1 Introduction

We are often told by western historians and scientists that Indians of the pre-Christian era were poor historians and even poorer at record keeping and hence that we know very little of the identities of the mathematicians and their contributions to the subject of mathematics. Our contention is precisely the opposite. Not only were the Indics superb record keepers , but they reported on the discoveries of their predecessors as well as contemporaries without the slightest sign of condescension or attempts to purloin the credit for themselves, a trait that appears to be singularly rare among those studying the field of Indology which seeks to obfuscate anything emanating out of India. In many cases the Vedic mathematicians were also the pre-eminent astronomers of their

throughout the ancient as well as the medieval eras Mediterranean, Arab and European savants went to great length to acknowledge the contribution of the Indics in various fields such as number theory, geometry ,astronomy, and medicine. It was only in the colonial era beginning with the discovery of Sir William Jones of the antiquity of Sanskrit, which had far reaching implications on the roots of their own civilization, that racial prejudice towards the Indics took on a dominant role and began to affect the quality as well as the accuracy of the scholarship in Europe. The roots of this prejudice and its progression over the 2 centuries of British rule in India are chronicled by Thomas Trautmann[1] Everything, including the truth became subordinate to the paramount goal of maintaining a dominant role in India and Asia. We do not know for certain that there was deliberate falsification of records to support their versions of Indic history, but what we do know is that in certain key instances, the text has been

---

[1] Trautmann,Thomas R(1997) Aryans and British India, University of California Press, Berkeley

2 List of Indologists who worked in the area of Indology

Indologists	
Sir William Jones (1746-1794) the founder of Indology, largely responsible for postulating a Proto Indo European language for which no speakers have been found and for misdating the chronology of ancient India	Hermann George Jacobi (1850-1837)was the first to suggest that the Vedic Hymns were collected around 4500 BCE based on Astronomical observations made by the Vedics
Thomas Babington Macaulay (1800-1859) decreed English to be the medium of instruction, drafted the Indian Penal Code. He did not study the texts himself because he was ignorant of Sanskrit, but he hired	Friedrich Maximilian Mueller (1823-1900) translated the books of the east. His private views of these books were vastly at variance with his public pronouncements

convert the heathen returned discouraged that it was very difficult too accomplish

Sir Charles Wilkins (1749-1836)

Translated the Bhagavad Gita in 1785

Henry Thomas Colebrook (1765-1837)

Studied Sanskrit from the Pundits and wrote on the Vedas

August Wilhelm Schlegel (1767-1845)

Lecturer in Sanskrit ,Bonn University

Colonel Colin Mackenzie (1753-1821)

Collector of Indian Manuscripts

Horace Hayman Wilson (1786-1860)

First Boden Professor of Sanskrit at Oxford U

wrote on the Puranas

Franz Bopp (1791-1867)

Did detailed research leading to postulation of Proto Indo European (PIE)

Arthur Schopenhauer

Asiatic Society of Bengal	Chair of Sanskrit Studies in 1811 with the purpose of debunking the Vedas
Frederick Eden Pargiter (1852-1897) published ‘Purana texts of the Dynasties of the Kali age”	Robert Caldwell (1815-1891) Collected Sanskrit manuscripts, a British missionary
Sir Mark Aurel Stein (1862-1943),Archaeological Survey of India	Vincent Smith(1848-1920), author of Oxford History of India
Arthur Barriedale Keith (1879-1944) published ‘The religion of and philosophy of the Vedas’ in 2 volumes in 1925, Cannot be regarded as an authentic or reliable translation	Arthur Anthony McDonnell(1854-1930), brought 7000 Sanskrit manuscripts from Kashi to Oxford University
	Maurice Bloomfield (1855-1928), interpreted the Vedas
Morris Winternitz (1863-1937), wrote History of Indian	Sir Robert Erie Mortimer Wheeler(1890-

of India "Indian philosophy was at the heart of Zimmer's interest in oriental studies, and this volume therefore represents his major contribution to our understanding of Asia. It is both the most complete and most intelligent account of this extraordinarily rich and complex philosophical tradition yet written."

tradition of Heinrich Zimmer, albeit he uses the word myth much too liberally

Among these there are quite a few who neither harbored preconceived notions nor would they indulge in the dishonest act of altering documents. Typical of these were names like Playfair, Jacobi, Schopenhauer, Alain Danielou, Heinrich Zimmer and Joseph Campbell. But even with the best of intentions it is difficult to translate accurately from a language and culture which is alien to ones own. When that language is over 4000 years old, the difficulties are multiplied in manifold ways. When Europeans studied Sanskrit and the Vedas the paradigm

