṇḍa Purāṇa* by Tagare²³ adds an unnecessary footnote citing the *Bhāgavata* that *all the stars and constellations are located as different parts of the body of this heavenly porpoise*. However, as seen previously the *Bhāgavata* mentions that only some people for meditation follow such a procedure and as far as the *Brahmāṇḍa* and the *Viṣṇu Purāṇa* (BP and VP) texts are concerned such interpretation is impossible. As per the original texts in the BP and the VP there is no way to conceive the constellation other than placing the fourteen stars on the outline figure of a *Śiśumāra* for its visual picture. The statement that four of the stars on the tail, with *Dhruva* as the fourth do not set clearly makes these circumpolar, for the observer and narrator of BP. The one to one correspondence between the Vedic and the Purāṇic description leads us to the conclusion that the constellation meant should be the Draco in the northern sky. Referring to Figure 1, the ancient description stopped with α -Draconis (Thuban) without including the stars κ - and λ - Draconis.

The names of some of the Vedic stars can be identified with their modern equivalents. Behind α -Draconis (Thuban) are ι , θ , η stars that can be recognized as *Prajāpati*, *Indra* and *Agni*. The name *Samvatsara* literally *Year*, for one of the stars (5th or 6th from Dhruva) is interesting. It is said to be the genital, meaning thereby in Vedic parlance, the producer of Years. It would be interesting to investigate this further to see whether a star of this constellation that exhibited visibility phenomena (rise and set) could have been used as a marker for recognizing the beginning of the New Year in 3rd - 4th millennium BCE. The stars *Dharma* and *Brahma* of TA can be identified as γ - and β -Draconis (magnitude 2.24 and 2.79) respectively. The Purāṇas changed *Brahma* to *Uttānapāda* so that his son *Dhruva* (*Abhaya*) remains at the end of the same figure, along with his mother *Sunīti* identifiable as star 10-Dra of magnitude 4.5. The forelegs with the two *Aśvins* and hind legs with *Mitra* and *Varuṇa* are identifiable as the two bends in the figure.

²⁰ Allen R.H. *Star Names and Their Meanings*, Dover Publications. Inc., USA.1963

²¹ The Matsya Purāṇa (Text and Transl by H.H.Wilson) Arranged by N.S.Singh, Nag Publ. N. Delhi, 1997

²² Dutt M.N. *English Translation of the Viṣṇu Purāṇa*, Chowkamba Publ.Varanasi. 1972.

²³ Tagare G.V. *English Translation of the Brahmāṇḍa Purāṇa*, Motilal Banarsidas Publ. N.Delhi, 2000.

Precession

The constellation *Śiśumāra*, the star *Dhruva* and the imaginary *Meru* have influenced the cultural practices of Vedic Hindus for more than four thousand years. The inviolable effect of precession started taking its toll on the prime position *Śiśumāra* enjoyed as a constellation in the cardinal north direction during large parts of 3rd millennium BCE. We have already seen mention of shifting and moving of *Dhruva* in the *Maitrāyaṇīya Āraṇyaka* in the 2nd millennium BCE. The Great Epic *Mahābhārata* revered the constellation, when King Drupada announced the marriage of his daughter Draupadī. The place for holding the famous archery competition was named *Śiśumārapura* and this was located to the *northeast* of the capital city²⁴. The name and the specific mention of direction is an unmistakable reference to the shift of the constellation somewhat towards northeast in the sky also. As the figure shifted far away from its prime north position its shape altered to bring in new names such as *Nahuṣa* (serpent) and *Ajagara* (python) in the precession legends, in which the southern star Agastya (Canopus) finds a dominant role. The first recognition of the southern star and its identification with Sage Agastya by the Vedic people around Kurukṣetra was probably around 3500 BCE²⁵. With passage of time the visibility interval of this star increased as also its altitude and importance of its first visibility in the Vedic annual cycle²⁶. It is interesting to note here that many of the legends connected with Agastya are about balancing the earth and rectification of the North-South direction. A popular astral legend appearing in the *Mahābhārata* is about King Nahuṣa seated in a palanquin being carried by the Seven Sages and Agastya on their shoulders when Agastya was kicked by Nahuṣa for being too slow²⁷. Agastya in anger curses the heavenly King Nahuṣa to lose his exalted position to become an ordinary *ajagara* (python). This legend is easily recognized as an allegory for precession being felt in the form of the *Śiśumāra* constellation losing its prime northern celestial position, along with star *Agastya* coming into prominence as a new bright star in the south. An interesting study of the religious influences of the Nahuṣa-Agastya legend has been carried out by Hiltebeitel²⁸. According to him, the identification of the heavenly Nahuṣa with the constellation Draco was first proposed by two German scholars, both Adolf Holtzmann (uncle and nephew). The *Mahābhārata* also mentions the movement of *Dhruva* as a bad omen before the Great War²⁹. This statement as also the most probable date of the war is in harmony with 2nd millennium BCE, when due to precession α -Draconis was no more at the NCP^{30,31}.

