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## TIME MEASUREMENT FROM VEDIC PERIOD TO TWELFTH CENTURY

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**Abstract:** We are going to throw light on different units of time in ancient and medieval India.

**Keywords:** Arthaśāstra, Bhāgavatapurāṇa, Brahmapurāṇa, Muhūrta, Nimeṣa, Siddhāntaśekhara, Sūryasiddhānta, Tatpara, Truṭi, Vateśvarasiddhānta.

### Introduction

The need for appreciation of the time elements grew as the civilization progressed. Thus, time plays an important role in human life and human civilization. It affects not only human life but everything in the world.[4]

It is known to us that the ancient Indian intellectuals were conscious the knowledge of time. The Vedic Aryans had the knowledge of time in relation to sunrise, moon, sunset, day, month, fortnight, seasons, half year (ayana), year and yuga. [5]

The ancient Indians knew the practical measurement of time and divided the day initially into 30 muhūrtas or 30 nālikās. They estimated the units of time as follows:

- 360 days 1 year,
- 30 days 1 month and
- 30 muhūrtas 1 day.

It is to be noted that the various entities of time measurement were used in ancient and medieval India. They are:

1. Muhūrta
2. Paramāṇu
3. Truṭi
4. Tatpara
5. GuruvākṣarcchāraṇaKāla
6. Mātrā
7. Ucchvāsa
8. Prāṇa
9. Lava
10. Kṣaṇa
11. Nimeṣa
12. Kāṣṭha
13. Palam
14. Kalā
15. Naḍikā etc.

Here I describe briefly the various units of time measurement which were used in ancient and medieval India. They are as follows:

1. **Muhūrtas:** Muhūrta is the unit of Time. Many ancient Indian seers accepted the division of a day into thirty Muhūrtas. It is to be noted that one Muhūrta as of 48 minutes in the terms of modern unit of Time. According to Manusmṛti and Viṣṇupurāṇa (3<sup>rd</sup> century B.C. to 2<sup>nd</sup> century CE) that the 30 Muhūrtas make one day or dinam. The same concept can be found in Arthaśāstra of Kauṭilya (100 B.C to 2<sup>nd</sup> century CE) that is thirty Muhūrtas make one day. We see the similar concepts can be found in Bhāgavatapurāṇa and Brahmapurāṇa (600 CE to 1030 CE) i.e the thirty (30) Muhūrtas are equal to one day or dinam.
2. **Paramāṇu:** Paramāṇu is the unit of time in ancient and medieval India. The terms like Paramāṇu, aṇu, trasareṇu, āvali which occur in ancient Indian literature means to denote very minute items of matter, including minute span of time. It is difficult to evaluate them with any of the present known measures. According to Bhāgavatapurāṇa and Brahmapurāṇa (600 CE to 1030 CE)  
2 paramāṇu= 1 aṇu (0.000056 second),



3 aṇu = 1 trasareṇu (0.000167 second),  
 3 trasareṇu = 1 truṭi (0.0005 second).  
 According to Gaṇitasārasaṃgraha (850 CE) of Mahāvīra  
 2 Paramāṇu = 1 āvali.

“अनुण्वन्तरं काले व्यतिक्रामति यावति।”

स कालः समयोऽसंख्यैः समयैरावलिर्भवेत्॥“ ch-I, v.32 [1]

anuraṇvantaram kāle vyatikrāmati yāvati।

sa kāla ḥsamayoasaṃkhyaiḥ samayairāvalirbhavet।ch-I, v.32

Translated into English above verse as follows:

The time in which an atom (moving) goes beyond another atom (immediately next to it) is a samaya; innumerable samayas make anāvali. (Gaṇitasārasaṃgraha, ch-I, v.32) [2]

3. **Truṭi:** Truṭi is a very small unit of time. It has been mentioned by several authors that truṭi is different time equivalents which is as follows:

According to Kauṭilya’s Arthaśāstra, truṭi is equal to 0.06 second.

According to Bhāgavatapurāṇa and Brahmapurāṇa truṭi is equivalent to 0.0005 seconds.

According to Vaṭeśvarasiddhānta of Vaṭeśvara and Nārada Mahāpurāṇam consider truṭi as the time taken to pierce a lotus petal, which is equivalent to 0.000008 seconds of the modern time measurement.

Musical works refer to a truṭi of 8 to 16 nimeṣas or 1/10 of a guru.

A guru is the time taken to pronounce a guruvākṣara or a long consonant. Thus, the term truṭi appears to connote different lengths of time according to different authors.

According to Vaṭeśvarasiddhānta (850 CE) of Vaṭeśvara 100 truṭi equal to one lava that is of 0.0008 seconds in modern time.

100 truṭi = 1 lava (0.0008 sec.)

According to Arthaśāstra of Kauṭilya (100 B.C. to 2<sup>nd</sup> century CE.)

“द्वौ तुटौ लवाः।”

“dvau tuṭau lavaḥ।”

Translated into English as follows: “Two tuṭas from a lava.” [3]

2 truṭi (0.06 seconds) = 1 lava (0.12 sec)

According to Bhāgavatapurāṇa and Brahmapurāṇa (600 CE. to 1030 CE.)

3 trasareṇu = 1 truṭi (0.0005 sec)

100 truṭi = 1 Vedha (0.047 sec)

4. **Tatpara:** It is a small unit of time in early medieval and late medieval period of India. According to Siddhāntaśekhara (1040 CE.) of Śrīpati, Siddhāntaśiromaṇi (1150 CE.) of Bhāskara II and Sūryasiddhānta.