Mueller's professor) they had never set foot in India or conversed with a pundit. In just as many instances such as that of max Mueller they could not converse or chant a single sloka in Sanskrit much less understand one when it was chanted in front of them. But that did not stop them from claiming to be Sanskritists of the first rank. Neither did their dilettante status in Sanskrit stop Bopp and Sir William from deciding that there must have been an ancestral language (which they called Proto Indo European (PIE for short) spoken anywhere but in India. Now that I ponder on the reluctance of Max Mueller to visit India, the suspicion is overwhelming that the real reason he never wished to set foot in India was that he would thereby be spared the embarrassment of facing a real pundit in Sanskrit and have to then admit how shallow his knowledge of Sanskrit was.

hardly very popular in Europe steeped as it was in anti Semitism. Therefore, when Sanskrit was first discovered, the notion that there was a race of noble Aryans who were their putative ancestors was then greeted with a great deal of enthusiasm once they had disposed of the prior suspicion that they were descended from the teeming millions of India.

The corollary to this proposition was that the denizens of the Indian subcontinent could not possibly have an antiquity greater than that of Greece or that of Pericles and the Shakespearean vision of the golden age of the Hellenic civilization. It was the conflict with his strict belief in the Creation theory postulated in the bible that led Sir William to lop of 1200 years from the Puranic history of India and to further postulate that the contemporary of Megasthenes , the Greek historian who visited India around 300 BCE was Chandragupta Maurya and not the Chandragupta of the Imperial Gupta dynasty.

efforts was to change the complexion of the debate. What was once a search for the roots of their own languages has now been transformed into, in their words, an obsession on the part of the Hindu right wing to prove that the Aryans were indigenous to India? This is undoubtedly a very astute strategy on their part since it takes the limelight of their own obsession to find a Urheimat for their group of languages and the fact that from the inception the postulates of dating Indic history have been political rather than academic in nature. The entire dating of the revisionist Indic history by the British and the Europeans has been a political enterprise right from the start. So, now when the argument is made that political considerations are driving the Hindu right wing in their opposition to theories such as the AIT, regardless of the truth of such an allegation, it ignores the glaring fact that it has always been so.

along the Mediterranean Sea. In AIT they saw their opportunity to portray themselves as the progenitors of a vast Eurasian civilization without aligning themselves too closely to the brown skinned people of India. The conclusion is inescapable that while validating the AIT is not crucial to the pride of the Indic other than that it robbed him of his own authentic history, the debunking of AIT would have a devastating effect on the European weltanschauung of the roots of his own civilization. Indics in general for understandable reasons tend to be Indocentric and look to their own psyche to comprehend the nature of this paradigm. We, the Indics, would be much better served if we sought to understand the motivations and psyche of the European, at least in this instance or in other words to understand why there is such a constant emphasis on Eurocentrism in the European psyche.

4 Misdating of Aryabhatta the Elder

Aryabhatta is without doubt the Astronomer/Mathematician non-pareil of the Post Vedic/Post Epic era in the historical narrative, especially so since his magnum opus *The Aryabhattium* , which packs a lot of information in the terse aphoristic style characteristic, of that era, has survived intact from the mists of a distant past when he first developed his thesis in 4 Chapters covering the subject of Mathematics and Astronomy. His work and the prior work in the Vedic area form an important sheet anchor for the entire chronology that follows, important by virtue of the fact that it attests to the state of the language prior to his contribution, and refers to the beginning of Kaliyuga as he reveals his own age. But first we list the main mathematicians during the period in question

in which he describes the motion of the sun and the moon

and advances a 95 year cycle

to synchronize the motions of the sun and the moon

Lagadha who authored the Jyotisha Vedanga

Baudhayana the author of the Sulvasutra named after him

Apastambha "

Katyayana "

Panini the Grammarian for the Indo Europeans

Pingala Binary System of number representation:[3]

Aryabhatta the astronomer laureate of ancient India

---

[3] A Mathematician named Pingala (c. 100BC) developed a system of binary enumeration convertible to decimal numerals [See 3]. He described the system in his book called *Chandahshaastra*. The system he described is quite similar to that of Leibnitz, who was born in the 17th century.[3]

We will tackle first the misdating of Aryabhatta for the reasons stated above .

