# Probabilistic Evaluation of Possible Dates of the Nirvāṇa of Lord Mahāvīra

Yashwant K. Malaiya
Colorado State University
malaiya@colostate.edu

This article presents a probabilistic perspective of the problem of identifying the date of the nirvāṇa of Lord Mahāvīra[1]. The article starts by examining the sources of uncertainly in the oral and written traditions and their impact on the reliability of evidence. It presents a probabilistic model for assigning reliability values to sources of information. It also considers modification of weights when synchronization among statistically diverse traditions can be obtained. The article takes the view that it may not be possible to exactly synchronize all the sources of information and thus a historian's task should be to identify an interval estimate rather than a point estimate, just as it is normally done with radiocarbon dating.

There are two separate motivations for attempting to date a significant event in the history of a religious tradition. Internally to the tradition, the date is needed to compile a consistent account of the religious tradition that can be narrated. The date is also needed for ritual purposes for annual and special celebrations. In Jainism, the anniversary of the nirvāṇa or Lord Mahāvīra is one of the most important events in the Jain festive calendar. To express the historical significance of the occasion, it is conventional to recall that this is the specific anniversary of the nirvāṇa[2]. The 2500th anniversary year of Lord Mahāvīra was celebrated widely in India in 1974, which was marked by publication of specially compiled books[3], construction of special temples[4] etc.

The academic researchers, on the other hand, examine available evidence critically, often questing the reliability of the sources of information. They try to reconcile diverse sources of information and propose dates of related or contemporary events. The researchers often differ, although many of them often attempt to converge to most common view. The views of the historians often drift gradually because of use of additional sources of information that may become available; or change in the approaches used to evaluate evidence.

## Need for a probabilistic perspective

There are some things we cannot know exactly based to the available information. This gives rise to a probabilistic perspective which are widely used in sciences, engineering, medicine etc. It is also applicable to history. For example, we do not know the exact date of birth of Sardar Patel, but we can be confident that he was born around October 1875, with an error margin of about a year. The famous Indian statistician Mahalanobis had identified the fact that ancient Jain principle of *syadvada* incorporates the modern theory of probability[5]. When we have multiple sources of information that generally agree with each other but not exactly, we need to use probabilistic methods to obtain the likely range of possible values.

**Sources of uncertainty**

Chronologies have historically been compiled using memory of individuals, oral traditions and textual traditions. Long chronologies are generally a result of interconnecting chronologies from different periods. In the monastic traditions, the chronologies take the form of Paṭṭāvalīs (Gurvavalis or Thērāvalīs). For royal linages, the average time step for a generation has been found to be around 20 years, as a result to female fertility patterns and primogeniture. However, for guru-shishya lineages, a single generation can be very short or very long.

There are a number of possible sources of errors. Individuals gradually lose the precision in things remembered with passage of time. In the past it was common for texts to be transmitted orally from teacher to student. With passage of time, texts get gradually altered or corrupted. Attempts to correct them may cause some information to be lost. When texts are written down on sheets (bhurja patra, tada patra or papers), the manuscripts decay with time and need to be copied after several decades or a few centuries. The process of copying manuscripts is also error prone. Sometimes an event may be correctly reported but its reported time may slide relative to the time of other events.

In the past, plurality of oral traditions was sometimes used to preserve the integrity of the texts. Assuming that the errors arise independently in each linage, an assembly of monks from several linages may be able to identify and rectify the errors. The same principle is used in modern times for compiling critical editions of texts by comparing multiple manuscripts.

The possible errors can include incorrectly remembered dates, missed generations, added generations (e.g. a Guru-bhāī may be taken as a Guru). Connecting partial linages may result in incorrect linkage.

Attempts to compile a chronology using different sources and reconciling the dates using some assumptions can also lead to errors. In some cases, the succession in a paṭṭāvalī may be correct but the dates associated may be incorrect. [6]

**Loss of reliability in traditions**

Reliability of oral memory decays with time. For example, it is generally hard for most families to recall names of their ancestors before 5th-6th generation. They may be able to compile their genealogies more reliably by consulting other branches of the family. Families that have a genealogy that was compiled and written down by someone a few generations ago, may be able to go back several more generations back.

Here I propose a probabilistic model for evaluation reliability of a report about an event that may have occurred in the past. I suggest the following components.

1.  A contemporary directly observed recording may be regarded to have perfect reliability, provided there is no bias in reporting and no error in observation. Thus

R(0) = 1                                                                                    (1)

Where the reliability R(t) is a function of the duration t between an event and its report. An implication of this is that an inscription or a physical manuscript records a contemporary event, the report may be taken to be completely reliable; provided there is no ambiguity in reading and interpretation of the inscription.

2. There is a loss of reliability with passage of time. A person remembers an event that he had directly observed with perfect (equal to 1 i.e., 100%) reliability. When the memory is passed using oral tradition the reliability decays with time and the value of the evidence asymptotically becomes worthless. Thus, the eventual value of the reliability is 0.5 where one concludes that the event may or may not have happened. Assume that the decay factor is the same for each period, the reliability is given by

$$R(t) = 0.5(1 + e^{-\lambda t})$$                                                         (2)

Where t is time in years and $\lambda$ is the decay factor per year.

Since the time between an event and its mention impacts its reliability, the article attempts to give a date for all sources of information. For some of the texts, only an approximate date is available however that should not significantly the reliability if the relative error is small.

3. When the information is written down, the decay is much slower since a manuscript can survive for a few centuries.[7] Thus

$$\lambda_p > \lambda_o > \lambda_w$$                                                       (3)

Where the decay factors $\lambda_p$ $\lambda_o$ and $\lambda_w$ characterize personal memory, oral tradition (as embedded in an orally transmitted text) and the written text (which is recopied time to time). The estimation of the decay factor values is a problem that needs to be addressed in future When some information about a contemporary event is inscribed on stone or on a metal plate, we can assume there is no decay in reliability.[8]

Determination of the absolute values of the decay factors will require further research. A preliminary assumption can be based on this hypothesis. A human generation (by birth) is regarded to be about 20 years whereas book will need to be copied in one or a few centuries. Taking a century to be equivalent to a human generation, we can make a preliminary assumption that $\lambda_o \approx 5x\ \lambda_w$. In a situation where sources of information are compared, a determination of the absolute values may not be needed.

