***European Journal of Science and Theology,*** *February 2021, Vol.17, No.1, 25-37*

# REVISITING PURĀṆIC CHRONOLOGY

**Sidharth Chhabra**[*]

*MIT School of Vedic Sciences, Rajbaug, Loni Kalbhor, Pu, Al Luqta St, Maharashtra, 412201, India*

(Received 22 May 2020, revised 21 October 2020)

## Abstract

The Purāṇas provide dates for major events in the history of the Earth, Solar System and Universe. These dates are within 0.3% of half of the modern scientific dates for these events. Since modern scientific dating involves several completely independent techniques that are subject to different sources of error, the fact that all of these scientific techniques yield dates that are twice those of Purāṇic dates suggests that traditional Purāṇic chronology is off by a factor of two. The 14th century Purāṇic scholar, Śrīdhara Svāmī, alluded to this in his commentary on the Viṣṇu Purāṇa. This paper also reviews Purāṇic time units and notes the presence of a time unit, the pratisaṃdhi, which has hitherto escaped scholarly attention.

*Keywords:* purāṇas, cosmology, chronology, radiometric dating, Big Bang

## 1. Introduction

The *Purāṇas* are Indian encyclopaedias handed down by oral tradition for thousands of years and first written down on palm leaves between the second and twelfth centuries AD [1]. The oldest extant editions of the *Purāṇas* date to the 19th century. Scholars now universally acknowledge that the *Purāṇic* system of time units is at least 2000 years old [2]. The *Purāṇas* provide dates for significant paleontological and astrophysical events, recorded in terms of specific periods of time known as *yugas, manvantaras* and *kalpas*.

There are eighteen Maha Purāṇas, which are considered corollaries to the four Vedas. Their names are Brahma Purāṇa, Padma Purāṇa, Viṣṇu Purāṇa, Śiva Purāṇa, Liṅga Purāṇa, Garuḍa Purāṇa, Nārada Purāṇa, Bhāgavata Purāṇa, Agni Purāṇa, Skanda Purāṇa, Vāyū Purāṇa, Brahma-vaivarta Purāṇa, Mārkaṇḍeya Purāṇa, Vāmana Purāṇa, Varāha Purāṇa, Matsya Purāṇa, Kūrma Purāṇa and Brahmāṇḍa Purāṇa. They all give exactly the same number of years for the *yugas*, *manvantaras*, *manvantara-saṃdhyās* and *kalpas,* which are the time-units used for measuring long periods [3]. Among these Purāṇic time units, the smallest is *kali yuga*, which is preceded by *dvāpara yuga*, then *tretā yuga* and, finally, *satya yuga*. A cycle of these four *yugas* is a *caturyuga*. Seventy-one *caturyugas* make a *manvantara*. A *manvantara-saṃdhyā* is situated between

[*]E-mail: sidc@umich.edu

consecutive *manvantaras.* Fourteen *manvantaras* and fifteen *manvantara-saṃdhyās* make a *Kalpa.* Since there is no ambiguity in the number of years assigned to these *Purāṇic* time units, there is no scope for speculation regarding the conversion of *Purāṇic* time units into human years. Table 1 lists human years for each of these Purāṇic time units, which is uniformly accepted by scholars.

**Table 1.** Purāṇic time units and their human equivalents.

| Purāṇic time units | Human years |
|---|---|
| Satya Yuga | 1.728 million |
| Tretā Yuga | 1.296 million |
| Dvāpara Yuga | 0.864 million |
| Kali Yuga | 0.432 million |
| Caturyuga | 4.32 million |
| Manvantara | 306.72 million |
| Manvantara-Saṃdhyā | 1.728 million |
| Kalpa | 4.32 billion |

There is a *Purāṇic* time unit that has hitherto escaped scholarly attention [4] and this unit is essential for the rest of this article. This is the *saṃdhyā* between consecutive *kalpas*, which is known as the *pratisaṃdhi*. This time unit is discussed in the following verses from the *Vāyu Purāṇa* (VP), and it is also discussed in the *Brahmāṇḍa Purāṇa* [5, 6]. Although most scholars are not aware of this unit, it is fully consistent with *Purāṇic* chronology in general because other *Purāṇic* time units always have a *saṃdhyā* associated with them.

"*Sambodhya sūtaṃ vacasā papracchāthottarāṃ kathām / ataḥ prabhṛti kalpajña pratisaṃdhiṃ pracakṣva naḥ / samatītasya kalpasya vartamānasya cobhyoḥ // kalpayorantaraṃ yatra pratisaṃdhiyyratastayoḥ / etadveditumicchāmaḥ atyantakuśalo'hyasi //*" (Desirous of further instruction, the son of *Kaśyapa* asked the intelligent *Sūta*: O sage, who are conversant with the subject of *kalpa*, please describe to me the *pratisaṃdhi*, which is the period between the previous *kalpa* and the current *kalpa*) (VP 1.7.2-3). This verse explicitly states that there is an interval between two *kalpas* and this interval is known as the *pratisaṃdhi*. Scholarly presentations (not really needed here in my opinion) on the subject of *Purāṇic* chronology have overlooked this chapter of the *Vāyu Purāṇa* that describes the time interval between *kalpas*. To my knowledge, I am the first to take into account the *pratisaṃdhi*.