Details of the life and contributions of this veritable genius are presented in the linked site. What concerns us most here is the episode relating to the misdating.

"Aryabhatta is the first famous mathematician and astronomer of Ancient India. In his book *Aryabhatteeyam,* Aryabhatta clearly provides his birth data. In the 10th stanza, he says that when 60 x 6 = 360 years elapsed in this Kali Yuga, he was 23 years old. The stanza of the sloka starts with

476 A.D Since in every genuine manuscript, we find the word "Shadbhi" and not the altered "Shasti", it is clear that Aryabhatta was 23 years old in 360 Kali Era or 2742 B.C. This implies that Aryabhatta was born in 337 Kali Era or 2765 B.C. and therefore could not have lived around 500 A.D., as manufactured by the Indologists to fit their invented framework. Bhaskara I is the earliest known commentator of Aryabhatta's works. His exact time is not known except that he was in between Aryabhatta *(2765* B.C.) and Varahamihira (123 B.C.)."

The implications are profound, if indeed this is the case. The zero is by then in widespread use and if he uses Classical Sanskrit then he antedates Panini

"How the beginning of Kaliyuga is Linked with the Dates of Indian astronomers? The ancient Indian astronomers perhaps purposely linked the determination of their dates of birth, composition of their

***Trayadhika vimsatirabdhastdheha mama janmanoatita*||**

"*When sixty times sixty years and three quarter yugas (of the current yuga) had elapsed, twenty three years had then passed since by birth*" (K. S. Shukla).

"*Now when sixty times sixty years and three quarter Yugas also have passed, twenty increased by three years have elapsed since my birth*" (P. C. Sengupta).

"I was born at the end of Kali 3600; I write this work when I am 23 years old i.e., at the end of Kali 3623" "(T. S. Kuppanna Sastry[11]).

Here, though only Yuga is mentioned, Kaliyuga is implied and its starting of 3102 BCE is taken for reckoning purpose. Thus, the date of Aryabhatta is determined as follows:

The year of birth = **3600 – 3102 = 488 / 499 – 23 = 476 CE**. This has

(Ch.I.verse.9):

Kalpadherabdhnirodhadhayam abdharashiritiritaha:

khagnyadhriramarkarasavasurandhrenadhavaha: te cangkkairapi 1986123730 **|**

"*Since the beginning of the current Kalpa, the number of years elapsed is this: zero, three, seven, three, twelve, six, eight, nine, one (proceeding from right to left) years. The same (years) in figures are 1986123730*".

Bhaskara mentions the names of Latadeva, Nisanku and Panduranga Svami as disciples of Aryabhatta.

Shastyabdanam Shadbhiryada vyateetastra yascha yuga padah.”

“Shastyabdanam Shadbhi” means 60 x 6 = 360. Which places his birth at 2765 BCE (360 -23 – 3102)

Or this one

Shastabdhanam shastardha vyatitastrashyam yugapadha|

Trayadhika vimsatirabdhastdheha mama janmanoatita||

Shastabdhanam shastardha means 60 x 60 = 3600

Which places his birth at (3600 – 23 – 3102) = 475 CE

Te resulting shift in the date of Aryabhatta of 3240 years, makes him roughly 3 times higher in chronology , and has profound consequences for the Indic contributions relative to those of Babylonian mathematicians

for the understanding and tradition of the Vedas.

1. Shiksha (*śikṣā*): phonetics and phonology (sandhi)
2. Chandas (*chandas*): meter Pingala
3. Vyakarana (*vyākaraṇa*): grammar Panini
4. Nirukta (*nirukta*): etymology Yaska
5. Jyotisha (*jyotiṣa*): astrology Lagadha
6. Kalpa (*kalpa*): ritual Apastambha, Baudhayana, Katyayana , Manava

The Vedangas are first mentioned in the Mundaka Upanishad as topics to be observed by students of the Vedas. Later, they developed into independent disciplines, each with its own corpus of Sutras.

great savants that India has produced in such abundance. The scope and scale of his vast contributions to language, grammar, computing science, and place value system is mind numbing at a time when scripts were in an embryonic stage of development. It is no hyperbole to say that there was no study of grammar as a codified set of rules until the west discovered Pannini's Ashtadhyayi

Pingala

Yaska

Apastambha

Baudhayana

Katyayana

Ashvalayana

Brahmanas	**800 to 600 BCE**
Sutras	**600 to 200 BCE**

7 Timeline according to Keith[5]

Taittiriya Samhita	**500 BCE**
Baudhayana	**400 BCE**
Ashvalayana	**350 BCE**
Sankhayana	**350 BCE**
Yaska	**300 BCE**
Apastambha	**300 BCE**

