

On the Chronological Framework for Indian Culture

Subhash Kak
Louisiana State University
Baton Rouge, LA 70803-5901, USA
Email: kak@ee.lsu.edu

Indian Council of Philosophical Research. 2000, pp. 1-24.

Introduction

It has been more than a decade that Indologists started voicing the need for a radical reexamination of the ideological premises on which early Indian historiography has been based. It was to satisfy this need that several departments of the Southern Methodist University (SMU) in Dallas, Texas organized on September 19, 1998 a day-long debate to consider the question of the earliest Indian chronology, especially as it pertains to the nineteenth-century notion of Aryan invasions.¹ At the end of the debate the moderator concluded that there was no evidence for any immigration/invasion into India in the prehistoric period and the Indian civilization must be viewed as an unbroken tradition that goes back to the earliest period of the Sindhu-Sarasvatī (or Indus) tradition (7000 or 8000 BC).

The proceedings of the Dallas debate are just one expression of the general agreement among scholars that a new paradigm for the history of ancient India is emerging. The new paradigm, which is informed by evidence from the fields of archaeology, history of science and art, and textual analysis takes the Indian tradition to be indigenous and of great antiquity. It is this new paradigm that is compelling a reexamination of the dates of Indian texts and the development of a chronology of Indic ideas.

Why have the assumptions on which, for more than a century, the academic world based the chronology of Indian texts and culture unraveled? The old assumptions were partly linguistic and partly cultural. The linguistic assumptions are being recognized as methodologically flawed², and archaeologists have found no evidence for a break in the Indian tradition going as far back as the beginnings of the Sindhu-Sarasvatī tradition in Mehrgarh and other neolithic sites. In fact, it is entirely possible that this tradition itself was just a late stage in the old rock art tradition that has been seen to extend back as early as 40000 BC.³ The archaeologists see their findings mirrored in the Vedic texts, which are squarely centered in northern India. In the words of Shaffer and Lichtenstein,⁴ “The South Asian archaeological record ..does not support.. any version of the migration/invasion hypothesis. Rather, the physical distribution of sites and artifacts, stratigraphic data, radiometric dates, and geological data can account for the Vedic oral tradition describing an internal cultural discontinuity of indigenous population movement.” This indigenous population movement appears to have occurred somewhat after 1900 BC due to ecological factors, principally the drying up of the Sarasvatī river, once the largest river in India.

The Myth of the Aryans

The concept of invading hordes of Aryans conquering northern India around 1500 BC arose in the nineteenth century for a variety of reasons. Linguists had established that the north Indian, Iranian, and most European languages are structurally related and belong to the same family, which was given the name Indo-European. A homeland was postulated, and it was assumed that the residents of this homeland spoke a common language, called *proto-Indo-European* (PIE), the hypothetical ancestor to the historically known ancient languages such as Sanskrit, Avestan, Greek, Latin, and so on. Based primarily on linguistic considerations, several theories were proposed according to which this homeland was likely to have been in southeastern Europe or Central Asia. By assigning an arbitrary period of 200 years to each of the several layers of the pre-Buddhist Vedic literature, the period of around 1500 BC was arrived at for the entry of the Aryans into India.

This alleged Aryan invasion was then tied up with the mention of the horse in the Vedic literature by asserting that the invading Aryans brought horses

and chariots with them. This hypothesis was considered proven by claiming that the domestication of the horse took place not long before 1500 BC. It was assumed that the horse provided military advantage to the Aryans, which made it possible for them to conquer the indigenous inhabitants of India.

Early objections

Scholars soon pointed out many problems with this theory. *First*, the earliest Indian literature has no memory of any such entry from outside, and its focus is squarely the region of the *Seven Rivers*, *Sapta Sindhu*, with its centre in the Sarasvatī valleys and covering a great part of north and northwest India ranging from Sindhu to Gaṅgā to Sarayū. *Second*, the traditional Indian king lists go back into fourth millennium BC and earlier; also, the lists of teachers in the Vedic books cannot be fitted into the Aryan invasion chronology. *Third*, it was contended that the beginnings of the vast Vedic literature needed a greater time horizon easily reaching back at least into the third millennium BC. Thus, astronomical references in the Vedic literature refer to events as early as the fourth millennium BC. The Purāṇas remember some migrations out of India; such migrations were invoked to explain the reference to Vedic gods in treaties between kings and to other Indic names in West Asian texts and inscriptions in the second millennium BC; but the supporters of the Aryan invasion theory interpreted these West Asian Indic references as traces of the migratory path of the Aryans into India. *Fourth*, the Vedic literature nowhere mentions riding in battle and the horse was rare in Vedic times; the word *aśva* for horse was often used figuratively for speed. *Fifth*, there was no plausible process explaining how incursions by nomads could have obliterated the original languages in one of the most densely populated regions of the ancient world. *Sixth*, the Vedic literature portrayed the Aryans as living in a complex society with an important urban element; there is mention of cities, ocean-going ships, numerous professions, which is contradictory to the image of barbaric invaders from the north. Defenders of the invasion theory, however, either ignored such references or wrongly attributed these cultural achievements to the non-Aryans.

Although the assumptions at the basis of the Aryan invasion theory were arbitrary and there was little supporting evidence, the reason this theory became popular was because it fulfilled several unstated needs of the historians

at the time. In particular, it reinforced the racial attitudes popular in the nineteenth century so that the highly regarded Vedas could be assigned to a time before the Aryans in India mixed with the indigenous races. The conquest of India by the British was taken to be similar to the supposed earlier conquest by the Aryans, and so this theory played an important imperialistic function. Slowly, as the Aryan invasion date became the anchor that was used to fix other ancient events in the histories of the Indian, Iranian, and European peoples, scholars became ever more reluctant to question the assumptions on which it was based.

New discoveries and insights

The recent discrediting of the Aryan invasion model has been caused primarily by archaeological discoveries. These discoveries have been reinforced by new insights from the history of science, astronomy, and literary analysis. The main points of the evidence are highlighted below:

- It has been found that the Sapta Sindhu region—precisely the same region that is the heartland of the Vedic texts—is associated with a cultural tradition that has been traced back to at least 8000 BC without any break. It appears that the Sarasvatī region was the centre of this cultural tradition, and this is what the Vedic texts also indicate. The term “Aryan” in Indian literature has no racial or linguistic connotations.
- According to the work of Kenneth Kennedy⁵ of Cornell University, there is no evidence of demographic discontinuity in the archaeological remains during the period 4500 to 800 BC. In other words, there was no significant influx of people into India during this period.
- Fire altars have been discovered in the third-millennium site of Kalibangan.⁶ It appears now that fire altars were in use at other Harappan sites as well. Fire altars are an essential part of the Vedic ritual.
- Geologists have determined that the Sarasvatī river dried up around 1900 BC. Since Sarasvatī is mentioned in the Ṛgvedic hymns as the largest river, one conclusion that can be drawn is that the Ṛgveda was composed prior to 1900 BC.