A fact deemed to be more important is likely to be remembered with higher reliability.

4. When two or more relatively independent traditions mention an event, the reliability is higher compared with what is can be concluded using a single tradition. If the two traditions are not independent, a convergence does not significantly enhance the reliability. There exists some literature on combining multiple sources of evidence,[9] however they do not yet incorporate measures of dependence. We can state the reliability of the combined evidence R as

$$R = f(R_1, R_{2,}\rho) \tag{4}$$

Where R increases with increasing values of R1 or R2, and the increase is lower when ρ, a measure of correlation is higher. The determination of the function is a problem that needs to be addressed.

An absence of a supporting evidence (such as an archaeological evidence) does not reduce the reliability to zero. There have been instances of archaeological evidence emerging unexpectedly. Examples of discovery of Mathura excavations supporting the Jain thērāvalī during 1871-91[10], and discovery of Pontius Pilate in 1961[11].

5. Reliability of a tradition is lower if the tradition has a bias or a need to promote a certain historical perspective.

6. If a tradition is composed of several lineages that frequently interact with each other, the diversity will reinforce the reliability. Thus, the decay factor will be lower than that for a single lineage.

The problem of assigning weights to alternative dates and estimation of confidence intervals will be an iterative problem where the results will get refined with each new scholarly investigation. The framework presented in this paper will also be applicable to other dating problems in history, where intuitive judgement can potentially be replaced with analytical methods.

In this paper, we use the six components of the probabilistic model implicitly. An explicit quantitative evaluation will need further work. The duration between an event and its specific mention in a text or inscription impacts its reliability. Thus, the date of each text is identified as a guide. For many books, its exact year of composition is not known, for them I have used the date generally given by scholars.

**Uncertainty in the dates of teachers of the Axial Age**

For a perspective on historical uncertainty, let us examine Zarathustra and Gautam Buddha, two other major figures of the Axial Age, and the Jesus of Nazareth. There has been a significant variation in the assumed date of the nirvāṇa of Gautam Buddha, the founder of Buddhism[12] which is discussed in detail below.

The Chinese visitor Xuanzang (602 – 664 CE), visited Kuśinagara, the site of the Buddha's nirvāṇa in 646 CE. He commented about the uncertainty about the time that has passed since the Buddha's nirvāṇa:

> "Some say more than 1,200 years, some say more than 1,300 years, some say more than 1,500 years; some say that 900 years have already passed, but not yet 1,000 years". [13]

These correspond to 554 BCE, 654 BCE, 854 BCE, and between 354 and 254 BCE. It is notable that the collective view of the prominent scholars about the Buddha's nirvāṇa has changed with time. At one time many western scholars generally agreed that the date is within a few years of 480 BCE. [14] In the 1991 conference, the general view was that the nirvāṇa occurred later, but there was no consensus on how much later.

There is considerable uncertainly in the dates of Zarathustra, the founder of Zoroastrianism. Zoroastrian text Bundahishn, mentions that he lived 258 years before Alexander conquest in 330 BCE, placing him in the 6th cent BCE during the axial age. However Greek authors place him 600 or 6000 years before Xerxes I's invasion of Greece in 480 BC. Mary Boyce, relying on the similarity of the languages of the Rigveda (c. 1700–1100 BCE) which is presumed to be from and the Gathas in Avesta, places him sometime during 1500 and 1000 BCE

The dates of Jesus of Nazareth, the founder of Christianity have less uncertainty because events in the Gospels can be dated using contemporary events in the Roman history. He was born in Herod's reign (36-1 BCE) according to Luke and Matthew. Scholars have generally converged round 4-6 BCE and CE 30 to 33 for the years of his birth and death, although the scholars differ by a few years. Christmas, the presumed date of his birth became established only in 336 AD. It is often believed that the date corresponded to existing Roman festivals of Winter Solstice or Saturnalia.

**Uncertainty in radiocarbon dating**

Radiocarbon dating method was developed by Willard Libby in 1940. Living vegetable matter absorbs radioactive carbon ($^{14}$C) during its lifetime, which gradually decays into ordinary carbon $^{12}$C with a half-life of 5,730 ± 40 years.  Measuring the ratio $^{14}$C/$^{12}$C allows an estimate of when the organic material stopped living. Consumption of vegetable matter by animals and humans passes $^{14}$C into them. For example, some bhūrja-patra manuscripts from Afghanistan have been dated and found to from 130 AD to 250 AD[15]. The range represents the margin of error.

It has been found that the absorption and decay is not completely contact and thus calibration of the dates is needed using samples with known dates, for example using tree rings.  A margin of error is computed which gives a range of most likely dates using statistical approaches.

Excavations in 2011 and 2013 at Lumbini at the Mayadevi temple, the presumed birth site of the Buddha has yielded materials that were dated to 799–546 BCE (**2σ**) or 793–751 BC (**1σ**) and 801–548 BCE (**2σ**) and 796–752 BCE (**1σ**) [16]. Some samples were much older. They conclude that a pre-

Mauryan wooden temple stood at the site, thus pushing the date of the life of the Buddha to earlier dates. Richard Gombrich has however questioned their conclusions.[17] Notable observation here is that for the time period generally under consideration here, even if organic material is available, the radiocarbon dating may yield an error margin of four to 25 decades. Charred bone fragments believed to the remainders of the Buddha and his immediate disciples are available, but they have not yet been subjected to radiocarbon dating, although it has been attempted for 13th century remains of Buddhist masters in Japan[18].