"*Lomaharśaṇa [Sūta]* spoke: I will describe to you the *pratisaṃdhi*, the period between the current *kalpa* and the previous *kalpa*" (*lomaharṣaṇa uvāca atra'vo'haṃ pravakṣyāmi pratisaṃdhiśca yastayoḥ / samatītasya kalpasya vartamānasya cobhyoḥ //*) (VP 1.7.4).

"O sages of holy vows, *manvantaras* are in those *kalpas*. This auspicious *kalpa* that is current now is the *Vārāha kalpa*. The *kalpa* that has gone before this *kalpa* was the *Sanātana kalpa*. Now understand the interim period between that *kalpa* and the present one." (VP 1.7.5-6) (*manvantarāṇi kalpeṣu yeṣu yāni*

*ca suvratāḥ / yaścāyaṃ varttate kalpo vārāhaḥ sāṃprataḥ śubhaḥ // asmāt kalpāṣca yaḥ kalpaḥ pūrvvo'tītaḥ sanātanaḥ / tasya cāsya ca kalpasya madhyāvasthānnibodhata //*)

The first line of the 5th verse states that *manvantaras* are within *kalpas*, which would be irrelevant in these verses about *pratisaṃdhi* unless connected with the 2nd line of the 6th verse. These verses hint that the interim period between consecutive *kalpas* has the duration of a *manvantara*, which will be explicitly stated in verse 9. "First, the *kalpa* ends and, subsequently, the *pratisaṃdhi* ends. Then, the next *kalpa* begins [with life imported] from *Jana* loka. [This process occurs] again and again." (VP 1.7.7) (*pratyāhate pūrvakalpe pratisaṃdhiṃ ca tatra vai / anyaḥ pravarttate kalpo janalokāt punaḥ punaḥ//*) "When a *kalpa* ends, a *pratisaṃdhi* begins. When this *pratisaṃdhi* ends, the next *kalpa* begins. At the end of a *kalpa*, all activities terminate. Thus, the period between consecutive *kalpas* is known as the *pratisaṃdhi*." (VP 1.7.8) (*vyucchinnat pratisaṃdhestu kalpāt kalpaḥ parasparam / vyucchidyante kriyāḥ sarvāḥ kalpānte sarvaśastadā / tasmāt kalpāttu kalpasya pratisaṃdhirnigadyate //*) "The *pratisaṃdhis* have the duration of *manvantaras*. A *pratisaṃdhi* follows the last *manvantara* of the preceding *kalpa*." (VP 1.7.9) (*manvantarayugākhyānām avyucchinnāśca saṃdhayaḥ / parasparāḥ pravarttante manvantarayugaiḥ saha //*)

Thus, the above verses state that a *pratisaṃdhi* is situated between consecutive *kalpas* and has the duration of a *manvantara*.

Tagare translated this verse as follows: "The joints (transition or *saṃdhis*) between the periods called *manvantara* and *yuga* are also cut off. *manvantaras* function with the inter-connections of *yugas*" [7]. This translation is unclear for the following reasons. First, the *saṃdhis* (joints or transitions) are time periods of fixed duration, which means that they are not subject to being 'cut off'. Second, the *Purāṇas* have specific time units, such as *satya yuga* and *dvāpara yuga*, but '*yuga*' is an unspecified period of time. There can't be a *saṃdhi* for something unspecified. Third, it is vague to say that *manvantaras* function with *yugas*. A *manvantara* is composed of 71 *Caturyugas*. Therefore, it appears Tagaare didn't understand what this verse is actually saying. In conclusion, a *pratisaṃdhi*, which has the duration of a *manvantara*, is situated between consecutive *kalpas* (306.72 million human years).

## 2. Our current position in Purāṇic chronology

The next step is to ascertain our current position in *Purāṇic* chronology. The consensus among *Purāṇic* scholars is that we are currently situated a few thousand years into *kali yuga* [2]. The *Vāyu* and *Viṣṇu Purāṇas* provide specific information that enables us to determine which *kali yuga* this is. According to the *Vāyu Purāṇa*, the *dvāpara yuga* of the 28th *caturyuga* of the 7th *manvantara* (*Vaivasvata manvantara*) has already elapsed (VP 1.23.111-207), which means that we are now a few thousand years into the *kali yuga* of the 28th *caturyuga* of the 7th *manvantara*. This is confirmed by the *Viṣṇu Purāṇa* [3, p. 21]. In the

current *caturyuga*, *satya*, *tretā*, and *dvāpara yugas* have already elapsed, and we are in the beginning of the *kali yuga*. In this article, I have consistently neglected the few thousand years that have elapsed since the beginning of *kali yuga* because the precise date for the onset of *kali yuga* is a topic requiring further research. Therefore, the *Purāṇic* dates listed in this article are a few thousand years less than the actual dates. Since I am dealing with million- and billion-year time intervals, a few thousand years doesn't make much difference.