- Study of pottery styles and cultural artifacts has led archaeologists such as Jim Shaffer of Case Western Reserve University to conclude that the Sindhu-Sarasvatī culture exhibits a continuity that can be traced back to at least 8000 BC. Shaffer summarizes:⁷ “The shift by Harappans [after the drying up of the Sarasvatī river around 1900 BC] is the only archaeologically documented west-to-east movement of human populations in South Asia before the first half of the first millennium BC.” In other words, there has been no Aryan invasion.
- A. Seidenberg reviewed the geometry of the fire altars of India as summarized in early Vedic texts such as the Śatapatha Brāhmaṇa and compared it to the early geometry of Greece and Mesopotamia. In a series of papers,⁸ he made a strong case for the view that Vedic geometry should be dated prior to 1700 BC.
- It has now been discovered⁹ that altar constructions were used to represent astronomical knowledge. Furthermore, an astronomical code has been found in the organization of the Vedic books. This code establishes that the Vedic people had a tradition of observational astronomy, which means that the many astronomical references in the Vedic texts that point to events as early as 3000 or 4000 BC can no longer be ignored.
- Recent computer analysis¹⁰ of the texts from India have shown that the Brāhmī script, the earliest example of which comes from Sri Lanka around 500 BC,¹¹ is derived from the earlier script of the Sindhu-Sarasvatī age. This again is strong evidence of cultural continuity. There is also continuity in the system of weights.
- The archaeological record shows that the Sindhu-Sarasvatī area was different from other ancient civilizations in many cultural features. For example, in contrast to ancient Egypt or Mesopotamia, it shows very little monumental architecture. It appears that the political organization and its relationship to other elites in the Indian society was unique. This is paralleled by the unique character of the Vedic literary tradition with its emphasis on knowledge and the nature of the self.
- Remains of the horse have been discovered in the Harappan ruins.¹² A clay model of a horse was found in Mohenjo Daro. New findings from

the Ukraine show evidence of horse riding as early as 4000 BC. Given the trade routes connecting the Harappan world with Central Asia and onward to the Ukraine and beyond, there is no reason to suppose that the Harappans were not familiar with the horse.

Taken together, the cumulative evidence completely belies the Aryan invasion theory. If an influx of people into India took place, it had to be much earlier than 4500 BC (if one considers the demographic evidence) and perhaps before 8000 BC (if one considers other related evidence). On the other hand, it is equally plausible that the Sapta Sindhu region was the original homeland of the Indic people from where their ideas and culture diffused to Iran and Europe, as remembered in Purāṇic legends.

Linguistic issues

Recently, linguists have called into question the very assumptions that are at the basis of the genealogical model of the Indo-European family of languages.¹³ It is accepted that the ancient world had great language diversity, and that population increase, greater contacts and trade with the emergence of agriculture, coupled with large-scale political integration, led to extinction of languages and also to a transfer of languages across ethnic groups. In such a complex evolutionary process, it is meaningless to pin a specific language on any racial type.

In the Indian linguistic area itself there exist deep structural relationships between the north Indian and the Dravidian languages. It is likely that the Vedic period represents an age long after the contact between these two linguistic families had begun; in other words, the early Vedic period might represent a synthesis between the north Indian and the Dravidian cultural histories. For some time it was fashionable to assume a Dravidian invasion of India before the Aryan invasion, but there is no good reason why we should place the majority of neolithic Dravidians anywhere outside of India.

Chronology of the Vedic literature

With the collapse of the Aryan invasion and immigration theory and the questioning of the assumptions upon which it was based, we must look afresh at the chronology of the Vedic literature. Certain key dates in Indian literature

were decided by assuming the flow of ideas from Greece to India. For example, the Sūtra literature was dated to after 300 BC primarily because it was assumed that the geometry of the Śulba Sūtras came after Greek geometry. Now that Seidenberg has shown that essentially the same geometry was present in the earlier Brāhmaṇas, which definitely predate Greek geometry, the question of the chronology of the Sūtra literature becomes important. Using astronomical references it appears that the Vedic Saṃhitās should be dated to the third millennium BC, the Brāhmaṇas to the second millennium BC, with the Upaniṣads and the Sūtras coming somewhat later. Sengupta did pioneering work¹⁴ on this latter problem but his research has not received the attention it deserves.

First, it should be stated that the archaeological and textual evidence compels us to assume that the Indic area became a single cultural area at least around 5000 BC. The Indian civilization was created by the speakers of many languages, but the language of the earliest surviving literary expression was Vedic Sanskrit, which is itself connected to both the north and the south Indian languages.

The distinctive character of the earliest Indic tradition is becoming clear from new analyses of ancient art.¹⁵ For example, David Napier shows¹⁶ how the forehead markings of the Gorgon and the single-eye of the cyclops in Greek art are Indic elements. Although he suggests that this may have been a byproduct of the interaction with the Indian foot soldiers who fought for the Persian armies, he does not fail to mention the more likely possibility that the influence was through the South Indian traders in 2nd-millennium-BC-Greece. This is supported by the fact that the name of the Mycenaean Greek city Tiryns—the place where the most ancient monuments of Greece are to be found—is the same as that of the most powerful Tamilian seafaring people called the Tirayans. Other evidence regarding the spread of Indic ideas to Mesopotamia, Egypt, the Graeco-Roman world, and greater Europe has also become clear.¹⁷

The genealogies of the Purāṇas and the later Vedic literature also reach back at least into the third or the fourth millennia BC. The Purāṇas list ninety-four generations of kings before the Bhārata War. The later Vedic literature, starting with the Śatapatha Brāhmaṇa, indicates a shift in the locus of the civilization outside of the original area of the Sindhu and the Sarasvatī valleys.