### Analysis of the sources of information

Here we first consider the approach that has been widely used by historians although has not been explicitly explained. Generally, the time of each event is given relatively to another event. There is often some inherent inaccuracy in recording of such durations and a historian's challenge to determine the most likely sequence of interconnected events.

The modern reference point is the beginning of the Common Era (CE), also termed Gregorian era, where AD stands for Anno Domini, Latin for "in the year of the Lord", and BC stands for "before Christ". Historians now prefer to use CE (Common Era) and BCE (Before Common Era). For the purpose of this analysis, it is useful to consider two reference points that can be fixed with almost complete certainty relative to the common era. Here we term them anchor points.

### Anchoring of historical dates in India

Here we consider two anchor points relative to which other events may be dated for the study of the date of Lord Mahāvīra's nirvāṇa. The first is the date of the accession of the Maurya ruler Aśōka which can be determined with considerable certainty and thus provides a valuable anchor for the historical dates. Numerous inscriptions of Dēvānampiya Piyadasi have been found in and around India, who is generally identified as Aśōka Maurya.[19] Aśōka's Rock Edit No. 13 provides a synchronization with several Hellenic rulers. It states:

> When king Devanampriya Priyadarsin had been anointed eight years, the Kalingas was conquered by (him). .. But this by Devanampriya, viz, the conquest by morality. And this (conquest) has been won repeatedly by Devanampriya both [here] and among all (his) borderers, even as far as at (the distance of) six hundred yojanas where the Yona king named Antiyoga (is ruling), and beyond this Antiyoga, (where) four kings (are ruling), (viz, the king) named Tulamaya, (the king) named Antekina, (the king) named Maka, (and the king) named Alikyashudala, (and) likewise towards the south, (where) the Chodas and Pandyas (are ruling), as far as Tamraparni.[20]

This edict is extremely valuable. The names of the Yavana (Greek) kings can be identified as Seleucid Antiochus II Theos (286 – July 246 BCE), Ptolemy II Philadelphus (309 – 28 January 246 BC) of Egypt, Antigonus II Gonatas (320 – 239 BC) of Macedon, Magas of Cyrene (276-250 BCE) and Alexander II of Epirus (272 - 242 BC), who can be dated reasonably reliably using various sources. This makes the dates of rule of Aśōka 268 to 232 BCE.  The dates of his father Bindusara

are estimated to be 297-272 and his grandfather Chandragupta Maurya 324 or 321 to 297 BCE. Megasthenes was an ambassador of Seleucus I Nicator, as quoted in Greek texts, in the court of Chandragupta. Thus Chandragupta was contemporary to Alexander the great (332-323 BCE). These facts make the date of the accession of Aśōka (and the related date of Chandragupta Maurya, see Appendix 2) a valuable anchor point.

Another anchor in Indian history is the beginning of the Śaka era which is believed to have begun with the accession of a Śaka ruler. There had been some disagreement about who he was. Historians now believe that he can be identified with Chashtan who became the satrap of Ujjain. In any case, the Śaka samvat is a well-known era widely used in India that started in 72 CE. It had been the standard era for astronomical computations. The term Śaka Samvat was explicitly used first in Varahamihir's Panchasiddhantika (Śaka Samvat 427 = 505 CE). It always starts with Chaitra Shukla 1, although the months are Pūrṇimāṁta in North and Amāṁta in South (including Gujarat and Maharashtra), like in the Vikram Samvat. The Vikram Samvat is obtained by adding 135 to the Śaka Samvat, however the Vikram Samvat[21] starts in Chaitra in north but Kartika in South. The Vikram Samvat has been widely used in North India[22] although Śaka is also sometimes encountered.

Another potential anchor in Jain history can be the date of the Valabhi assembly organized by Devardhigaṇī Kśamāśramaṇa and following that first recitation of the Kalpasutra in the assembly of Dhruvasena by Kālakācārya. The date of Valabhi assembly is said to either 980 or 993 years after Lord Mahāvīra's Nirvāṇa. The disagreement suggests possible disagreements among the traditions. Unfortunately, the date of Dhruvasena can be determined with a high reliability. There are several inscriptions of kings named Dhruvasena. The period of the first Dhruvasena is said to be from 526 to 550 CE. However, the tradition about Dhruvasena is not regarded to be reliable by some of the scholars and thus this is not considered to be an anchor point[23].

One of the most important facts that can help in fixing the date of the nirvāṇa of Lord Mahāvīra is the contemporaneity of Lord Mahāvīra and the Gautama Buddha and the numerous mentions of Nigaṇṭha Nātaputta (Mahāvīra) and his ascetic followers who are termed Nigaṇṭhas in the Pali Tripitaka texts. Many lay followers of Mahāvīra are also mentioned.

**Synchronization of the dates of Mahāvīra and Buddha**

An attempt to date the nirvāṇa of Lord Mahāvīra has to include an examination of the dates of Gautama Buddha, sometimes called Shakyamuni because of the clan he was born in. Buddhist tradition believes that there were earlier Buddhas, however since only the last one is under consideration here, he is simply termed the Buddha.

Almost all scholars believe that the Buddha and Mahāvīra, who is called Nigaṇṭha Nātaputta in the Pali texts were contemporary. This assumes Nigaṇṭha Nātaputta is Mahāvīra. The assumption has been questioned [24], however there is however no doubt that Nātaputta is indeed Mahavira. Mahavira belonged to the Jñātṛ clan, which is also referred to as Nāya or Nāta[25]. In Daśavaikālika Mahāvīra is specifically called nāyaputta. Nigaṇṭha specifically identifies the Jain tradition within

the Jain and Buddhist literature. Also, the demise of Nigaṇṭha Nātaputta at Pāvā is specifically noted in the Pali texts in conformance with the Jain tradition.  This contemporaneousness provides a valuable linkage for the two dating problems. The discussion here is based on the Pali cannon known as Tripiṭaka. These texts were reduced to writing very early in Sri Lanka around 29 BCE on palm leaves. That is about 454 years after Buddha's nirvana and thus regarded to have high reliability.