Tatpara constitutes 100 truṭis (0.003 secnds). Vaṭeśvara calls 100 truṭis as one lava, which is equivalent to 0.0008 seconds.

5. **Guruvākṣarochchāranakāla:** Guruvākṣarochchāranakāla or the time taken to pronounce a long consonant was considered as a unit of time. Generally, it is accepted as a space of 0.4 second. The term laghuvākṣara or short consonant and guruvākṣara or long consonant connote different time factors. The time taken to pronounce a short consonant is one laghu and two laghus make a guru in poetical works.

6. **Mātrā:** It is known to us that the term Mātrā is used in musical and poetical works. In both musical and poetical works, Mātrā is a fixed time limit. The time taken to pronounce five short syllables (laghuvākṣara) is considered as amātrā.

Kallinātha the commentator of Saṅgitaratnākara in his commentary gives a clear distinction between the mātrā of the poetical meter and the mātrā of musical meter. In connection with the poetical meter, the time taken to pronounce a short syllable is meant by the word mātrā, while in the musical time measurement (tāla) it should be regarded as the time measured in pronouncing 5 short syllables. Here the commentary on Saṅgitaratnākara also certain works on music and dancing differentiate the mātrā between mārgi and deśi styles.

In the former, the time taken to pronounce 5 akṣaras stand for amātrā, while in the latter it is equal to 4 akṣaras.

7. **Ucchvāsa:** Ucchvāsa is a unit of time in ancient and medieval India. According to Gaṇitasārasaṃgraha (850 CE) of Mahāvīra Ucchvāsa was considered as 1/7 of stoka. One Ucchvāsa is equal to 0.75 seconds.

8. **Prāṇa:** In ancient India Prāṇa is also a unit of time. According to Sūryasiddhānta and Brahmasphuṭasiddhānta of Brahmagupta Prāṇa is the time taken to pronounce 10 guruvākṣaras.



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According to Āryabhaṭṭīyam (499 CE) and Brahmasphūtasiddhānta (628 CE.) 10 gurvākṣaras is equal to one Prāṇa or 04 second in morden unit of time.

**9. Lava:** Lava is a controversial unit of time in ancient and medieval India. It seems to be a superficial measure. According to Vaṭeśvarasiddhānta the time taken to pierce a lotus petal is considered as lava.

According to musical works Rasakaumudī, (Ch.IV, 97-101), it is the time taken to pierce 800 petal by a needle.

According to Kauṭilyaone lava constitutes 2 truṭis.

According to Bhāgavatapurāṇa and Brahmapurāṇa, 300 truṭis make a lava (0.142 seconds).

**10. Kṣaṇa:** It is a unit of time in ancient and medieval India. According to Monier Williams, Kṣaṇa is a moment of twinkling of the eye or any instantaneous point of time.

According to Bhāgavatapurāṇa and Brahmapurāṇa Kṣaṇais of 5 nimeṣas (1.28 second).

According to the Nyāya works of Śrīdhara and Udayana, Kṣaṇa is the smallest unit of time (0.0035 seconds).

**11. Nimeṣa:** Nimeṣa is the most common unit of time in ancient and medieval India. It varies with each and every author. Nimeṣa literally means a wink or twinkling of an eye.

According to Vaijayanti, it is the time between two akṣarapatakas.

According to Kauṭilya 4 truṭis make one Nimeṣa.

According to Bhāskara II (1150 CE.) 3000 truṭis equal to one Nimeṣa.

According to Bhāgavatapurāṇa and Brahmapurāṇa 10,000 truṭis one Nimeṣa.

Nimeṣa is omitted by Āryabhaṭṭa, I as well as Mahāvīra.

In morden usage a nimeṣa is put as the equivalent of a minute.

**12. Kāṣṭhā:** It is a unit of time in ancient and medieval India. Kāṣṭhā also varies with each and every author for its duration of time.

According to Arthaśāstra of Kauṭilya Kāṣṭhā is 5 nimeṣa (1.2 seconds).

According to Bhāgavatapurāṇa and Brahmapurāṇa 15 nimeṣas is equal to one Kāṣṭhā (6.4 seconds).

Kāṣṭhā referred is equal to 1.16 seconds in Vedāṅgajyotiṣa

According to Manu and Bhāskara II Kāṣṭhā is 18 nimeṣas (1.6 seconds).

Nyāya works of Śrīdhara and Udayana consider Kāṣṭhā is equal to 3.2 seconds.

**13. PALAM:** It is a unit of time in ancient and medieval India. Palam mentioned by Bhāskara II (1150 CE.) and Vaṭeśvara (850 CE.) and it is equal of 24 second. This may be considered as equal to vināḍī of Brahmagupta.

**14. Kalā:** Kalā is a very well-known unit of time in ancient India. It has been accepted by several writers as equivalent to 30 kāṣṭhās.

According to Kauṭilya, a Kalā will be 36 seconds, while according to Siddhāntaśiromaṇi it will be 48 seconds.

Manusmṛti, Viṣṇupurāṇa and Siddhāntaśekhara refer to a Kalā which is equal to 96 seconds.

Kalā is a bigger unit of time which is mentioned in Vedāṅgajyotiṣa. According to this work, a Kalā will be equivalent to 2.4 minutes and 603 Kalās would make a day.

Kalā mentioned in the Abhidhānacintāmaṇi that it seems to be a very small unit of time comprising only 8 seconds.

## Conclusion

In the various astronomical units of time in ancient and medieval India were discussed here briefly. In the next paper, I may add some more units of time which are given between thirteenth century to 18<sup>th</sup> century CE. in details.

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