Vedic and Purāṇic History

The vast Vedic literature can be analyzed on its own terms by considering its various layers. The Vedic books, such as the Saṃhitās and the Brāhmaṇas (in particular, the Aitareya and the Śatapatha), mention names of kings in an incidental fashion. But they do at times provide the genealogies of ṛṣis. The Vedic books have been preserved with astonishing accuracy and a tradition has preserved the names of the authors of hymns or verses when a hymn has multiple authors. But not all the famous kings of the Ṛgvedic age are lauded in the hymns.

On the other hand, the bards (sūtas) of the Purāṇas and the epics have preserved genealogies of kings and other people. “As seen by good people in the ancient times, the sūta’s duty was to preserve the genealogies of gods, ṛṣis and glorious kings and the traditions of great men.” (Vāyu P. 1. 31-2) According to the epics and the Purāṇas (e.g. Mahābhārata 1.63.2417, Vāyu P. 60. 11-12) the arranger of the Vedas was Parāśara’s son Kṛṣṇa Dvaipāyana Vyāsa who lived at the time of the Bhārata battle.

The most famous historical event mentioned in the Ṛgveda is “the Battle of the Ten Kings”, (*daśarājñā*), mentioned in four hymns of the seventh book of the Ṛgveda (18, 19, 33, 83). The battle took place between Sudās, the Trtsu king, and a confederacy of ten people that include Pakthas, Bhālānas, Alinas, Śivas, and Viṣāṇins.

One of the hymns of the Ṛgveda (10.98) is, according to the indices, composed by Devāpi, and this hymn mentions Śantanu, Bhīṣma’s father. This appears to be the youngest hymn in the Ṛgveda, and thus the reference is supportive of the Indian tradition. The Yajurveda does not mention anyone later than Dhṛtarāṣṭra, and the Atharvaveda mentions a Parīkṣit ruling over the Kurus. There is no mention in the Vedic Saṃhitās of any of the Purāṇic kings who came much after the Bhārata battle.

Although the Purāṇas have suffered extensive revisions, the core Purāṇa can be dated to Vedic times. Atharvaveda 11.7.24 mentions *Purāṇa* along with the three other Vedas. Śatapatha Brāhmaṇa 11.5.6.8 refers specifically to the *itihāsa-purāṇa* and 13.4.3.13 refers to the recitation of the Purāṇa. There is a similar reference in the Chāndogya Upaniṣad 3.4.1.

According to the Viṣṇu Purāṇa, the original Purāṇa was transmitted to Romaharṣaṇa by Vyāsa. Romaharṣaṇa taught it to his six disciples, including his son Ugraśravas. At that time the Purāṇa consisted of 4,000 verses. The

oldest three Purāṇas—the Vāyu, the Matsya, and the Brahmāṇḍa—are supposed to have been narrated in the reign of Adhisīmakṛṣṇa, the great-great grandson of Parīkṣit. The Vāyu Purāṇa was first narrated to a gathering of ṛṣis, performing their twelve-year sacrifice in the Naimiṣa forest on the banks of the river Dṛṣadvatī.

A Purāṇa is supposed to have five distinguishing marks: *sarga* (primary creation of the universe), *pratisarga* (secondary creation), *vamśa* (genealogy), *manvantarāṇi* (the reigns of Manus in different yugas), and *vamśānucarita* (history). Within this framework, the bards have found fit to add new episodes, but king lists have always remained an important component of the books. Over the centuries, the Purāṇas have become enlarged with additional material and reworking of old material. The Viṣṇu Purāṇa gives genealogies of the various dynasties of which that of the Aikṣvākus is the most complete, giving ninety-three generations from the mythical Manu to Bṛhadbala of the Bhārata battle. The dynasty of the Pūrus is assigned fifty-three generations for the same period. Clearly, the lists are not complete, and in fact the Purāṇic tradition itself claims that the lists are incomplete (e.g. Matsya Purāṇa 49.72). This is true even of the Ikṣvāku line, which is the longest (e.g. Vāyu Purāṇa 88.213). It appears therefore that some other system of reckoning must have also been used, because we find it is still possible to obtain a consistent list by the use of internal synchronisms and through cross-validation with independent sources.

The Vedic genealogies of ṛṣis can be found in the Śatapatha Brāhmaṇa (10.6.5.9) and Bṛhadāraṇyaka Upaniṣad (2.6; 4.6; 6.5), but such lists are not characteristic of the Vedic books. However, the Anukramaṇīs provide invaluable references to the composers of the hymns. The Vedic books do not present history in any systematic fashion. Nevertheless, the isolated references to kings and ṛṣis can be compared usefully with the independent references in the Purāṇas to obtain a chronological framework for the events of the Vedic era.

The famous kings of the epics and the Purāṇas were Māndhātṛ, Hariścandra, Sagara, Bhagīratha, Daśaratha, and Rāma of Ayodhya; Śaśabindu and Arjuna Kārtavīrya of the Yādavas; Duṣyanta, Bharata, Ajamīdha, Kuru and Śantanu of the Pauravas; Jahnu and Gādhi of Kānyakubja; Divodāsa and Pratardana of Kāśī; Vasu Caidya of Cedi and Magadha; Marutta Āvikṣita and Tṛṇabindu of the Vaiśāla kingdom; and Uśīnara and Śivi of the Ānavas. Of those that are mentioned in the Ṛgveda are Bharata (RV 6.14.4), Śantanu

(RV 10.98.1), Ajamīḍha (RV 4.44.6), Māndhātṛ (RV 1.112.13, 8.39.8, 8.40.12) and Rāma (RV 10.93.14). Furthermore Ṛgveda 10.34 is attributed to Māndhātṛ, 10.179.1 is attributed to Śivi, and 10.179.2 is attributed to Pratardana.

Of the kings lauded in the Ṛgveda, Vadhryaśva, Divodāsa, Sṛñjaya, Sudās, Sahadeva and Somaka appear as kings in the North Pañcāla genealogy, but there is no description of their exploits. On the other hand, other Ṛgvedic kings such as Abhyāvartin Cāyamāna, Śrutarvan Ārkṣa, Plāyogi Āsaṅga and Svanaya Bhāvya are unknown in the epics and the Purāṇas.

That Sudās, the most famous king of the Ṛgveda, should just be a name in the Purāṇas can be explained in two ways. First, this king lived long before the compilation of the genealogies and second, the focus of his exploits was far from the region where the Purāṇic genealogies were organized. The Purāṇas themselves claim that the sūtas were originally from the eastern regions of Magadha and Anūpa, and this was far from the locale of the Sudās battle in north Punjab.