Among the four major elements handed down by the Vedic *Taittirīya Āraṇyaka*, the visible entities were the star *Dhruva* and the dolphin-like shape of constellation *Śiśumāra*. As these shifted position, the two receded from the day to day lives of common people, only to remain in legends. The third one namely the *meru* was always imaginary, but this withstood the passage of

²⁴ *tataḥ purajanāssarve sāgaroddhūta nissvanāḥ | śiśumārapuram prāpya nyaviśan teca pārthivāḥ ||
prāguttareṇa nagarād bhūmibhāge same śubhe | samājavātaḥ śuśubhe bhavanaiḥ sarvato vṛtaḥ ||*

(MB Ādi Parvan Ch 176 v 15,16)

²⁵ Abhyankar K.D. Folklore and Astronomy: Agastya a Sage and a Star, *Current Science*, 89, pp.2174-2176. 2005.

²⁶ Iyengar R.N. Parāśara's Six Season Solar Zodiac and Heliacal Visibility of Star Agastya in 1350-1130 BCE. *Ind. J History of Science*, 49.3, pp.223-238, 2014.

²⁷ *Mahābhārata*, Udyoga Parvan, Ch.17, v. 14-18. (BORI, Pune Critical Edition).

²⁸ Hiltebeitel A. Nahuṣa in the Skies: A Human King of Heaven. *History of Religions*. 16.4. pp.329-350. 1977.

²⁹ *dhruvaḥ prajvalito ghorah apasavyam pravartate ||* (Bhīṣma Parvan Ch.3, v.17)

³⁰ Iyengar R.N. Internal Consistency of Eclipses and planetary positions in the *Mahābhārata*, *Ind. J History of Science*. pp. 77-115, 2003.

³¹ Bhatnagar A.K. Date of *Mahābhārata* War Based on Astronomical References. *Ind. J. History of Science*, pp. 369-394, 2017.

time best, providing the basis for the cosmological view of not only Hinduism, but also of Jainism and Buddhism and appears as an architectural feature now all over India in temples. The fourth element namely, the Third Step of Viṣṇu in the sky was always an esoteric Vedic concept and remains so even to this day. However, all Hindu traditions whenever a physical correspondence had to be shown, took this to be located in the figure of *Śiśūmāra*.

A difficulty one faces with BP is regarding its fixture in script which must have happened in the early centuries of the Common Era. All Purāṇas basically claim to narrate ancient legends. Hence, one can object that BP text describing the *Śiśūmāra* need not refer to Thuban as the Pole Star, but another one lying very close to the Pole. Such a possibility cannot be denied, since BP can be interpreted to state 15 stars, by counting the names *Mārīca* and *Kaśyapa* separately. The only eligible candidate for this possible alternate identification of *Dhruva* is κ -Draconis, which was nearest to the NCP *c* 1300 BCE at declination $85^{\circ}13'$, violating the property of being seen to be fixed, even though it could still have indicated the north direction. This possibility does not in any way affect the conclusions about *Abhaya-Dhruva* being known as a fixed star in the Vedic period. The other candidate routinely suggested for being near the NCP in ancient times, is the star Kochab (β -U.Minor). The nearest approach of this star to NCP (*c* 1100 BCE) was 83° that is 7° away from the Pole. For a naked eye observer this separation equals the spatial distance covered by fourteen lunar orbs kept side by side. Hence the chance of this being denoted as *Dhruva* the Fixed Pole Star in the Vedic period has to be dismissed. The comparison of such a star to the central point of a potter's wheel as in the Purāṇa texts will be most unlikely. These facts and the geometry of U.Minor do not match with the TA and BP textual descriptions of *Dhruva* better than α - or κ -Draconis. In the identification of the equinox day, BP mentions that when Sun is in the first quarter of *kṛttikā* (Alcyone) and Moon in the fourth quarter of *viśākha* (α -Libra), the day and night are equal. Similarly when Sun is in the third quarter of *viśākha* and Moon is at the beginning of *kṛttikā* it is *viṣuvam* (equinox). This statement appears in several Purāṇas and hence cannot be ignored as spurious. This has been discussed in detail in relation to other ancient astronomical statements by Koch³², to show that the record preserved in the Purāṇa holds valid for the middle of 2nd millennium BCE