## 3. Matsya Avatāra

The *Matsya Purāṇa*, *Bhāgavata Purāṇa* and *Agni Purāṇa* describe the activities (*Līlā*) of the *Matsya Avatāra* of *Śrī Viṣṇu* [8]. The most prominent feature of the *Purāṇic* description is a *pralaya*, which consisted of catastrophic environmental conditions that completely destroyed plant and animal life. Therefore, I chose mass extinction as the most appropriate translation of the word *pralaya* in this context. The Monier-Williams Sanskrit dictionary also translates *pralaya* as mass extinction.

Verses 6 and 7 of Chapter 2 of the *Matsya Purāṇa* [9] explicitly state that flora and fauna will be destroyed during the Mass Extinction: "O great sage, the total fauna will be agitated and entirely distressed. Thus, whatever animals were on the surface of the Earth will be afflicted and destroyed." (*Matsya Purāṇa* 2.6) (*trijagannirdahan kṣobhaṃ sameṣyati mahāmune / evaṃ dagdhā mahī sarvā yadā syādbhasmasaṃnibhā //*) "O destroyer of enemies, the Earth will become very hot due to the heat of the atmosphere. Consequently, the grieving fauna will be completely destroyed." (*Matsya Purāṇa* 2.7) (*ākāśamūṣmaṇā taptaṃ bhaviṣyati paraṃtapa / tataḥ sadevanakṣatraṃ jagadyāsyati saṃkṣayam //*)

The severity and chronology of the Mass Extinction are corroborated by the commentaries of eminent 16$^{th}$ and 17$^{th}$ century *Purāṇic* scholars. In his *Sārārtha Darśinī commentary on the Bhāgavata Purāṇa (8.24.37)*, Śrīla Viśvanātha Cakravartī Ṭhākura states that the Mass Extinction was the most severe in this Day of *Brahmā* [10]. Śrīla Rūpa Gosvāmī confirms this in his *Purāṇic* commentary, *Laghu Bhāgavatāmṛta (3.18-19)* [11]. The date of the Mass Extinction is described in a number of *Purāṇas*. Here, I focus on the *Matsya Purāṇa*: *"tvayā sārdhamidaṃ viśvaṃ sthāsyatyantarasaṃkṣaye / evamekārṇave jāte cākṣuṣāntarasaṃkṣaye //*" (Along with the Earth, you will be preserved throughout the mass extinction, the great inundation, which will occur as the *Cākṣuṣa manvantara* is passing away) (*Matsya Purāṇa* 2.14).

According to this *Purāṇic* verse, the Mass Extinction took place as the *Cākṣuṣa manvantara* was passing away; in other words, during *the last caturyuga of the Cākṣuṣa manvantara*. Further details on the chronology of this event are found in the *Ain-i-Akbari*, a lengthy document about the Mughal Emperor Akbar's administration written in the year 1590. According to this document, the Mass Extinction took place during the *satya yuga* (*Ain-i-Akbari*, p. 162). Soifer also states that the *Matsya Avatāra* appeared in the *satya yuga* [12].

Since, as discussed in the previous section, we are now a few thousand years into the *kali yuga* of the 28th *caturyuga* of *Vaivasvata manvantara*, 28 *caturyugas* (minus the remainder of the present *kali yuga*) have elapsed since the beginning of *Vaivasvata manvantara*. A *caturyuga* lasts 4.32 million human years. Multiplying 28 by 4.32 million years yields 120.96 million years, from which we must subtract 0.432 million years, which is the duration of a *kali yuga*. Thus, our current position is 120.528 million years since the beginning of *Vaivasvata manvantara*, accurate to within a few thousand years. Since there is a *saṃdhyā* before the *manvantara* begins, we have to add *manvantara-saṃdhyā* (1.728 million years) to obtain time since the end of the *Cākṣuṣa manvantara.* Therefore, 122.256 million human years have elapsed since the end of the previous *manvantara*.

As stated above, the Mass Extinction took place in the final *satya yuga* of *Cākṣuṣa manvantara* (the previous *manvantara*). Moreover, according to the *Matsya Purāṇa*, King *Satyavrata* (also known as *Vaivasvata Manu*) was engaged in meditation for a million years prior to the Mass Extinction. He wanted to save his progeny from the imminent Mass Extinction: "After a period of a million years of continued meditation, *Brahmā* became pleased with him (*satyavrata*) and told him to ask for a boon" (*Matsya Purāṇa* 1.14). (*babhūva varadaś cāsya varṣāyutaśate gate / varaṃ vṛṇīṣva provāca prītaḥ sa kamalāsanaḥ //*)

According to the *Purāṇas*, during *satya yuga*, almost everyone is engaged in meditation. Therefore, it is very likely that *Satyavrata* was engaged in meditation right from the start of the *satya yuga*. In other words, the Mass Extinction must have taken place one million years after the start of the final *satya yuga* of *Cākṣuṣa manvantara*. To obtain this date for the beginning of the pralaya (Mass Extinction), we add one Caturyuga and subtract 2 million years from 122.256 million years. In conclusion, *Matsya Purāṇa* contends that the Mass Extinction took place 125.576 million years ago.