There has been significant disagreement among the scholars about which one of the two teachers was younger. The Pali texts (Majjhim Nikāya, Samāgama Suttāṁta 3-1-4 and Digha Nikāya, Pasadika Sutta, 3-6) explicitly mention that the Buddha had heard about the passing of Mahāvīra at Pava which caused a split in the sangha of Mahāvīra. [26]  The temporal accuracy of the sutras mentioning Gautama Buddha hearing about the death of Mahāvīra has been questioned by some scholars who believe that the Buddha was older. They regard this error was caused because of the mistakes made in compilation of the sections of the Tripitaka.

One of the arguments used to support the hypothesis that the Buddha was older is based on a passage In Digha Nikāya [27]. A mahamatya of Ajātaśatru (Kunika) refers to Nigaṁṭha Nātaputta as ardha-vaya-gata, i.e. middle aged. Taking the human lifespan to be 100 years, ardha-vaya-gata may be interpreted to mean he was about 50. In the Jain tradition, Lord Mahāvīra's nirvāṇa is said to have occurred during the 22nd years of Ajātaśatru's rule whereas in the Buddhist tradition, the Buddha's nirvāṇa is thought to have occurred during the 8th year of Ajātaśatru's rule. This implies that when Mahāvīra was about 50 years old, the Buddha was 80-8 = 72 years old, implying that Mahāvīra was about 22 years younger. [28] However, Sukhlal Sanghavi and Muni Nagaraj interpret the passage as implying that the Buddha was younger.

We however should note that in addition to the two mentions of the Buddha hearing about the passing of Mahāvīra, there are several incidents mentioned in the Buddhist texts that mention that the Buddha or his disciples met several followers of Mahāvīra, implying that Mahāvīra had been teaching for a many years before the Buddha commenced his teaching.

In two mentions, the Buddha is explicitly mentioned as a younger person. In Sutta Nipat Sabhiya Bhukshu wonders – when the aged philosophers, Purana Kashyap, Nigaṁṭha Nātaputta etc could not answer my questions, how can a young shramana Gautama answer them? In Dahara Sutta of Sanyukta Nikāya king Presenjit asks when Purana Kashapa, Nigaṁṭha Nātaputta etc do not talk about samaka sambodhi, how can you since you are younger and newly initiated. [29]

The Pali texts mention several devout followers of Nigaṁṭha Nātaputta that were later attracted to the teachings of the Buddha. The narrations remind one of stories of conversion in the missionary literature.  While the descriptions involve obvious sectarian bias, the mentions clearly imply that Lord Mahāvīra started teaching earlier. These include the following[30]:

- Mṛgāra śrēṣṭhī is mentioned as a devout follower of the Nirgranthas but his daughter-in-law favored the Buddha because her parents were followers of the Buddha.

- Siṁha Sēnāpati of Vaishali is said to have been a follower of the Nirgranthas who visited the Buddha. Buddha was able to influence him. Vinaya Pitaka Mahavagga Bhaishajya Khandaka narrates an incident according to which Simha fed meat to the Buddha and his sangha. After that numerous Nirgranthas are described as condemning the Buddha for having eaten meat. While the passage reflects rivalry between the two groups, it implies that that the Nirgranthas were well established in Vaishali.

- Dirgha Tapasvi, a Nirgrantha of Nalanda and Upāli Gṛhapati are said to have been followers of Nigaṁṭha Nātaputta. Majhim Nikāya Upāli Suttanta 2-1-6 mentions discussions between them and the Buddha.

- Majjim Nikāya, Abhaya Rajakumara Suttanta 2-1-8 mentions a prince Abhaya of Rajagrih who a follower of Nigaṁṭha was Nātaputta. According to this text, he sought advice from Lord Mahāvīra about how to debate the Buddha. He then visited the Buddha and eventually accepted him.

- There are several other mentions of the Nigaṁṭhas and their followers.

It is notable that the Jain texts do not mention the Buddhist activity during the time of Mahāvīra. While that can be interpreted as Nirgranthas (Jain monks) being indifferent to the activity external to them, it also suggests that the Buddhist sangha was established later which attempted to attract followers of the established order.

With the overwhelming evidence from the Pali texts about the Buddha being younger, I would question the supposed "generally agreed" dates among some of the scholars for Mahāvīra's nirvāṇa of 468 BCE and Buddha's nirvāṇa of 480 BCE.[31]

**Buddha's Nirvāṇa**

This is an overview of the widely researched question of the date of Buddha's Nirvāṇa. Multiple sources of information have been examined.

In Sri Lanka Dīpavaṁsa is believed to have been compiled during 3-4th century CE. Mahāvaṁsa, a more literary text was compiled during the 5th century CE. According to their chronology the Buddha's nirvāṇa occurred in 544 or 543 BCE. This is referred to as the *Ceylonese or long chronology*. This is the traditional chronology in the Theravada countries and was the basis of the 2500th Jayanti celebration in India in 1956. According to this chronology, Aśōka's accession occurred 218 years after the Buddha's nirvāṇa, which suggests that there may have been an error of about 55-65 years. The *Dotted record* of Canton yields a date of 486 BCE. Subtracting the presumed error moves the date to about 480 or 486 BCE. This is referred to as the *corrected long chronology*.

Some Sanskrit texts such as Mahāmēghasūtra (about 3rd century CE) place the nirvāṇa about 120-160 years before Aśōka, which give rise to short chronologies[32]. Eggermont has proposed the

date of Buddha's nirvāṇa as late as 262 BCE, making Mahāvīra and Buddha contemporary to Aśōka[33] (see Appendix3). This date appears to be clearly unreasonable.