First Millennium BCE

The very fact that BP first refers to Dhruva as a fixed peg to which the stars are tied, and next to a self-circling *Dhruva* driving the sun, moon and stars, is evidence of modification of a hypotheses made necessary due to the effect of precession. The further cosmological extensions with large spatial measure numbers must have been inspired by the imaginary *Meru*, at the tip of which *Dhruva* was taken to reside. This may be a development of the first millennium BCE, when there was no visible Pole Star at NCP. Texts reliably dateable to the first millennium BCE are very few. We have already seen that the *Grhya Sūtra* texts dateable to *c* 500 BCE refer to the more ancient Vedic rites. These do not refer to *Śiśūmāra* but by an unbroken tradition the location of *Dhruva* must have been known to the faithful. The *Atharvaveda Pariśiṣṭa* (AVP) an unaccented text, considered to be an appendix to the Atharvaveda, is available in 76 Chapters³³. The work contains very ancient as well as not so ancient material, added most probably after *c* 500 BCE. The text refers to Pāṇini (AVP 43.4.16) and also to *dīnāra* a gold currency (AVP

³² Koch D., *Astronomical Dating of the Mahābhārata War*. Erlenbach, Switzerland. 2014. (http://www.gilgamesh.ch/KochMahabharata6x9_V1.00.pdf)

³³ *Atharvaveda Pariśiṣṭa* Ed. by G. M. Bolling & J. von Negelein (1910). Leipzig

36.26.3) of foreign origin which was in circulation in the northwest part of India at the turn of the Common Era. AVP has long chapters on stars, planets and comets like a *jyotiṣa-samhitā*. For the present purpose it is sufficient to note that Chapter 52 titled *Grahasaṅgraha* preserves a collection of names of stars and constellations other than the well-known *nakṣatras* along the ecliptic. In this list the Seven Sages with names; *Gautama*, *Atri*, *Vasiṣṭha*, *Viśvāmitra*, *Kaśyapa*, *Ṛcīkaputra* and *Bharadvāja*, are said to be fixed in the north. This is followed by another star group fixed at the end of the middle sky, with unmistakable reference to *Dhruva* with *Śiśumāra* and a few others followed by *Viṣṇupada*³⁴. Some of the stars are named differently from the Vedas and the Purāṇas, but the constellation figure of *Śiśumāra*, the famous ancient star *Dhruva* and the station of *Viṣṇu* are same as in the TA and BP texts. Some of the texts of the Jain tradition fixed within a few centuries after the advent of Mahāvira (599-527 BCE) contain information in the form of omens, anecdotes, and the calendar. The Bhadrabāhu Samhitā (c 300 BCE) mentions a comet masking *śiśumāra* as a bad omen³⁵. A more detailed statement about a comet by name *Calaketu* rising in the west and moving north touching Saptarṣi and Dhruva before turning south, is available in the *Parāśaratantra*³⁶. Such statements indicate that the constellation was variedly remembered, with or without Dhruva.