The Purāṇic genealogies all begin with the mythical Manu Vaivasvata. He had several offspring of whom his daughter Ilā bore a son named Purūravas Aila; their further successors represent the Aila or Lunar branch of the Vedic people. Manu's chief son Ikṣvāku became the king of Madhyadeśa with the capital at Ayodhyā. The Aikṣvākus are the Solar dynasty.

Amongst the Ailas, Purūravas was succeeded by Āyu; he in turn was succeeded by the famous king Nahuṣa, whose son and successor was Yayāti. The kingdom expanded a great deal during his reign, and Yayāti divided up this state amongst his sons Yadu, Turvasu, Druhyu, Anu, and Pūru.

Reconstruction of genealogies

The Viṣṇu Purāṇa and other Purāṇas provide various king lists. Pargiter collated the Purāṇic and the epic lists,¹⁸ using synchronisms to place the kings of the main Aikṣvāku list in relation to the kings in the even less complete lists of the other dynasties. He was also able to establish the general credibility of the lists by comparison with the well preserved information of the Vedic books. Pargiter drew attention to the fact that the genealogies are more complete in regard to the eastern kingdom of Ayodhyā. He argued that the focus of the civilization described in the Purāṇas was eastern India.

The king lists are traditionally placed in different yugas as follows: The

Kṛta age ended with the destruction of the Haihayas [by Rāma Jāmadagnya]; the Tretā began approximately with Sagara and ended with Rāma Dāśarathi's destruction of the Rākṣasas; and the Dvāpara began with his reinstatement at Ayodhyā and ended with the Bhārata battle. By taking the numbers in the table of genealogies, the division is approximately thus: the Kṛta Nos. 1-40, the Tretā Nos. 41-65, and the Dvāpara Nos. 66-95.

What was the Purāṇic theory of the yugas? According to the Vāyu Purāṇa 32.58-64, the Kṛta yuga is 4,000 years together with 400 years of sandhyās on either side; the Tretā yuga is 3,000 years with total sandhyā periods of 600 years; the Dvāpara is 2,000 years with sandhyās of 400 years; and the Kaliyuga is 1,000 years with sandhyās of 200 years. In other words, the four yuga periods are 4,800, 3,600, 2,400 and 1,200 years, respectively. Taken together the cycle of the four yugas amounts to a total of 12,000 years.

To summarize the lists, one sees that there are ninety five generations before the Bhārata War. The references to kings and ṛṣis are distributed over the entire range. Yayāti is at generation number six, Divodāsa of Kāśi at twenty five, Hariścandra of Ayodhyā at thirty three, Bharata of the Pauravas at forty four, Bhagīratha of Ayodhyā at forty five, Rāma of Ayodhyā at sixty five and Pratīpa of the Pauravas is at eighty seven. Pargiter uses the internal evidence to show that many kings and ṛṣis at different periods shared the same names, and this has led to a lot of confusion. He placed the first Viśvāmitra at generation number thirty-two and Vāmadeva, the author of the fourth book of the Ṛgveda, at sixty-ninth generation.

Pargiter places Sudās at number sixty-eight, whereas the Druhyus who are supposed to have left the country are placed at thirty-eight. This indicates a possible error in his synchronism. Pargiter's lists cannot be considered to be the final word, but they are a useful starting point. In spite of the limitations of the lists, Pargiter is to be commended for the care that he took in obtaining his synchronisms. But his interpretation of the lists was vitiated by his implicit use of the incorrect but fashionable theories about the spread of Aryans within India. In order to conform with Max Müller's date for the composition of the Ṛgveda, Pargiter considered that the Bhārata battle took place around 950 BC. Assuming that each king ruled approximately for twelve years he traced the genealogies to about 2000 BC.

Since Pargiter's work was done before the discovery of the Sindhu-Sarasvatī civilization, he was not able to use archaeological checks for his assumptions. He did not use the internal tradition in the Purāṇas regarding the time span

between king Parīkṣit and the Nandas, and he also did not use the fact that the lists are incomplete. But he demonstrated that with the most conservative view of the data, there was no escaping the fact that the Indian tradition went back to at least 2000 BC.

A later attempt by Bhargava departs from Pargiter in assigning a more realistic period of twenty years per generation. Considering one hundred generations of kings up to the time of the Bhārata battle this took him to 3000 BC as the dawn of Indian history. Although this work improves on Pargiter's synchronism, Bhargava's work remains limited because of two assumptions: (i) that the Bhārata battle took place in about 1000 BC (he also used unconvincing arguments to reconcile it with the Purāṇic statements); (ii) seeing the Aryans only in the Sapta Saindhava area during the Ṛgveda era, which is in contradiction to the internal evidence of the Purāṇas. The provenance of the kings and the ṛṣis shows that during the Ṛgvedic times itself the Aryans were spread to about the current geographical extent of the Indo-Aryan languages in India.

The Ṛgveda (RV 8.9.2) speaks of five peoples (*pañca mānuṣān*); in 1.108.8 they are named as Yadu, Turvasu, Druhyu, Anu, and Pūru. Identified by some as five Aryan *tribes* but described in the Purāṇas as the sons of Yayāti. According to the Purāṇas, the Pūrus were located in the Punjab region, and a disproportionately large number of kings mentioned in the Ṛgveda belong to the Pūrus.

In summary, the evidence from the Purāṇas clearly indicates that there were at least one hundred kings in a genealogical succession before the Bhārata battle. If an average span of twenty years is assigned to each king, this provides a period of 2,000 years for the duration of the Vedic age, which takes us back to the Harappan period, even if the most conservative chronology is used. This raises important questions about placing the Bhārata battle within the framework provided by the recent archaeological discoveries from India.

The Bhārata War

Let us review the three main Indian traditions regarding the time of the Bhārata War.

1. *The Purāṇic Evidence*

To examine this tradition we depend on the collation of data by Pargiter. According to the Purāṇas, a total of 1,500 years (in certain texts 1,015, 1,050, or even 1,115 years) (Vāyu 99.415; Matsya 73.36 etc) elapsed between the birth of King Parīkṣit and the accession of Mahāpadma Nanda. The king lists for this period add up to 1,498 or 1,500 years in the most reliable records. It appears that the correct elapsed duration is 1,500 years as it tallies with the detailed count.