Paleontologists unanimously agree that the mass extinction at the end of the Permian Period was by far the most severe in the Phanerozoic Eon, the last 540 million years [13]. In the year 2018, a world-renowned geochronological team at the Massachusetts Institute of Technology, headed by Professor Samuel Bowring, dated the first pulse of the end-Permian Mass Extinction at 251.939 ± 0.031 million years ago [14]. If we double the date for the Mass Extinction given in the *Matsya Purāṇa*, we obtain 251.152 million years, which differs from the latest scientific dating by a mere 0.3%.

Not only is the Purāṇic date for *Matsya Pralaya* strongly correlated with the end-Permian Mass Extinction, but the time required for biotic recovery is equally well-correlated. Professor Benton wrote: "Triassic ecosystems were rebuilt step-wise from low to high trophic levels through the Early to Middle Triassic, and a stable, complex ecosystem did not re-emerge until the beginning of the Middle Triassic, 8-9 Myr [million years] after the crisis" [15]. Benton and Newell discuss changes in plant morphology through the Mass Extinction and found that Megafossil plant species recovered by 9 million years after the end-

Permian Mass Extinction [16]. A dearth of plants and vegetation on land results in intensified weathering. It was observed that intensified weathering began in the late Permian and continued until the middle of the Triassic, indicating that plants and vegetation didn't recover fully until the middle of the Triassic [17]. Moreover, Benton mentioned a 10 million year 'Coal-Gap' at the Permian-Triassic boundary, which is a period when there were no trees or plants. According to the latest reports, marine ecosystems achieved a complete recovery between 244.15 and 244.9 million years ago [18, 19]. Thus, according to palaeontologists, it took 7-10 million years for complete biotic recovery.

According to the Purāṇas, life on *Bhū-maṇḍala* is rejuvenated at the beginning of each new manvantara, which is after the pralaya that ended the preceding *manvantara*. After the Cākṣuṣa *manvantara*, the next (or the current) *manvantara* began 122.256 million years ago (the calculation is discussed above). If we double this date, we get 244.512 million years ago. This date for rejuvenation of life on *Bhū-maṇḍala* is very close to the paleontological date for complete biotic recovery.

## 4. Brahmā's reconstruction

According to the *Vāyu Purāṇa* (2.38.138-169), at the end of each Day of *Brahmā*, the Sun expands in size, thereby destroying all life on Earth and, thereafter, the Solar System disintegrates. Then, during each of *Brahmā*'s Nights, there is no activity. *Brahmā*, near the end of each of his Nights, reconstructs the Solar System: "Then, as the night ends, Prajāpati [*Brahmā*] wakes up and feels the urge to reconstruct [the Solar System]" (VP 2.38.195). (*tato rātrikṣaye prāpte prati buddhaḥ prajāpatiḥ / manaḥ sisṛkṣayā yuktaḥ sargāya nidadhe punaḥ //*) "Earlier, *Brahmā* reconstructed the Sun, Moon and four *lokas*, beginning with *Bhū loka*" (VP 1.8.16). (*bhūrādyāścaturo lokāścaṃdrādityau grahaiḥ saha / pūrvavannirmame brahmā sthāvarāṇīha sarvaśaḥ //*)

As discussed in Sections 1 and 2, each Day of *Brahmā* has the duration of a *kalpa*, which includes 14 *manvantaras* and 15 *saṃdhyās*. The period of time between the Night and the Day of *Brahmā* is called the *pratisaṃdhi*, which equals a *manvantara* in duration. Since *Brahmā* feels the urge to reconstruct the Solar System at the end of his Night, the reconstruction starts at the beginning of the *pratisaṃdhi*.

As discussed in Sections 3 and 4, we are now in the 28$^{th}$ *kali yuga* of the 7$^{th}$ *manvantara*, which means that 122.256 million years have elapsed since the end of the 6$^{th}$ *manvantara*. Since, a *pratisaṃdhi* equals one *manvantara* in duration, seven *manvantaras* and an additional 122.256 million years have elapsed since the last time *Brahmā* reconstructed the Solar System. Each *manvantara* is accompanied by its *manvantara-saṃdhyā*. A *manvantara* plus its *saṃdhyā* equals 308.448 million Solar years. Multiplying 308.448 by 7 equals 2159.136, to which we must add an additional 122.256, which yields 2281.392 million years. Thus, according to the *Vāyu Purāṇa*, the last time *Brahmā*

reconstructed the Solar System was 2281.392 million years ago, which was at the end of his most recent Night.