Common Era (CE)

As we enter the CE the nature of Indian astronomy, as is well known, changes its colour with emphasis on mathematics. The connection between the astronomical knowledge of the more ancient period and the Siddhānta texts of the CE is not well investigated. There was no recognized Pole Star during CE and we do not come across reference to *dhruva* unambiguously as a star at the NCP till the 15th Century. But the terminology *dhruvaka* for polar longitude is derived from *dhruva*, interpreted as the Pole, an imaginary point on the sphere. *Meru* finds mention in the chapters on *Bhuvanakośa* but not *dhruva* as a visible star at NCP. Brahmagupta (598-670 CE) discussing the rotation of the celestial sphere uses the phrase *dhruvayoḥ nibaddham*, meaning the two geometrical north and south poles of the sphere. The group of stars near the Pole was named *dhruvamatsya* (Polar-fish) and not as *Śiśumāra*. Bhāskaračārya (1114-1185 CE) in his *Siddhānta-śiromaṇi*, under *Bhuvanakośa* refers to the mouth and tail of this polar-fish and its synchronization with sun rise and sun set. In the 15th Century the present Polaris or α-U.Minor had reached close to the Pole at about 86° and a line connecting it to star *markaṭi* (β-U.Mi or Kochab) was recognized to rotate in the night sky. This fact was used by Padmanābha to develop his astronomical instrument *Dhruva-matsya-yantra* for finding time as in a clock³⁷. *Siddhāntic* astronomers were true to their empirical scientific observations, even though they were well versed in the ancient Vedic and Purāṇic lore. Kamalākara Bhaṭṭa the famous author of *Siddhānta-tattva-viveka* (1658 CE) addressed the question of which star should be seen by the bride in Hindu marriages. This question should have been very relevant, since the prescribed Vedic hymns refer to the fixity of Dhruva. True to the spirit of the Vedic mantra but not to the letter, he gave the celestial coordinates of *Dhruva* along the ecliptic as nearly 90°

³⁴ *śiśumāreṇa* sahitā *dhruveṇa* ca mahātmanā | pulastyah pulahaḥ somo bhrgurāṅgirasā saha || hāhāhūhū ca vijñeyau *viṣṇoścāpadam* uttamam | madhyāntasthāvarāṅām tu niyatāviti buddhimān || AVP(52.10.4,5)

³⁵ *Parāśaratantra* (Reconstructed text with translation and notes by R.N.Iyengar) Jain University Press, Bangalore, 2013.

³⁷ Sarma S.R. The Dhruvabhrama-Yantra of Padmanābha. *J. Rashtriya Samskrita Samsthan*, Vol.6, pp.321-343, N.Delhi, 2012.

longitude and 66°latitude³⁸. Thus from his astronomical point of view the current Pole Star is to be taken as the *Dhruva* for religious purposes also.

However, orthodox Hindus have looked for their *Dhruva* in the Śīsumāra constellation only. We have already seen the supportive evidence of societal memory provided by Alberuni on this aspect. An example of how the Vedic facts were textually recorded other than in the Purāṇas, is available in the commentaries on the *Viṣṇusahasranāma*, which is a part of the *Mahābhārata*. All the three schools of Vedānta, namely Advaita, Viśiṣṭādvaita and Dvaita recognize this text as important for their philosophical traditions. The commentaries specific to the three schools interpret the 441st name *nakṣatranemi*, as a homonym for Viṣṇu, the controller of the *nakṣatras*, stationed at the heart-region of the (constellation) *śīsumāra*, quoting the Vedic and Purāṇic texts in differing details. Śāṅkarācārya explains that Dhruva sitting on the tail of this figure rotates the stellar circle. He quotes cryptically, the Vedic authority for his explanation as *viṣṇurhrdayam*, which is the Taittirīya Āraṇyaka hymn (II.19)³⁹. This commentary has a gloss by Tāraka Brahmānanda Sarasvati a monk of the Śāṅkara tradition. His date is not exactly known, but he was after Sāyaṇa and hence can perhaps be assigned to 15-16 Century CE. We have already noted that Sāyaṇa commenting on the TA hymn says that one has to see the *dhruva-maṇḍala* in the evening (see *f.n.* 8). One may wonder, which part of the sky was meant by the *dhruva-maṇḍala*, since Polaris was approaching the NCP and *dhruva-matsya* was perhaps known to the general populace. We can surmise that Sāyaṇa being a follower of Śāṅkara would have known correctly the sky part of *Śīsumāra* with the last star being the Dhruva of the TA hymn. However, any semblance of doubt that may remain is set right by Tāraka Brahmānanda Sarasvati in his gloss. He not only elaborates on the original text and the commentary of his mentor but takes trouble to give the new configuration of the ancient *Śīsumāra* in the sky. He first explains the form of this not as an aquatic animal, but says it looks like a Lizard or Iguana⁴⁰. Next he says that *Dhruva* is residing at the tip of the uplifted tail of this figure, leaving the faithful with no doubt as to where to look for the Vedic *Dhruva*.