Based on his collation, Pargiter suggested an important emendation as follows:¹⁹

The Great Bear (the ṛkṣas or the Seven Sages or Saptarṣi) was situated equally with regard to *the lunar constellation* Puṣya while Pratīpa was king. At the end of the Andhras, who will be in the 27th century *afterwards*, the cycle repeats itself. In the circle of the lunar constellations, wherein the Great Bear revolves, and which contains 27 *constellations* in its circumference, the Great Bear remains 100 years in (*i.e.* conjoined with) each in turn.

This implies a period of 2,700 years from a few generations before the War to the middle of the third century AD. Support for this reading comes from the following statement that has often been misinterpreted: The Saptarṣi were in Maghā at the time of Yudhiṣṭhira but had shifted to Pūrvāṣāḍhā (ten nakṣatra on) at the time of Nanda and Śatabhiṣaj (a further four nakṣatras) at the end of the reign of the Andhras (Vāyu P. 99.423). This astronomical evidence would point to a gap of about 1,000 years between Parīkṣit and Nanda and another 400 years between Nanda and the end of the Andhras. Considering that Pratīpa was only seven generations before Parīkṣit, or about 150 years earlier, this gives a total interval of about one-half the interval of 2,700 years mentioned above. But we do know that the gap between Nanda and the end of the Andhras was more than 800 years. It is clear that this second reference counts two hundred years for each nakṣatra. This may have had something to do with the Jain tradition that counted a total of 54 nakṣatras and to the number stated one had to add a like number for a correct count.

As for the duration of reigns, Vāyu Purāṇa 99.416 speaks of a gap of 829 years between Nanda and the end of Andhras. Elsewhere this gap is given to be 836 years. Adding the dynastic lists with 100 years to the Nandas, 137

years to the Mauryas, 112 years to the Śungas, 45 years to the Kaṇvas, and 460 years to the Andhras one gets a total of 854 years.

The Purāṇas also assign one hundred years to Mahāpadma Nanda and his eight sons. Furthermore, in Magadha 22 Bārhadhrathas, 5 Pradyotas and 10 Śiśunāgas are assigned for the period between the Bhārata War and the inauguration of Mahāpadma Nanda for a total of $(967+138 +346)$ 1,451 years. The historian of astronomy P.C. Sengupta argues that to the Pradyotas one should add another 52 years, giving a total of 1,503 years. Over the same period are said to have ruled 30 Paurava kings and 29 Aikṣvākus. It is also stated that when Mahāpadma Nanda defeated the kṣatriyas, there had reigned since the Bhārata War 24 Aikṣvākus, 27 Pañcālas, 24 Kāśis, 28 Haihayas, 32 Kalingas, and so on.

Assuming that the lists are complete and that the year assignments are wrong, various suggestions have been made for the duration of the average reign. On the other hand, using the statement that ten centennials (ten nakṣatras) had passed between the time of Parīkṣit and Nanda, one gets approximately 1,100 years upto Candragupta, which yields circa 1420 BC for the War.²⁰

Considering that Candragupta became king about 324 BC the direct reference to the years elapsed (counting 1500 years of the Purāṇic statement and 100 years of the Nandas) leads to the date of 1924 BC. But clearly the average reigns for the kings are too long, unless these lists are incomplete and the names are the most prominent ones, in which case there would have been other kings who ruled for very short intervals.

If the nakṣatra reckoning was for some reason actually being done per each two centuries as the gap of 829 years for four nakṣatras indicates, then there should be about 2,000 years between Parīkṣit and Nanda. This would take the Bhārata battle to around the middle of the third millennium BC. We will show later that this takes us to 2449 BC.

2. The Kaliyuga Tradition

According to the famous astronomer Āryabhaṭa (c. 500 AD) the Kaliyuga began in 3102 BC, which the Mahābhārata says happened thirty-five years after the conclusion of the battle. This implies the date of 3137 BC for the War if we assume with the tradition that the Kaliyuga era began 35 years after the War. But there are other accounts, such as that of Kalhaṇa in his Rājatarāṅginī 1.51, where it is stated that 653 years of the Kaliyuga had

passed when the Kurus and the Pāṇḍavas lived on the earth.

3. *Varāhamihira's Statement*

Varāhamihira (550 AD) claims that according to the earlier tradition of the astronomer Vṛddha Garga, the Pāṇḍava king Yudhiṣṭhira was ruling 2,526 years before the commencement of the Śaka era (Bṛhatsaṃhitā 13.3). This amounts to 2449 BC for the War and 2414 BC for the beginning of the Kali era.

There is no reference to the Kaliyuga era in texts before Āryabhaṭa, and so it has been claimed that this era was devised by Āryabhaṭa or his contemporaries. The first inscriptional reference to this era is in the Aihole inscription of 633/634 C.E.

After analyzing the astronomical evidence, P.C. Sengupta spoke in favour of the date of 2449 BC. We will examine these conflicting accounts and see if they can be compared considering independent evidence. Here we will use the king lists of the epics and the Purāṇas, the Greek evidence, and contemporary archaeological insights.

Analysis of the Literary Evidence

The Purāṇic Evidence

We have seen that the Purāṇic data has been interpreted variously to yield dates for the Bhārata War that range from the latest of 1424 BC to the earliest of late-fourth millennium BC.²¹ Each of these will be separately examined.

1424 BC

This date is suggested by the mention in some Purāṇic manuscripts of the interval of 1,050 years between Parīkṣit and Nanda. This date is too late by about 500 years when compared to the totals of the reigns in the Purāṇas. On the other hand, it does bring the average reign period to the realm of possibility, as it reduces to about 27 years, assuming of course that the lists are complete. The fact that a submerged temple at Dvārakā dating to the middle of the second millennium BC has been discovered has been taken as the evidence of the destruction of that city soon after the Bhārata War. However, we do not know if this temple is the one that was lost to the sea soon after the Bhārata War.

There is no archaeological evidence suggesting a flowering around 1500 BC. For this epoch for the War, one would expect evidence for the tremendous literary activity of the arrangement of the Vedas and the composition of the other texts. The second millennium BC is archaeologically the lesser age or the dark age.

We must reject this date if we consider the evidence related to the Sarasvatī river, which was supposed to be a major river during the time of the Bhārata War. Since this river dried up around 1900 BC, the figure of 1424 BC for the War is too late. The rapid decline around 1900 BC of cities, such as Kalibangan in the mid-course of the Sarasvatī, makes it impossible for us to assume that the river could have somehow been called “major” when it ceased to flow all the way to the ocean.