One of the reasons many of the 52 scholars who participated in the 1991 Symposium at Gottingen were included towards later dates is the results of the archaeological exploration of related sites. For example, Hartel referes to the finding that *new* Rājagṛha has radiocarbon dates lying between 245±105 to 265±105 BCE. A.K. Narain points that that those findings refer to the new Rājagṛha and the *old* Rājagṛha. As discussed above, an absence of archaeological support can be misleading. Many of the older sites were situated on riverbanks with wood being the common building material. Floods can wash away the traces of the settlements. Settlements also tended to shift.


### Possible dates for the Nirvāṇa of Lord Mahāvīra

Researchers have proposed several possible dates for the nirvāṇa of Lord Mahāvīra.[34] The Jain scholars of both sects almost unanimously agree with the traditional date that serves as the basis of the Vīra Nirvāṇa Samvat that begins in 527 BCE[35] (specifically Oct 15, 527 BCE), although there are a few alternative dates in the Jain tradition that are sometimes encountered, directly or implied, in the writings of 20th century as well as some medieval authors. There exist several paṭṭāvalīs/thērāvalīs that start with the nirvāṇa of Lord Mahāvīra and have continued to modern times, where attempt can be made to synchronize them with identifiable secular events.

Tilōyapaṇṇatti of Yativṛṣabha (estimated 6th cent CE[36]) mentions four traditions regarding the time elapsed between the nirvāṇa of Mahāvīra and when the Saka became king (i.e., beginning of the Saka era).[37]

1. 461 years
2. 9785 years[38]
3. 14793 years
4. 605 years and 5 months. This yields 527 BCE as the date of the nirvāṇa.

Tilōyapaṇṇatti is an encyclopedic compilation of numbers and computations from the Jain tradition. Yativṛṣabha did not have any comments about the four traditions, he just reports them without implying any preference. Note that the mention of 5 months makes the fourth date more specific, which may be taken to mean it came from a more detailed memory.

Dhavala commentary of Acharya Vīrasēna (780 CE) mentions the fourth and third view, and also gives 7995 years as the difference. He also quotes an old gatha in support of the fourth view[39] suggesting that the gatha had some specific historicity.

'पंचयमासा पंच य वासा छच्चेव होति वाससया / सगकालेण य सहिया यावेयव्वो तदो रासी

A nearly identical verse occurs in Titthōgālī Painnaya a Śvētāmbar Agamic text. The date of its composition is not known[40], but it can be presumed to go back at least as far as the Valabhī Vāṁcanā (about 453 or 466 CE).

The same 605 years and 5 months duration is mentioned by Jinasena's Harivaṁśa Purāṇa (783 CE) Nēmicandra's Trilōkasāra (973 CE), Merutunga's Vicāra Śrēṇi (1306 CE, but quoted from an older source). Some texts mention the duration between the nirvāṇa of Lord Mahāvīra and beginning of the Vikram era as 470 years. They include the Prakrit Paṭṭāvalī of Nandisangha, Tapagachchha Paṭṭāvalī, Avashyaka Vritti of Haribhadra (about 775 CE) Since the Vikram era began in 57 BCE, they support the traditional date of Nirvāṇa being 527 BCE.

A. Shantraj Shastri, a Digambara scholar, had regarded the Śaka samvat as the Vikrama Samvat and thus regarded the nirvāṇa to have occurred 605 years before the Vikram era which yields 663 BCE as the data of Mahāvīra's nirvāṇa. The view has however been considered to be a mistake by other Digambara scholars[41].

It is sometimes said that there is disagreement between the Digambara and Śvētāmbar Jain traditions, that is however incorrect. Practically all traditional Jain authors of both traditions agree on a single date.[42]

The other anchor point is the during from Mahāvīra's nirvāṇa to the accession of Aśōka or his grandfather Chandragupta Maurya. In Hemacandra's Sthiravali in Pariśiṣṭaparvan (12th cent CE), Chandragupta's accession is said to have occurred 155 years after Mahāvīra's nirvāṇa. This would imply a date of 477 BCE for the nirvāṇa of Mahāvīra with a margin of perhaps a decade. Notably elsewhere Hemacandra supports the traditional date implying 527 BCE. Using the principle of the loss of reliability with time, a 12th century text would be regarded to be significantly less reliable than texts that are 6-8 century older. While Hemacandra was a very thorough scholar, the tradition about the 155-year gap was likely received using an oral tradition, since it is not mentioned in an earlier text. The list given in the Sthiravali has some archaeological support and the sequence is likely to be of high accuracy. However, the 155 year difference may have been a relatively insignificant fact and may not have been remembered accurately. Titthōgālī Painnā states that the Palakas reigned for 60 years after the nirvāṇa of Lord Mahāvīra followed by the Nandas who ruled for 155 years when the Mauryas started.

It has not been noted by the scholars that Tilōyapaṇṇatti mentions a tradition that held that the onset of the Śaka era occurred 461 years after the nirvāṇa of Lord Mahāvīra. Relative to the generally accepted date of 605 years, this implies a date later by 144 years. Hemacandra's 155 year duration to Chandragupta's accession implies a date later by 50 years. Thus, this cannot be considered to be supporting Hemacandra's statement however it potentially can serve as an argument for a later date.

In the paṭṭāvalīs of both sects, Chandragupta is said to be a contemporary of Bhadrabāhu. They are mentioned together in inscriptions dating back to about 600 AD.[43] The dates given for

Bhadrabāhu in the Himavant Sthiravali and Parishishta parvan are 156-170 after Mahāvīra's nirvāṇa. In the Digambara Paṭṭāvalīs he is said to have lived until 162 years after Mahāvīra's nirvāṇa. These dates in the paṭṭāvalīs do not match the historical dates of Chandragupta if we use the date of Mahāvīra's nirvāṇa as 527 BCE. Using a date later by about 50 years will make Bhadrabāhu contemporary with Chandragupta.