Controversy among Indologists

European scholars started taking interest in Sanskrit language, grammar and the Vedic literature from the 18th Century onwards. A topic of interest to many of these scholars was the date of the Ṛgveda, the most ancient literature of India, variously assigned from 4th millennium BCE to 1500 BCE. Jacobi⁴¹ a German scholar of repute was a proponent of archaeo-astronomy as a means of dating the Vedic culture. He pointed out the importance given by all the Gṛhya Sūtras to show *Dhruva* as the Pole Star to the bride in Vedic marriage rites. His argument was, since there was no Pole Star during the composition of the *Sūtra* literature (*c* 500 BCE), the composers of these texts should have known a star which was at the NCP in more ancient times, which can be none other than α-Draconis (Thuban). Jacobi somehow referred only to the late marriage codes for presenting his case. His opponents prejudiced as they were against dating the Ṛgveda to any period before 1500 BCE, treated *Dhruva* as an independent entity mentioned only in the

³⁸ cale' calepi dhruvabhe svameṣādrāśitrayam taddhruvakaḥ śarastu|

ṣaṣṣaṣṭibhāgāḥ pariṇītanāryāḥ mahatphalaṁ darśanato'sti yasya|| (*STV Bhagrayutyadhikārah* v. 8)

³⁹ *Viṣṇusahasranāmastotram with the commentary of Śāṅkarācārya and the gloss of Tāraka Brahmānanda Sarasvati* (Edited by R.Rama Sastry) ORI Sanskrit Series, 106, Univ. of Mysore 1961.

⁴⁰ śimśumāro jalajantuviśeṣaḥ saraṭagodhādyākārah, tadākṛti jyotiścakram - śimśumaracakram tasya pradakṣiṇāvartakuṇḍalībhūtasya unnamitapucchāgre vyavasthito dhruvaḥ || (gloss in the reference above)

⁴¹ Jacobi H.G. On the date of the Ṛgveda, (Transl. from German) *The Indian Antiquary*, 23, 154-159. 1894.

Sūtras without any connection to the Vedic *Śiśumāra*. Typical was the dismissal by Whitney⁴² an American academic, when he wrote “...any star not too distant from the pole would have satisfied both the newly wedded woman and the exhibitor; there is no need of assuming that the custom is one handed down from the remote period when α -Draconis was really very close to the pole, across an interval of two or three thousand years during which there is no mention of pole-star, either in Veda or in Brāhmaṇa.” Keith working in India in the Colonial Office translated into English *Taittirīya Samhitā* and several other Vedic texts. Notwithstanding his knowledge of the country and its culture, he was derisive of the Hindu marriage ritual to comment⁴³ “...the argument from the pole star assumes an accuracy in the demands of the primitive Indian wedding ritual which is wholly unnatural.” While criticizing the *Śatapatha Brāhmaṇa* text mentioning that the Pleiades do not slip from the east he wrote “a passage which consists of foolish reasons for preferring one or other of the Nakṣatras; we are in the same region of popular belief as when in the Sūtra literature the existence of *Dhruva*, a fixed polar star, is alleged.” As if not satisfied with the above arguments he added a foot note on page 79 of his monograph - “The pole star, Dhruva, appears in the Gṛhya Sutras only.” It is clear Whitney and Keith had no understanding of the TA text, assuming they had read it. Keith coauthored a Vedic Index with Macdonell⁴⁴, which is popular as a reference book even now. Under *Dhruva* there is reference to Jacobi and the controversy of this being the Pole Star. But under the entry *Śiśumāra/Śiśumāra* the word is taken just as an aquatic animal with no archaeo-astronomical recognition of a constellation. This is misleading, since even the Monier Williams Dictionary of 1899 listed one of the meanings for *Śiśumāra* as: *a part of the heavens having stars of that shape*.