The consensus among modern astrophysicists is that our Solar System formed from a 'proto-Solar' molecular cloud consisting mostly of hydrogen and helium with a small admixture of heavier elements. The process started with the collapse of a region of the proto-Solar molecular cloud. A major part of this region's mass became gravitationally concentrated at the centre, forming the 'proto-sun', while the rest flattened out, by rotation, into a compressed disk of gas and dust, which kept rotating due to conservation of angular momentum. Subsequent evolution of the disk created the Solar System, which consists of the planets with their satellites, as well as asteroids and comets [20]. According to the latest reports, the core of the proto-Solar cloud began collapsing 4567.30 ± 0.16 million years ago [21]. If we double the date from the *Vāyu Purāṇa* for the reconstruction of Solar System, we obtain 4562.784, which differs from the latest scientific dating by a mere 0.1%.

## 5. Prākṛtika pralaya

According to the *Purāṇas*, the Universe contains an enormous number of *Brahmāṇḍas* that periodically undergo disintegration and reconstruction. Reconstruction of the *Brahmāṇḍa* is called '*Visarga*', secondary or partial reconstruction, and reconstruction of the Universe is called '*sarga*', primary or elemental reconstruction. According to González-Reimann [4], another name for Visarga is '*dainandina*', which means daily (or, in other words, occurring every Day of *Brahmā*). *Brahmā* is the person in charge of disintegration and reconstruction of the *Brahmāṇḍa*. Reconstruction of the Universe is performed by *Śrī Prakṛti*, who paves the way for each *Brahmā* to reconstruct each *Brahmāṇḍa* by providing fundamental elements needed for this reconstruction. Therefore, another name for *sarga* is *Prākṛtika* because it is performed by *Śrī Prakṛti* [4]. In essence, there are two types of reconstruction: (1) *Visarga*: reconstruction of the *Brahmāṇḍa* (Solar System) by *Brahmā* and (2) *sarga*: reconstruction of the fundamental elements of the Universe by *Śrī Prakṛti*.

According to the *Purāṇas*, there are two types of major *pralaya* - (1) *naimittika*: partial disintegration of the *Brahmāṇḍa* at the end of the Day of *Brahmā* and (2) *prākṛtika*: complete disintegration of the elements of the *Brahmāṇḍa* and, consequently, the *Brahmāṇḍa* itself [4]. "The end of a Day of *Brahmā* and the associated disintegration is called *Brahmā-naimittika*. The absorption of living beings [into *Śrī Viṣṇu*] and the associated dissolution of the fundamental elements is called *prākṛtika*." (*Vāyu Purāṇa* 2.38.133) (*brāhmo naimittikastasya kalpadāhaḥ prasaṃyamaḥ / pratisarge tu bhūtānāṃ prākṛtaḥ karaṇakṣayaḥ //*)

Thus, during the *prākṛtika*, the fundamental elements and the living entities are absorbed into the body of *Śrī Viṣṇu*. However, during the *naimittika*, the *Brahmāṇḍa* is partially destroyed. According to the *Purāṇas*, there are fourteen lokas in the *Brahmāṇḍa*. Out of these fourteen, the top three remain

intact during the *naimittika* disintegration: "The three lokas - *Jana*, *Tapa* and *Satya* - remain undisturbed until the final [*Prakṛtika*] disintegration." (*Vāyu Purāṇa* 2.39.15) (*janastapaśca satyaṃ ca sthānānyetāni trīṇi tu / ekāntikāni tāni syustiṣṭhantīhāprasaṃyamāt//*)

Thus, three lokas - *Jana loka*, *Tapa loka* and *Satya* loka - are not disintegrated at the end of each Day of *Brahmā*. *Brahmā*, sages, and progenitors reside on these lokas during the Night of *Brahmā*. In some *Purāṇic* verses, the top four lokas are said to remain intact during the *naimittika* disintegration, whereas other verses state that only the top three lokas remain intact. In either case, it is inconsequential for the dating analysis. In summary, *naimittika pralaya* is the partial disintegration of the *Brahmāṇḍa*, whereas *prākṛtika* is the complete disintegration of the *Brahmāṇḍa* and concomitant absorption of all living entities into the body of Śrī Viṣṇu.

To appreciate the *Purāṇic* calculation for the age of our Universe, it is essential to understand the enormous scale of *Brahmā*'s life. The lifetime of *Brahmā* is divided into two halves, which are called '*parārdhas*'. "By such days and nights characterized by the movement of time, even the maximum life of *Brahmā*, consisting of a hundred years, comes to an end." (*Bhāgavata Purāṇa* 3.11.33) [22] (*evaṁ-vidhair aho-rātraiḥ kāla-gatyopalakṣitaiḥ / apakṣitam ivāsyāpi paramāyur vayaḥ-śatam //*) "The one hundred years of *Brahmā*'s life are divided into two parts (*parārdhas*), the first half and the second half. The first half of the duration of *Brahmā*'s life is already over, and the second half is now current." (*Bhāgavata Purāṇa* 3.11.38) (*yad ardham āyuṣas tasya Parārdham abhidhīyate / pūrvaḥ parārdho 'pakrānto hy aparo 'dya pravartate //*)