It is notable that Titthōgālī Painnaya gives four successive verses 620-622 that state that Pālaka was anointed king in Avanti the night of Mahāvīra's nirvāṇa; after that Pālaka dynasty ruled for 60 years, and then Nanda dynasty for 155 years, then Mauryas for 108 years and Pushyamitras for 30 years. They were followed by Balamitra-Bhanumitra for 60, Nahasena for 40, Gardbhilla for 100 years followed by the origin of the Śaka era[44]. Verse 623 however then states that 605 years and 5 months after Mahāvīra's nirvāṇa. This is puzzling because 60+155+108+30+60+40+100 = 553, which is 52 years shorter. The discrepancy was noted by Kalyan Vijaya but was dismissed as an error.[45] We could take the verses 620-622 as supporting a date later by about 50 years.

It is notable that overwhelming majority of the authors in both Digambara and Śvētāmbar traditions accept the date of 527 BCE. That is significant considering the two traditions separated several centuries ago. The most common assumption is that the lineages separated after Bhadrabāhu (about 3rd cent BCE) [46]and even after a separation of about 8-9 centuries still generally agreed on a common date. Jaini traces the division to the split reported in the Buddhist texts that is said to have occurred right after Mahāvīra's nirvāṇa.[47] However on the other hand there is some evidence that a clear split did not occur until the Valabhi council[48], and the Vividha Tīrth Kalpa suggests that separation was not complete even in the 14th century CE.

There have been attempts to date Mahāvīra's nirvāṇa using astronomical data in Jain texts. These approaches need further examination.

**Observations on futility of attempting to find a deterministic reconciliation**

Even if any objects associated with the nirvāṇa of Lord Mahāvīra were available that could be carbon-dated, there would still be some uncertainty of several decades, as we have seen with the objects excavated from Māyadēvī temple at Lumbini. In the past some of the Jain and Buddhist scholars were aware of the uncertainty, as Yativṛṣabha and Xuanzang has observed. I believe that we can be reasonably confident that the nirvāṇa of Lord Mahāvīra occurred within a few years of the 527 BCE to 482 BCE range. This is a significantly narrower range compared with what Yativṛṣabha had encountered.

In the past this diversity of dates was never of concern to ordinary Jains and Buddhists, who used the secular Śaka and Vikrama eras. The reckoning based on the nirvāṇa dates was used only occasionally for religious purposes. In India Vira Nirvāṇa Samvat became popular among the Jains during the early 20th century as a result of increasing awareness of the Jain identity. Now several organizations publish special Jain calendars, and the Vira Nirvāṇa Samvat is included in the commercial Hindu calendars. It is possible that the Buddhist Era also came into common use in

Theravada countries (Sri Lanka, Myanmar, Thailand, Cambodia) in the early 20th century. This brings focus on research on the dates of the nirvāṇa of the two teachers.

The researchers have attempted to identify specific nirvāṇa dates for Lord Mahāvīra and Lord Buddha and have attempted to reconcile all the major dates. For example, Sagarmal Jain in his careful analysis seems to have preferred 467 BCE for Mahāvīra and 482 BCE for the Buddha, although he acknowledges some support for the 527 BCE. The date of 467 BCE for Mahāvīra would satisfy reconciliation with some of the archeological findings. However, that would be contrary to the overwhelming evidence from multiple mentions the Pali texts that clearly imply that the Buddha was younger.

It appears that there might be multiple independently occurring inaccuracies in the Jain and Buddhist chronological traditions and it may not be possible to satisfy all the major assumptions that are accepted. If the views shared at the 1991 Symposium at Gottingen are a guide, a consensus might be hard to achieve. This thus remains a fascinating research problem. The six mathematical principles proposed above will help in evaluating the assumptions quantitively while minimizing personal inclinations. Further research is needed to develop methods that will be applicable to the problem of identifying the probability distributions and interval estimates.

## Conclusions

The date of 527 BCE behind the existing Vira Nirvāṇa Samvat, which is accepted by all the Jain sects is historically reasonable. A date in the vicinity of 467 BCE suggested by some scholars, appears to provide a better fit with some of the connected historical events. However, it is based on a single comment from a 12th century text by Hemacandra who had himself adhered to the common date of 527 BCE elsewhere[49]. Thus, for ritual purposes there is no need to seek an alternative. For the purposes of historical research, the quantitative methods given in the six-point probabilistic model needs to be further developed and applied to available sources of information. The determination of this and other related dates will be an iterative process to obtain a scenario with maximum likelihood. It is unlikely that a deterministic scenario can be obtained and thus the perspective has to be probabilistic.

## Appendices

### Appendix 1: An example of errors in Paṭṭāvalīs

A well-known paṭṭāvalī from the Digambara tradition is the Mūla Saṃgha Balātkara Gaṇa Sarasvatī Gaccha paṭṭāvalī. Several Bhaṭṭaraka seats represented branches of this tradition. They are all extinct with the exception of original seat at Humcha in Karnataka. Prof. Hoerncle had two

articles published in Indian Antiquary, in Oct 1891 and March 1892[50]. The paṭṭāvalīs belong to Nagaur (written sometime after 1873) and Amer/Jaipur (written after 1765, 1822, and 1898).

Johrapurkar has provided a a compilation of a large number of inscriptions and colophons which can be used to construct reliable terminal dates of many of the Bhaṭṭarakas[51]. Here are the dates given in Paṭṭāvalī E written after 1880 and the dates determined by Dr. Jyotiprasad Jain[52] (the same dates are given in Johrapurkar's Bhaṭṭāraka Sampradaya) based on inscriptions and colophons of manuscripts.

| Bhaṭṭāraka | Date in Paṭṭāvalī E (AD) | By Jyoriprasad Jain (AD) | Difference |
|---|---|---|---|
| Prabhācandra | 1318 | 1253 | 65 |
| Padmanandi | 1328 | 1368 | -40 |
| Śubhacandra | 1393 | 1418 | -25 |
| Jinacandra | 1440 | 1450 | -10 |

This suggests that the dates for Jinacandra are almost correct, suggesting that the Paṭṭāvalīs might have been constructed shortly after the Bhaṭṭāraka Jinacandra. The error increases as we go backwards in time.