Conclusion

Any attempt to trace cultural history of India cannot overlook the influence of precession on the observed sky pictures from the most ancient times starting with the vast Vedic literature and the Purāṇas. These texts present the oldest description of a constellation named the *Śiśumāra* comprising of fourteen stars including the Pole Star of those days. The identification and constraints for locating *Dhruva*, the ancient Pole Star, as vividly described in the *Taittirīya Āraṇyaka* of the Yajurveda and the *Brahmāṇḍa Purāṇa* are presented in this article from a chronological perspective. It is seen that the legendary *Dhruva* has left his imprint permanently on the sands of time, starting from *c* 3200 BCE to the present day. The ancient Indian cultural practice of having a spiritual dialogue between the visible sky and the earth (*Dyāvā-prthivī*) has passed through the Vedic Samhitā, Brāhmaṇa, Āraṇyaka to the Purāṇas with many twists and turns and still later into the period of mathematical astronomy, preserving evidence of reference to two Pole Stars, a rarity for any living culture. Scientific astronomers of the early *siddhānta* period scrupulously avoided the *Śiśumāra* of the Veda and the Purāṇa but retained the term *dhruva* to mean a fixed reference point, which terminology they needed for the coordinate *dhruvaka*⁴⁵. But with passage of time, as star Polaris approached the NCP, the nearby group of stars was named *Dhruvamatsya* (Polar Fish) and the new Pole Star was kept at the *mouth* of this animal figure, in contrast to the ancient *Dhruva* placed at the tail of the aquatic animal *Śiśumāra*. This ambivalence must have confused an outsider like Alberuni since the orthodox Hindus

⁴² Whitney W.D. On a recent attempt by Jacobi and Tilak to determine on Astronomical Evidence the Date of the earliest Vedic Period as 4000 BC. *The Indian Antiquary*, 24, 361-369. 1895.

⁴³ B.Keith (1925) *The Religion and Philosophy of the Veda and Upanishads*, Harvard Univ. Press, USA.

⁴⁴ Macdonell, A. A., & Keith, A. B. *Vedic Index of Names and Subjects*. J. Murray. London, 1912.

⁴⁵ Abhyankar K.D. *Dhruvaka-vikshepa system of Astronomical Coordinates*, Ind. J. Hist. Sci. 41, 151-157. 2006

whom he knew, must have held on to their belief that the Pole Star was at the tip of the tail of the constellation *Śiśumāra*, looking more like a whale and not a fish. This amply demonstrates the long memory of the devout Hindus of their ancestral astral religion carried through centuries, attempting synchronization of their faith with the universal law as perceived in the Vedas.

We conclude that the Vedic people of the Yajurveda branch beheld the sky picture of a constellation named *Śiśumāra* (the modern Draco) with fourteen stars the last one being stationary without perceivable diurnal motion to be called Dhruva (α -Draconis) the Pole Star around 3000 BCE. They also preserved this information in their orally transmitted text *Taittirīya Āraṇyaka* which formed the basis for the *meru* centric astronomical models of the later Purāṇas and the still later cosmological speculations in the *siddhānta* astronomical texts. Observation of this star Dhruva attained canonical ritualistic status in Hindu marriages and got codified in the *Gṛhya-sūtra* literature. However the effect of precession was felt in the form of this Dhruva star to be moving or circling in the same location in the 2nd millennium BCE as stated in the *Maitrāyaṇīya Āraṇyaka* and the *Brahmāṇḍa Purāṇa*. Archaeo-astronomical analysis of ancient Sanskrit texts upholds a high chronology of 3rd-4th millennium BCE for Vedic sky observations and cultural practices.

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Fig.1. Iconic representation of Viṣṇu in the form of Śiśumāra with the Pole star Druva at the uplifted tail end. (Source: <https://divyakataksham.wordpress.com>)