Each *parārdha* is equivalent to 50 Years of *Brahmā*'s life. The following verse from the *Vāyu Purāṇa* states an important relationship between the constituents of the Universe and a *parārdha*: "That which is immortal and eternal, along with cosmic vibration, is dissolved. The past, present and future constituents [of the Universe] are calculated to last up to a *parārdha*, a divine number." (*Vāyu Purāṇa* 2.38.240) (*śāśvate cāmṛtatve ca śabde cābhūtasaṃplavaḥ / matītā vartamānāśca tathaivānāgatāḥ prajāḥ / divyasaṃkhyā prasaṃkhyātā aparārdhaguṇīkṛtāḥ //*)

This verse states that the constituents of the Universe last only for a *parārdha*, implying that Śrī Prakṛti performs *sarga* twice in the life of *Brahmā*. The first time Śrī Prakṛti does this is at the beginning of his first *parārdha*, and the second time is at the beginning of his second *parārdha*. The elemental reconstruction at the beginning of the first *parārdha* is universally acknowledged by *Purāṇic* scholars [4]. A unique contribution of this article is the discovery that there was an elemental disintegration and reconstruction at the end of the first *parārdha*. In his commentary on the *Bhāgavata Purāṇa* (3.12.3), Śrīla Viśvanātha Cakravartī Ṭhākura, an eminent 17$^{th}$ century *Purāṇic* scholar, confirms the fact that all living entities were absorbed into the body of Śrī Viṣṇu at the end of the first *parārdha*: "*Brahmā* and others, who live for the entirety of *Brahmā*'s life, entered into the body of Śrī Viṣṇu at the end of the first *parārdha*

of *Brahmā*'s life." (*mahā-kalpāyuṣāṁ brahmādīnāṁ jīvatām eva prathama-parārdhānte parameśvare praveśāt*)

As discussed above, this entering of all living entities, including *Brahmā*, into the body of Śrī Viṣṇu, takes place exclusively during *prākṛtika* disintegration. Thus, there must also have been a complete disintegration at the end of the first *parārdha*. Someone might argue that, according to the *Bhāgavata Purāṇa* (12.4.5), *prākṛtika* disintegration happens only at the end of two *parārdhas* of Brahma's life. However, there are two equally valid translations of this verse: (1) when [both of] the two *parārdhas* of *Brahmā* are complete, the seven fundamental elements are disintegrated and (2) when [each of] the two *parārdhas* of *Brahmā* is complete, the seven fundamental elements are disintegrated. Thus, this verse equally well supports either one or two *prākṛtika* disintegrations in the lifetime of *Brahmā*.

Since *Brahmā* lives for two *parārdhas*, there must be a *sarga* reconstruction immediately after the *prākṛtika* disintegration at the end of his first *parārdha*. According to the *Purāṇas*, *Brahmā* appears on a cosmic lotus (*Padma* in Sanskrit) at the beginning of his life, at which time he constructs the lokas in the stem of the cosmic lotus. Therefore, the first Day in *Brahmā*'s life is called the *Padma kalpa*. The *Bhāgavata Purāṇa* states that the lokas were reconstructed in the stem of the cosmic lotus in the *kalpa* immediately after the end of *Brahmā*'s first *parārdha*; therefore, this *kalpa* is also called the *padma* (lotus) *kalpa*: "*tasyaiva cānte kalpo 'bhūd yaṁ pādmam abhicakṣate / yad dharer nābhi-sarasa āsīl loka-saroruham //*" (The *kalpa* after the end of the first half of *Brahmā*'s life is called the *Padma kalpa* because the lokas were constructed in the stem of the cosmic lotus in the navel lake of Hari [Śrī Viṣṇu]) (*Bhāgavata Purāṇa* 3.11.36).

Note that, in his commentary on the *Bhāgavata Purāṇa* (3.11.36-37), Bhaktivedānta Svāmī disagrees with Śrīla Viśvanātha Cakravartī Ṭhākura that the current *kalpa* is the *padma kalpa* [23]. However, in his commentary on the *Bhāgavata Purāṇa* (2.10.47), Bhaktivedānta Svāmī agrees that the current *kalpa* is, in fact, the Padma *kalpa*, and he also states that this conclusion is in agreement with the commentaries of Śrīla Viśvanātha Cakravartī Ṭhākura, Śrīla Jīva Gosvāmī and Śrīla Śrīdhara Svāmī. The *Bhāgavata Purāṇa* (3.11.36) is equivocal on the issue of whether the *padma kalpa* is the *kalpa* before the end of the first *parārdha* or after the end of the first *parārdha*. However, from *Bhāgavata Purāṇa* (2.10.47) and the commentaries by Śrīla Viśvanātha Cakravartī Ṭhākura, Śrīla Jīva Gosvāmī and Śrīla Śrīdhara Svāmī, it is clear that the *padma kalpa* is the first Day of *Brahmā* in the second *parārdha*. The issue is so subtle that even a great scholar like González-Reimann [4] mistakenly identified the *padma kalpa* as the last *kalpa* of the first *parārdha*.