**Appendix 2: Haryanka and Maurya dynasties**

For reference, the relevant succession lists of the two dynasties are given below.  The Haryanaka dynasty was ruling when Mahāvīra and Buddha were teaching. Biṁbisāra is referred to as Śrēṇika in the Jain tradition. The Maurya dynasty was founded by Chandragupta who is mentioned as being contemporary with Bhadrabāhu, the last shruta-kevali.

| Haryanka dynasty (dates are according to the Jain tradition) | |
|---|---|
| Biṁbisāra or Śrēṇika | 544–492 BCE |
| Ajātaśatru or Kuṇika | 492–460 BCE |
| Udayin | 460–444 BCE |

| Maurya Dynasty (dates are given according to the views of modern historians) | | |
|---|---|---|
| Candragupta | 24 | 322-298 BCE |
| Bindusāra | 25 | 298-273 BCE |
| Aśōka | 36 | 268-232 BCE |

**Appendix 3: Evolution of scholar's opinions about the nirvāṇa of Lord Mahāvīra**

This table gives the dates of how the opinions of the scholars have evolved during the past century.

| Date Suggested (BCE) | Researcher | Publication |
|---|---|---|
| 526, 477 | V Herman Jacobi | 1891, 1930 |
| 467 | Jarl Charpentier | 1914 |
| 545 | K.P. Jayaswal | 1917 |
| 663 | A. Shantiraj Shastri | 1941 |
| 528 | Jugalkishor Mukhtar | 1956 |
| 528 | Jyotiprasad jain | 1964 |
| 528 | Muni Kalyanavijaya | 1966 |
| 528 | VA Smith | 1969 |
| 527 | Muni Nagraj | 1969 |
| 252 | P.H.L. Eggermont, | 1991 |
| 467, 528 | Sagarmal Jain | 1998 |

## References

[1] This article is based on a presentation by the author at the International Symposium on Dating Mahavira Nirvana, July 9-10, 2022 at Naval Veerayatan, Pune, India.

[2] Diwali 2021 was celebrated as the 2547th.

[3] For example, Bharat ke Digambar Jain Tirth Part 1-4, Balbhadra Jain, Bharat Varshiya Digambar Jain Mahasabha, 1974-1978. Part 5 by Rajmal Jain was published in 1988.

[4] For example, the Samosharana temple of Kundalpur was constructed in 1974.

[5] P.C. Mahalanobis, The Indian-Jaina Dialectic of Syadvad in Relation to Probability, Dialectica 8, 1954, p. 95–111.

[6] The well-known paṭṭāvalī of Mula-Sangh Balatkara-Gana Sarasvati-Gachchha appears to have the correct dates for the Bhaṭṭarakas who reigned around the time when the paṭṭāvalī was compiled. Going back in time, the names appear to be in the right order but the dates available from inscriptions do not match the paṭṭāvalī well. Please see Appendix 1.

[7] Many tāḍa-patra manuscripts available today are up to 4-5 centuries old. Older tāḍa-patra manuscripts exist some going back to about 12th century, but they are relatively uncommon.

[8] This assumes that there is no error in inscribing, reading or interpreting the inscription.

[9] Fabrice Daniel, Bayesian and Dempster-Shafer models for combining multiple sources of evidence in a fraud detection system, 15 Apr 2021, https://doi.org/10.48550/arXiv.2104.07440

[10] Smith, Vincent Arthur (1901). The Jain stûpa and other antiquities of Mathurâ. Allahabad: K. Frank Luker, Superintendent, Government Press, North-Western Provinces and Oudh, p. 1-6

[11] James J. C. Cox, Pontius Pilate and the Caesarea Inscription, (1975). Faculty Publications. 4028.

[12] According to the Buddhist tradtion, there were other Buddha who preceded Gautam Buddha. Aśōka had visited the stupa of Konagaman Buddha, a previous Buddha, and had left a pillar edict there.

[13] Antonello Palumbo, What Chinese sources really have to say about the dates of the Buddha, XVIth Congress of the International Association of Buddhist Studies, Dharma Drum Buddhist College, Jinshan, Taiwan, 22 June 2011, 20 pages.

[14] H. Bechert, Introductory Essay: Scope of Symposium and Question of Methodology in The Dating of the Historical Buddha, Part 1, 1992.

[15] Scrolls confirmed asoldest Buddhist texts, Barney Porter, The World Today, 9 March, 2006.

[16] R.A.E. Coningham, K.P. Acharya et al, The earliest Buddhist shrine: excavating the birthplace of the Buddha, Lumbini (Nepal), ANTIQUITY 87 (2013): 1104–1123.

[17] Richard Gombrich, Pseudo-discoveries at Lumbini, Oxford Center for Buddhist Studies, Oxford University, 27th November 2013

[18] T. Nakamura, S. Sagawa et al, Radiocarbon dating of charred human bone remains preserved in urns excavated from medieval Buddhist cemetery in Japan, Nuclear Instruments and Methods in Physics Research B 268 (2010) 985–989.

[19] Attempts have been made to use astronomical information in Mahabharata to come up with a chronology that supports some of the Puranic dates that differ widely with those generally accepted by academic historians. For example, see B. N. Narahari Achar, The Mahabharata War: It's Date on the basis of Astronomical References in
Origin of Indian Civilization, Edited by Bal Ram Singh, D K Print World, New Delhi, India (2010), Pp. 202-252.

[20] E. Hultzsch, Inscriptions of Asoka. New Edition. In: Corpus Inscriptionum Indicarum vol. I. Oxford: Clarendon Press, 1925.

[21] The common era year is obtained by subtracting 57 or 56 from the Vikram era. Exact date conversion can require careful computations because the common era using a tropical year. See Pancanga (version 3.14) March, 2014: by M. Yano and M. Fushimi.