1924 BC

This date is a result of the stated interval of 1,500 years between Parīkṣit and Nanda, and the count obtained by adding up the durations of the reigns. This appears to be the original interval of the Purāṇas that became corrupted. Pargiter has suggested that the Purāṇas, as living bardic material, were transcribed into Sanskrit sometime between the reigns of the Śungas and the Guptas from the then form in Prakrit. This translation often used ambiguous constructions which is how the figure of 1,500 was read wrongly at some places. According to Lalit Mohan Kar,²² “If a comparative estimate is desired between the totals, as given by the different Purāṇas (vis., 1015, 1050 and 1115 years), and the sum total found by calculation of the details [1500 years], the scale must turn in favour of the latter, as a corruption, or at least a variation, depends on the mutation of two or three letters of the alphabet, as is evident from there being those different versions of the total period, while the details are more definite.”

If the Bhārata War story was a metaphor for the natural catastrophe that occurred in India around 1900 BC, then this is the correct date. On the other hand, if the War did take place (although it was remembered in an embellished form), then the natural catastrophe may have contributed to it by causing a breakdown of the old order.

2449 BC

This is the date mentioned by Varāhamihira. The Purāṇas may be interpreted to point to this date, and also this date may be correct if the genealogies represent only the chief kings.

It is indirectly supported by the archaeological evidence. Since a great deal of literary output of Vedic times was produced and arranged during the centuries after the War, one would expect that such efforts would have been supported by kings and that one would find a correlation with prosperity in the land. The archaeological evidence indicates that the Harappan era represents a period of great prosperity.

This date implies that the Harappan phase of the Sindhu-Sarasvatī tradition is essentially post-Vedic. But this date also implies that the genealogical lists are hopelessly incomplete which is plausible if a great catastrophe, such as the drying up of the Sarasvatī, caused the tradition to be interrupted.

3137 BC

The problem with this date is that the Purāṇic evidence does not support it. On the other hand, some scholars have suggested that the Sarasvatī river went through two phases of diminution: *first*, around 3000 BC, after which the river ceased to flow all the way to the sea; *second*, 1900 BC, when due to further shrinkage the river was unable to support the water needs of the communities around it, ending the most prosperous phase of the Harappan era. Since the Ṛgveda describes the Sarasvatī as sea-going so, going by this theory, the Ṛgveda must be prior to 3000 BC.

This date could be reconciled with the Purāṇic accounts only if we take it to define the last phase of the Ṛgveda and assume that the Bhārata War was wrongly transferred to this earlier era when the last major assessment of ancient Indian eras and history was done during the early Siddhāntic period of Indian astronomy in early centuries AD.

The Saptarṣi Era and the Greek Notices

The Indian tradition of the seven ṛṣis, the stars of Ursa Major, is an ancient one which goes back to the Ṛgveda. The Śatapatha Brāhmaṇa speaks of a marriage between the ṛṣis and the nakṣatras; specifically it mentions that the ṛṣis were married to the Kṛttikās. In the Purāṇas, this notion of marriage is elaborated when it is clearly stated that the ṛṣis remain for a hundred years in each nakṣatra. This Purāṇic account implies a centennial reckoning system with a cycle of 2,700 years. Such a system has been in use in parts of India since centuries before Christ, and it is called the Saptarṣi era. Each cycle of 2,700 years was called a cakra, or cycle. By current reckoning in

Kashmir, in use at least from the time of Kalhaṇa (1150 AD), Saptarṣi era began in 3076 BC, and there is evidence that, originally, it started in 6676 BC.²³

It appears that it is the beginning of this era that is quoted by the Greek historians Pliny and Arrian:

From Father Liber to Alexander the Great, they reckon the number of their kings to have been 154, and they reckon (the time as) 6,451 years and 3 months. [Pliny, *Naturalis Historia*, 6.59-60]

From Dionysos to Sandrocottos (Candragupta) the Indians count 153 kings, and more than 6,042 years; and during this time, thrice for liberty ... this for 300 years, the other for 120 years. [Arrian, *Indica*, 9.9]

These two traditions, perhaps derived from the same source, can be reconciled if the Arrian years are all added up, which gives (6,042+ 300+ 120) or 6,462 years, which is only 11 years different from the other account. These eleven years might represent the gap between the time of Alexander and the Greek embassy to Candragupta Maurya. If one takes the year 314 BC for the embassy to Candragupta, one gets 6776 BC as the beginning of the Indian calendar in use at that time. This is just one centennial removed from the epoch of 6676 BC suggested by its current beginning of 3076 BC, together with an additional 3,600 years.

As to the count of 153 or 154 kings, it accords quite closely if one follows up the list until the Bhārata War, with the kings of the Magadhan line together with the ten kings of the Bārhadraṭhas, whose names the Purāṇas tell us are lost. This total up to Candragupta is 143, which is only ten or eleven less than the Greek total. This close accord tells us that the king lists of the fourth century BC are about the same as those now, excepting that the current lists have dropped a few names. This loss of about ten kings from the lists in a span of five or six hundred years, when the current versions of some of the Purāṇas became fixed, suggests that a similar loss might have occurred before, and it supports the view that the genealogies are incomplete.

It has been argued that the Kaliyuga and the Varāhamihira traditions about the Bhārata War can be reconciled if it is assumed that a change in reckoning from a system of 28 nakṣatras to that of 27 nakṣatras took place sometime after the time of Candragupta. It is also suggested that the

Kaliyuga tradition might be authentic and the Varāhamihira tradition was derived from it.

But the evidence from the Ṛgveda supports the notion that the original system of nakṣatras was 27 and that it was modified to 28 later. The notion of 27 nakṣatras can also be found in the Taittirīya Samhita.

It is significant that the epoch of 6676 BC is exactly 3,600 years earlier than the starting point of 3076 BC for the Saptarṣi era, as accepted now. Since it is clear that at the time of the Mauryas, the cycles of the Saptarṣi era were counted back to 6676 BC, it appears that the new count that goes back to 3076 BC was started later to make it as close to the start of the Kali era as possible.

There exists another plausible explanation for how the tradition of the starting point of 6776 BC arose. By the time of the Greeks, the nakṣatras were listed starting with Aśvinī (as in Sūrya Siddhānta 8.9). As Maghā is the tenth nakṣatra in a count beginning with Aśvinī, one needs to add 900 years to find the epoch for the beginning of the cycle. This takes one to 3976 BC. One more complete Saptarṣi cycle of 2,700 years before that brings us to 6676 BC.