The reconstruction of all the lokas in the cosmic lotus takes place exclusively during the *sarga* reconstruction. Since all the lokas were reconstructed at the beginning of the second *parārdha*, this reconstruction of lokas must have been preceded by reconstruction of the fundamental elements of the Universe at that time. The *sarga* reconstruction at the beginning of the

second *parārdha* is corroborated by the commentary of Śrīla Viśvanātha Cakravartī Ṭhākura on the *Bhāgavata Purāṇa* (3.11.37): "*Mahar loka, jana loka, tapa loka* and *satya loka*, which [are commonly believed to] remain intact until the end of the second *parārdha* of his life were, in fact, dissolved during the process of devastation at the end of the first *parārdha* of *Brahmā*'s life. Those who live until the end of *Brahmā*'s life on those lokas entered into the body of *Śrī Viṣṇu*, along with *Brahmā*, during the Night at the end of the first *parārdha* of *Brahmā*'s life. *Purāṇic* scholars say that the first Day in the second *parārdha* of *Brahmā*'s life is called the *Sveta-Varāha* or *padma kalpa*." (commentary on *Bhāgavata Purāṇa* 3.11.37) [10] (*prathama-parārdhānte mahar-janas-tapaḥ-satyānāṁ dvi-parārdhānta-paryanta-sthāyinām anaṣṭānām api jala-plāvanaṃ tathā tatratyānāṁ sarveṣām eva kalpāyuṣāṁ brahmā-sāhitenaiva śrī-nārāyaṇe praveśam ākhyāya prathama-parārdha-samāptau dvitīya-parārdhasyādimaṁ śveta-vārāham eva pādmam āhuḥ*)

The essential point in the above commentary is that the *Brahmāṇḍa*, which is partially disintegrated at the beginning of each Night of *Brahmā*, was completely disintegrated at the end of the first half of *Brahmā*'s life (the first *parārdha*) and then reconstructed at the beginning of the second *Parārdha* (Figure 1).

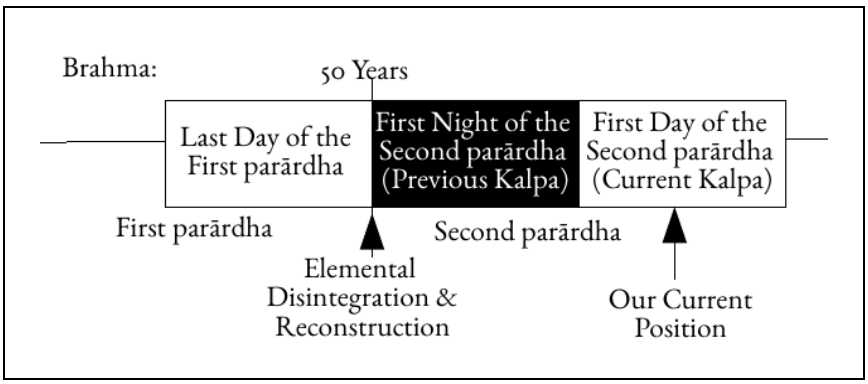


**Figure 1.** Elemental disintegration and reconstruction at the end of the first parārdha.

In summary, according to the above verses and the associated discussion, the Universe was completely disintegrated (*prākṛtika*) at the end of the last Day of the first *parārdha*. Since the duration of *Brahmā*'s life had not yet expired, the reconstruction of the fundamental elements (*sarga*) began immediately after the disintegration, and *Brahmā* reappeared on the top of the cosmic lotus. The reason why the elemental reconstruction takes place during the Night of *Brahmā* is that *Brahmā* needs these elements to reconstruct the lokas as soon as he wakes up. According to the *Bhāgavata Purāṇa* (3.10), *Śrī Prakṛti* creates the fundamental elements and *Brahmā* reconstructs using those elements.

As discussed above, we are currently in the Second *parārdha* of *Brahmā*'s life. The *Purāṇas* agree that we are currently in the first Day of this *parārdha*: "O *Dvijas*, the current *kalpa* is called *Vārāha*. This is the first Day." (VP 1.5.46)

(*yatsv ayaṃ vartate kalpo vārāhantaṃ nibodhata / prathamaḥ sāṃpratasteṣāṃ kalpo ayaṃ vartate dvijāḥ //*) According to this verse, we are currently in the first Day of the Second *parārdha* of *Brahmā*'s life. Since the Universe was disintegrated at the end of the last Day of the first *parārdha* of *Brahmā*'s life (in other words, at the end of the previous Day of *Brahmā*), the fundamental elements of the Universe were reconstructed at that time.