[22] Yashwant K. Malaiya, "The Sravakas of Madanasagarpura in the Chandel Period" Anekanta, July-Sept. 1993, p. 13-18.

[23] Madhukarmuni, Kanhaiyalal Maharaj, Trilokmuni, Devendramuni, Ratanmuni, Trini Chedsutrani, 1982, p. 150.

[24] Michel Clasquin-Johnson, Will the real Nigaṃṭha Nātaputta please stand up? Reflections on the Buddha and his contemporaries, Journal for the Study of Religion 28,1 (2015) 100 – 114.

[25] Kshemchandra Shravak, Veerstuti, 1939, p. 149-150.

[26] Muni Nagaraj, Agama aur Tripitaka, ek Anushilan, Part 1 1987, P. 71

[27] Digha Nikāya, Samannaphala Suttam, 2/1/7

[28] Sagarmal Jain, Reconsidering the date of the Nirvāṇa of Lord Mahāvīra, Jaina Literature and Philosophy a Critical Approach, 1999, p. 106-114

[29] Sukhlal Sanghavi in Muni Nagaraj, Agam aur Tripitaka, P. xx

[30] Muni Nagaraj, P. 356-390.

[31] Heinz Bechert, A remark on the problem of the date of Mahāvīra,1983, IT 11: p. 287-290

[32] D. Seyfort Ruegg, A New Publication on the Date and Historiography of the Buddha's Decease ("nirvāṇa"): A Review Article, Bulletin of the School of Oriental and African Studies, University of London, 1999, Vol. 62, No. 1 (1999), pp. 82-87

[33] A. K. Narain, Book Review, The Dating of the Historical Buddha. Die Datierung des Historischen Buddha, part I, ed. Heinz Bechert, The Journal of the International Association of Buddhist Studies, V. 16, No. 1, 1993, p. 187-201

[34] Sagarmal Jain, Reconsidering Date Of Nirvāṇa Of Lord Mahāvīra, Aspects of Jainology, Vol VI, 1998, p. 106-114.

[35] Jyotiprasad Jain, महावीर-निर्वाण-काल, Bhagawan Mahāvīra Smriti Granth, Dipavali 1975 (VNS 2501), p. 41-60.

[36] There is disagreement among the scholars about the date of Tilōyapaṇṇatti. Verse 1508 in chapter 4 implies that it was composed after the rule of the Guptas. However, it is possible that some of the verses may be later additions. A.N. Upadhye gives the dates 473 and 609 CE as the two limits for Tilōyapaṇṇatti and its author in the introductory article in Tilōyapaṇṇatti Part 2, p. 16.  Prem Suman Jain suggests that the text may have been composed in the 2$^{nd}$ or 3$^{rd}$ century CE.

[37] Solomon opines that there are an old Saka era originating around 248-83 BC (Richard Salomon, Indian Epigraphy- A Guide to the Study of Inscriptions in Sanskrit, Prakrit, and the Other Indo-Aryan Languages, 1998 p. 181.). The classical Saka era originated in 78 CE.

[38] Pt. Kailashachandra, Jain Sahitya ka Itihas Purva Pithika. P. 283-298

[39] Jyoti Prasad Jain,  p. 41-60.

[40] Titthōgālī Painnaya, Panyas Kalyana Vijaya, Thakur Gajsimha Rathod, 1975 P. 7-8,

[41] Jugalkishor Mukhtar, Vira Nirvāṇa Samvat ki samalochana par vichar, in Jain Sahitya aur Itihas par vishad Prakash, 1956, p. 46-56

[42] It is interesting to note that Padmanabh Jaini has contradicted himself in his article - Jain Sectarian Debates
Eighty-four points of contention (Cauryāṃsi bol) Between Śvetāmbaras and Digambaras, J Indian Philos (2008) 36:1–246. In footnote 12 he mentions the Digambara date to be 605 BCE, whereas on page 5 he mentions that both traditions are unanimous in accepting 527 BCE.

[43] Radha Kumud Mookerji, Chandragupta Maurya and his times, 1988, p. 14.

[44] Incidentally, Tilōyapaṇṇatti gives the same durations for the seven dynasties, except that it allocates only 40 years to the Mauryas, instead of 108 years, a difference of 68 years. Tilōyapaṇṇatti, Ch 4, v. 1505-1507.

[45] Kalyanvijay Gani, Vir Nirvan Samvat aur Jain Kal Ganana, 2000, p. 140-141

[46] Traditionally the Śvētāmbar texts mention 82 AD as the date of the split and Digambara texts mention 79 AD.

[47] Padmanabh S. Jaini, Jain Sectarian Debates: Eighty-four points of contention (Cauryāmsī bol) Between Śvetāmbaras and Digambaras, Journal of Indian Philosophy, February 2008, Vol. 36, No. 1 (February 2008), p. 1-246

[48] Even after the Valabhi council, there is evidence that the two linages often coexisted together. Vividha Tirtha Kalpa mentions that then Dandanayaka Vimala (11$^{th}$ cent) organized a pilgrimage, it included both Shvetambar and Digambara monks.

[49] It is possible that Acharya Hemacandra may have missed the Pālaka dynasty which lasted for 60 years according to the Titthōgālī Painnaya.

[50] Dr. Hoerncle, Two Pattvalis of the Sarasvati Gachha of the Digambar Jains, Indian Antiquary, Oct 1891, p. 341-361, and Dr. Hoerncle, Three Further Pattvalis of the Digambars, Indian Antiquary, Oct 1891, March 1892, p. 57-85.

[51] V P Johrapurkar, Bhattarak Sampradaya, 1958

[52] ज्योतिप्रसाद जैन : दिल्ली पट्ट के मूलसंघी भट्टारकों का समय क्रम : Anekanta, V 17, No.2, 1964, p. 61-63, 159-163.