Although the limitations and ambiguities of the Purāṇic evidence have been much debated, it should be realized that much old criticism has lost its weight in view of the new archaeological discoveries indicating continuity in Indian culture. Thus the calendrical framework described above is perfectly consistent with the other evidence, although one would take it to have been confirmed only after its details are corroborated independently.

Relative Chronology of the Texts

Our examination of the evidence leaves us with three choices for the Bhārata War: 1924 BC, 2449 BC, and 3137 BC. One might wish to speak of a High Chronology and a Low Chronology to indicate the limits within which one might safely place the War based on the current evidence. If we anchor our dates to the catastrophic events of 1900 BC and see the Mahābhārata story as the mapping of a geological disaster into a human one, then one must place the Ṛgvedic era somewhat before 2000 BC. The tradition that the Bhārata War began about 1,500 years before the Nandas would agree completely with this view.

The Brāhmaṇas and the Āraṇyakas would then belong to the early or mid-2nd millennium BC, the forest age between the two early urbanizations of India.

Since the earliest Vedic literature, as in the Saṃhitās, is encyclopaedic, the longer time-spans over which it developed allow us to narrow the gap between the three choices. We don't wish to depend on literary tradition alone, and therefore take the physical event of the drying up of the Sarasvatī river to help determine the period of the texts.

Thus, since the Ṛgveda mentions a Sarasvatī flowing all the way down to the sea, this text should be earlier than 1900 BC. How much earlier, we cannot say. Indeed, if the theory that the Sarasvatī river ceased to reach the sea about 3000 BC is true, then the Ṛgveda should be prior to this early epoch. But wishing to be as conservative as possible, we take the latest possible date for the drying up of the Sarasvatī, and this has the virtue of being the about same as the Purāṇic date of 1924 BC. This has further support from the reference in the Brāhmaṇas about the migration east from the Sarasvatī area due to heat and, presumably, famine.

Analyzing the astronomical evidence alone, Sengupta in 1947 came up with the following chronology for the references in the texts: the Vedic Saṃhitās, 4000-2500 BC; Brāhmaṇas, 2500-1000 BC; Baudhāyana Śrauta Sūtra, 900 BC; and so on. My own analysis of the astronomy gives three phases:²⁴

Ṛgvedic astronomy: 4000 - 2000 BC

The astronomy of the Brāhmaṇas: 2000 - 1000 BC

Early Siddhāntic and early Purāṇic astronomy: 1000 BC - 500 AD

The date of Vedāṅga Jyotiṣa of Lagadha is 1300 BC, thus placing it in the Brāhmaṇa age.

Much of the early Sūtra literature can be expected to belong to the first half of the first millennium BC, which may also be the age of the Bhagavad Gītā.

The Development of Ideas

Indian culture, as depicted by its texts and its art, has unique features. For example, the ancient Indian rock art, which is believed to be several tens of thousands years old, has tessellations that are unique in the ancient world.²⁵

Some have suggested that these designs may represent “mystical” experience. The Vedic texts are mystical, and they themselves say so when they assert that words have limitations.

The Sindhu-Sarasvatī cultural tradition has characteristics that indicate a social and political organization, and hence a world-view, different from the other traditions of West Asia. There is very little monumental architecture and it appears that the elites were a religious aristocracy.

The Harappan art includes motifs that could very well represent the goddess imagery of the Purāṇas. One image is a cylinder seal from Kalibangan that shows a goddess holding back two warriors; here, using a very clever, representational style, the goddess is also shown separately merging into a tiger, suggesting that the tiger is the mount of the goddess. Durgā as Mahiṣāsura-Mardinī is depicted in the Purāṇas as riding a lion or a tiger.

A significant building at Mohenjo-Daro has been identified as a fire temple. The building has a central courtyard and a symmetric arrangement of rooms. Every alternate room has a low brick platform and one of the rooms has a staircase leading to an upper floor. It appears that a fire altar was placed in the central courtyard.

This fire temple has symmetric features that have much in common with the architectural maṇḍalas discovered in North Afghanistan,²⁶ which have been dated to 2000 BC. Since textual evidence suggests that such maṇḍalas came to be employed long after the Ṛgvedic age, this evidence provides a useful chronological marker. Apart from the textual evidence, one would expect that an artistic representation of the abstract yantric concept would take centuries to develop.

The notion of the yantra and the mythology of the goddess represent a mature stage in the evolution of Indian religious imagination. Their existence in the 3rd millennium calls for a drastic revision of the academic chronology for these ideas.

Libation vessels made of the conch shell *turbinella pyrum* have been found at Mohenjo-Daro. One of these has vermilion filled incised lines. We know such conch vessels were used in the Vedic ritual and for administering sacred water or medicine to patients.

The Vedic altars had an astronomical basis. In the basic scheme, the circle represented the earth, while the square represented the heavens or the deity. But the altar or the temple, as a representation of the dynamism of the universe, required a breaking of the symmetry of the square. As seen clearly

in the agnicayana and other altar constructions, this was done in a variety of ways. Although the main altar might be square or its derivative, the overall sacred area was taken to be a departure from this shape. In particular, the temples of the goddess were drawn on a rectangular plan. The dynamism is expressed by a doubling of the square to a rectangle or the ratio 1:2, where the garbhagrha is built in the geometrical centre.

The constructions of the Harappan period appear to be according to the same principles. The dynamic ratio of 1:2:4 is the most commonly encountered size of rooms of houses, in the overall plan of houses and the construction of large public buildings. This ratio is also reflected in the overall plan of the large walled sector at Mohenjo-Daro called the “citadel mound”.

If the Harappan iconography expresses the ideas of the original Purāṇa, we are quite close to the traditional chronology of Indian history.

Concluding Remarks

New findings are leading to a new view of ancient India, revealing substantial convergence between the archaeological record and the literary tradition. To be as conservative as possible within the parameters of the new archaeological and astronomical evidence, we think it prudent to consider 2000 BC as the divide between the early Vedic and the later Vedic literature.

The new paradigm is of the greatest significance in understanding the development of philosophical ideas in India. As the Harappan record becomes more accessible, we will be able to provide material evidence of innovations that had their parallels, or inspiration, in philosophical thought.