Since we are currently in the first Day of the second *parārdha*, *Śrī Prakṛti* must have performed elemental reconstruction during the first Night of the second *parārdha*. As discussed in Section 1, each *kalpa* is preceded by a *pratisaṃdhi*, which is the transition period between consecutive *kalpas*. Therefore, according to the *Purāṇas*, *Śrī Prakṛti* began the elemental reconstruction at the beginning of the *pratisaṃdhi* of the previous *kalpa*. In other words, at the end of *Brahmā*'s previous Day, the elemental reconstruction of the Universe began.

As calculated in Section 3, the previous *kalpa* ended 2281.392 million years ago. A *kalpa* lasts 4320 million years and a *pratisaṃdhi* (along with its *manvantara-saṃdhyā*) lasts 308.448 million years. Adding 4320, 308.448 and 2281.392 yields 6909.84 million years. Thus, according to the *Vāyu* and *Bhāgavata Purāṇas*, as well as the commentary of Śrīla Viśvanātha Cakravartī Ṭhākura, *Śrī Prakṛti* began elemental reconstruction 6909.84 million years ago. Since scientists now contend that the fundamental elements of the Universe first came into existence at the time of the Big Bang, this time corresponds to *Śrī Prakṛti's* most recent *sarga* (reconstruction of the fundamental elements of the Universe). The most recent scientific estimate for the age of the Universe, which is based on data from the Planck satellite, is 13801 ± 24 million years [N. Aghanim et al, *Planck 2018 results. VI. Cosmological parameters*, 2018, 5.04.2019, arXiv.org website: https://arxiv.org/abs/1807.06209]. If we double the *Purāṇic* date for the origin of the Universe, we obtain 13819.68 million years, which differs from the latest scientific value by a mere 0.1%.

## 6. Śrīdhara's factor-of-two

The *Viṣṇu Purāṇa* (1.3) has an elaborate discussion on the divisions of time. Larger units of time consist of multiples of smaller units of time. For example, thirty *muhūrtās* make a day. An important relationship is between *kalās* and *muhūrtās*. There are two opinions on this relationship. The literal translation of the text and other references [3, p. 22; 24], contend that thirty *kalās* make one *muhūrtā*, whereas the earliest and most widely accepted commentator, Śrīdhara Svāmī, wrote that sixty *kalās* make a *muhūrtā*: "*triṅśaṁ kalā ekā ghaṭikā te dve mauhūrttiko vidhiḥ*" (Thirty *kalās* make a *ghaṭikā* and two *ghaṭikās* make a *muhūrtā*." (commentary on Viṣṇu *Purāṇa* 1.3.7) [25]

In other words, *Śrīdhara*'s computation of the *Purāṇic muhūrtā* is twice as long as the traditional value. I resolve this conflict by hypothesizing that Śrīdhara Svāmī is stating that the *Purāṇic muhūrtā* is twice as long as the

traditional measurement. Thus, this introduces a factor of two in the traditional Indian computation of time.

In previous sections, I documented the fact that the dates obtained by multiplying traditional *Purāṇic* dates by Śrīdhara's factor of two bring them into close agreement with dates obtained by modern scientific methods for significant events in the history of the Earth, Solar System and Universe.

The first step in comparing *Purāṇic* dates with scientific dates is to note that there are a number of fundamentally different scientific dating methods, each of which is subject to different kinds of contamination. Although any one of these scientific dating methods could be wrong, the probability is essentially zero that all of these methods are wrong in such a way as to maintain a constant factor-of-two difference with *Purāṇic* dates over billions of years. There are three completely independent scientific dating methods discussed in this article: (1) radiometric dating, (2) sclerochronometry and (3) cosmological dating. Within radiometric dating, there are at least three different methods that are relevant to our thesis, namely potassium-argon, rubidium-strontium and the uranium series. The first two of these involve beta-decay only, whereas the uranium series involves both beta and alpha decay. Moreover, the half-lives of the parent radionuclides in these three methods are substantially different. Nevertheless, these different radiometric techniques all yield dates that are very close to each other over a range of 4.5 billion years. Within cosmological dating, there are two different methods: analysis of the cosmic microwave background radiation and analysis of baryon acoustic oscillations, both of which closely agree. These cosmological dating methods are totally different from the radiometric dating methods, but all the cosmological and all the radiometric methods yield dates that differ from *Purāṇic* dates by a factor of two. Thus, it appears that Śrīdhara's factor of two is to be applied in order to calculate Solar years from traditional *Purāṇic* time units.

## 7. Conclusion

This article reviews *Purāṇic* time units and notes the presence of a time unit, the *pratisaṃdhi*, which has hitherto escaped scholarly attention. This discovery, along with Śrīdhara's factor of two, appears to bring *Puranic* chronology in close agreement with that of modern science. I compared the date for *Matsya Avatāra pralaya* with Earth's Greatest Mass Extinction, the date for *Brahmā's* most recent *Visarga* with the origin of the Solar System, and the date for *Śrī Prakṛti's* most recent *sarga* with the origin of the Universe. Since this article hasn't exhausted the full stock of *Purāṇic* chronological information, it opens up a new frontier in *Purāṇic* research based on correlation with state-of-the-art scientific dating.

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