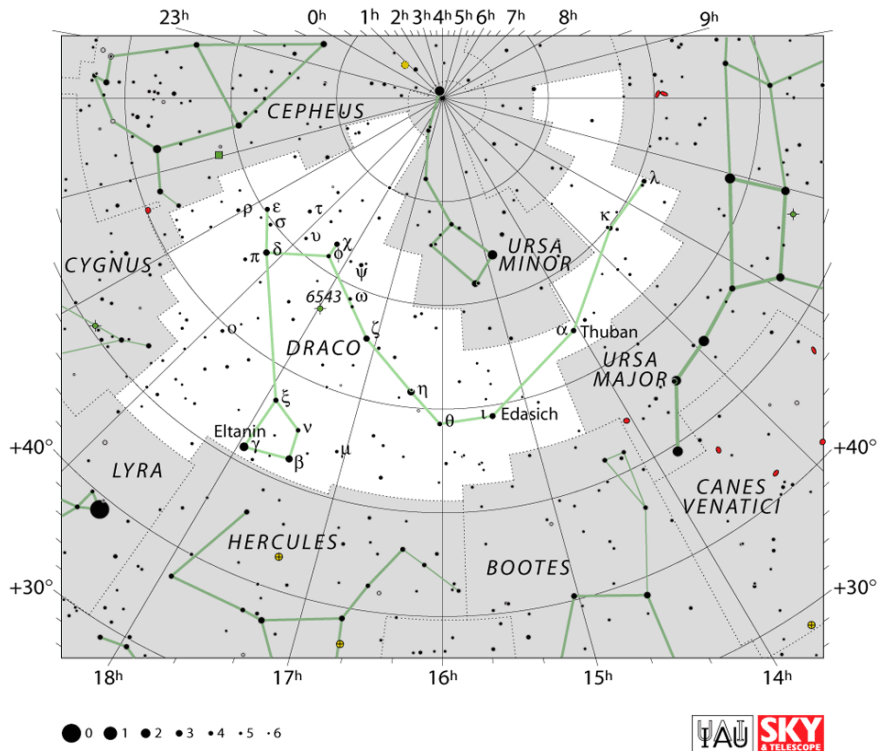


Figure 2. Constellations Draco and U. Minor with Polaris the current Pole Star at NCP. *Abhaya-Dhruva* (Thuban in the above figure) of the *Taittirīya Āraṇyaka* was close to the Pole during 3200-2400 BCE.

(<http://www.iau.org/static/public/constellations>)

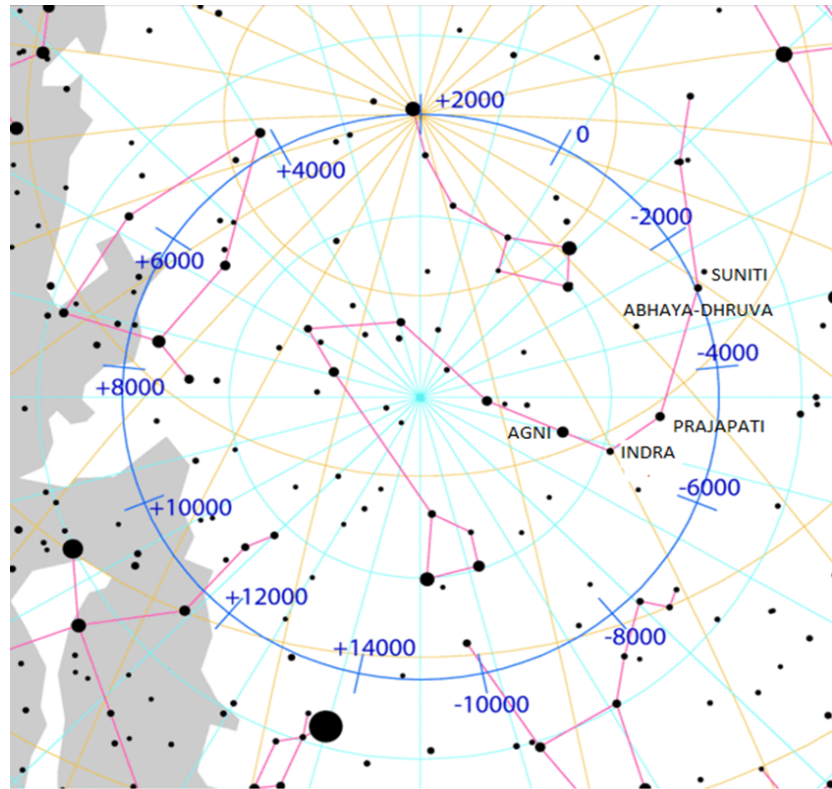


Fig. 3. The blue circle shows the path of the North Celestial Pole among the stars due to precession. The Era in which a visible Pole Star exists at the NCP is shown on the circle. Negative numbers stand for BCE years. Common Era starts from 0 year.

(Source: Tau'olunga. June,2006. https://commons.wikimedia.org/wiki/File:Precession_N.gif)