Notes

1. The participants included an archaeologist (Greg Possehl, Univ of Pennsylvania), three linguists (Madhav Deshpande, Univ of Michigan, Andree Sjöberg, Univ of Texas, and Michael Witzel, Harvard Univ), and a historian of science (Subhash Kak); Lonnie Kliever of SMU served as the moderator. The participants looked at both the idea of invasions and that of a more peaceful process of immigration.
2. E.g. Robb (1993). Basically, the proposition is that the ancient world

was much more complex than supposed in the 19th century models. This complexity viewed within the Indian context is examined in Kak (1994b). Even the idea of the neat *centum/satem* split geographically has been undermined by the discovery of Bangani, a *centum* language in India.

3. Wakankar (1992).
4. Shaffer and Lichtenstein (1998).
5. Kennedy (1995).
6. Lal (1997).
7. Shaffer and Lichtenstein (1995).
8. Seidenberg (1978).
9. For example, see Kak (1994a, 1995a,b, 1996a, 1998b,c).
10. Kak (1988).
11. Allchin (1995), pages 176-179.
12. See Sharma (1995); for new evidence on the domestication of the horse several thousand years before the older postulated period of the second millennium BC, see Anthony et al. (1991).
13. Kak (1994b).
14. Sengupta (1947).
15. Kak (1998b, 1998d).
16. Napier (1986, 1998).
17. Kak (1998d); see also Alvarez (1978) and Taylor (1992).
18. Pargiter (1922); see Bhargava (1971), Frawley (1991), and Klostermaier (1994, 1998).
19. Pargiter (1922).

20. This date has been quite popular with scholars for some time but has much evidence going against it.
21. Another date of 950 BC was proposed to fit in with the theory of the Aryan invasions. But this date has nothing to commend it. For a critique see Kak (1994a).
22. Kar (1916). Also note that in Sengupta (1947; page 55) the date is given as 1921 BC.
23. See Kak (1994a) for a further discussion.
24. Kak (1998c). For another attempt to construct a new chronology of the texts, see Feuerstein (1998).
25. See, for example, Rao and Kak (1998). For further details on the rest of this section, see Kak (1998a, 1998d) and Feuerstein et al (1995).
26. Kak (1994a), pages 43-46.

Bibliography

- Allchin, F.R. (ed.), 1995. *The Archaeology of Early Historic South Asia*. Cambridge.
- Alvarez, O. 1978. *Celestial Brides: A Study in Mythology and Archaeology*. Stockbridge.
- Anthony, D., Telegin, D.Y., Brown, D. 1991. The origin of horseback riding. *Scientific American*, December, 94-100.
- Bhargava, P.L. 1971. *India in the Vedic Age*. Lucknow.
- Feuerstein, G. 1998. *The Yoga Tradition*. Prescott.
- Feuerstein, G. Kak, S. and Frawley, D. 1995. *In Search of the Cradle of Civilization*. Wheaton.
- Frawley, D. 1991. *Gods, Sages, and Kings*. Salt Lake City.

- Kak, S. 1988. "A frequency analysis of the Indus script." *Cryptologia* 12: 129-143.
- 1994a. *The Astronomical Code of the Ṛgveda*. New Delhi.
- 1994b. "On the classification of Indic languages." *Annals of the Bhandarkar Oriental Institute* 75, 185-195.
- 1995a. "The astronomy of the age of geometric altars." *Quarterly Journal of the Royal Astronomical Society* 36: 385-396.
- 1995b. "From Vedic science to Vedānta." *Adyar Library Bulletin* 59: 1-36.
- 1996a. "Knowledge of planets in the third millennium BC." *Quarterly Journal of the Royal Astronomical Society* 37: 709-715.
- 1998a. "Mind, immortality and art." Presented at the *International Seminar on Mind, Man and Mask*, Indira Gandhi National Centre for the Arts, New Delhi, Feb 24-28, 1998.
- 1998b. "Early theories on the distance to the sun." *Indian Journal of History of Science* 33: 93-100.
- 1998c. "The sun's orbit in the Brāhmaṇas." *Indian Journal of History of Science* 33: 175-191.
- 1998d. "Indic ideas in the Graeco-Roman world." to appear in *Indian Historical Review*.
- Kar, L.M. 1916. "Introduction" to *The Matsya Puranam*. Allahabad.
- Kennedy, K.A.R. 1995. "Have Aryans been identified in the prehistoric skeletal record from South Asia? Biological anthropology and concepts of ancient races." In *The Indo-Aryans of Ancient South Asia.*, G. Erdosy (ed.). 32-66. Berlin.
- Klostermaier, K. 1994. *A Survey of Hinduism*. Albany.
- 1998. *A Short Introduction to Hinduism*. Oxford.

- Lal, B.B. 1997. *The Earliest Civilization of South Asia*. Delhi.
- Napier, A. David. 1986. *Masks, Transformation, and Paradox*. Berkeley.
- 1998. “Masks and metaphysics in the ancient world: an anthropological view.” Presented at the *International Seminar on Mind, Man and Mask*, Indira Gandhi National Centre for the Arts, New Delhi, Feb 24-28, 1998.
- Pargiter, F.E. 1922. *Ancient Indian Historical Tradition*. London.
- Rao, T.R.N. and Kak, S. (eds.) 1998. *Computing Science in Ancient India*. Lafayette.
- Robb, J. 1993. A social prehistory of European languages. *Antiquity*, 67, 747-760.
- Seidenberg, A. 1978. The origin of mathematics. *Archive for History of Exact Sciences* 18: 301-342.
- Sengupta, P.C. 1947. *Ancient Indian Chronology*. Calcutta: University of Calcutta Press.
- Shaffer, J.G. and Lichtenstein, D.A. 1995. “The concept of ‘cultural tradition’ and ‘palaeoethnicity’ in South Asian archaeology.” In *The Indo-Aryans of Ancient South Asia.*, G. Erdosy (ed.). 126-154. Berlin.
- 1998. “Migration, philology and South Asian archaeology.” In *Aryan and Non-Aryan in South Asia: Evidence, Interpretation and Ideology*, J. Bronkhorst and M. Deshpande (eds.). In press, Ann Arbor.
- Sharma, A.K., 1993. “The Harappan horse was buried under the dunes.” *Puratattva* 23: 30-34.
- Taylor, T. 1992. “The Gundestrup cauldron.” *Scientific American* 266(March): 84-89.
- Wakankar, V.S. 1992. “Rock painting in India.” In *Rock Art in the Old World*, M. Lorblanchet (ed.). 319-336. New Delhi.