[4] Friedrich MaxMueller (1968) A History of AncientSanskrit Literature,Varanasi,Chowkambika Sanskrit Series Office

[5] Keith,Arthur Barriedale, various works, see Rajaram (1995)

8 Conventional Timeline of Mathematicians in the ancient world (Wiki)

- ca. 70,000 BC South Africa ochre rocks adorned with scratched geometric patterns [1]
- ca. 35,000 BC to 20,000 BC Africa & France, earliest known prehistoric attempts to quantify time (references: [2], [3], [4])
- ca. 20,000 BC Nile Valley, Ishango Bone: earliest known prime number sequences and also Egyptian multiplication
- ca. 3400 BC Mesopotamia the Sumerians invent the first numeral system, a system of weights and measures, and are the first to construct cities

exactly 0.028 kg

- 2800 BC The Lo Shu Square, the unique normal magic square of order three, was discovered in China
- ca. 2700 BC Indus Valley Civilization, the earliest use of negative numbers (see Negative Number: History)
- 2700 BC Egypt, precision surveying
- 2600 BC Indus Valley Civilization objects, streets, pavements, houses, and multi-storied buildings are constructed at perfect right-angles, with each brick having exactly the same dimensions
- 2400 BC Mesopotamia, the Babylonians invent the earliest calculator, the Abacus
- 2400 BC Egypt, precise Astronomical Calendar, used even in the Middle Ages for its mathematical regularity

solve 2nd order algebraic equations: [7].

- ca. 1800 BC Vedic India Yajnavalkya writes the Shatapatha Brahmana, in which he describes the motions of the sun and the moon, and advances a 95-year cycle to synchronize the motions of the sun and the moon
- ca. 1800 BC the Yajur Veda, one of the four Hindu Vedas, contains the earliest concept of infinity, and states that "if you remove a part from infinity or add a part to infinity, still what remains is infinity"
- 1650 BC Rhind Mathematical Papyrus, copy of a lost scroll from around 1850 BC, the scribe Ahmes presents one of the first known approximate values of π at 3.16, the first attempt at squaring the circle, earliest known use of a sort of cotangent, and knowledge of solving first order linear equations
- 1350 BC Indian astronomer Lagadha writes the "Vedanga Jyotisha", a Vedic text on astronomy that describes rules for tracking the motions of the sun and the moon, and uses geometry and trigonometry for astronomy

text, contains the first use of the Pythagorean theorem, quadratic equations, and calculates the square root of 2 correct to five decimal places

- 600 BC - Apastamba, author of the Apastamba Sulba Sutra, another Vedic Sanskrit geometric text, makes an attempt at squaring the circle and also calculates the square root of 2 correct to five decimal places
- ca. 600 BC - the other Vedic "Sulba Sutras" ("rule of chords" in Sanskrit) contain the first use of irrational numbers, the use of Pythagorean triples, evidence of a number of geometrical proofs, and approximation of π at 3.16
- 530 BC - Pythagoras studies propositional geometry and vibrating lyre strings; his group also discover the irrationality of the square root of two,
- ca. 500 BC - Indian grammarian Pānini, considered the father of computing machines, writes the Astadhyayi, which contains the use of metarules, transformations and recursions, originally for the purpose of systematizing the grammar of Sanskrit

(zero)

- 370 BC - Eudoxus states the method of exhaustion for area determination,
- 350 BC - Aristotle discusses logical reasoning in *Organon*,
- 300 BC - Jaina mathematicians in India write the "Bhagabati Sutra", which contains the earliest information on combinations
- 300 BC - Euclid in his *Elements* studies geometry as an axiomatic system, proves the infinitude of prime numbers and presents the Euclidean algorithm; he states the law of reflection in *Catoptrics*, and he proves the fundamental theorem of arithmetic
- ca. 300 BC - Brahmi numerals, the first base-10 numeral system, is conceived in India
- ca. 300 BC - Indian mathematician Pingala writes the "Chhandah-shastra", which contains the first use of zero (indicated by a dot) and also presents the first description of a binary numeral system, along with the first use of Fibonacci numbers and Pascal's triangle

- 225 BC - Apollonius of Perga writes *On Conic Sections* and names the ellipse, parabola, and hyperbola,
- 150 BC - Jain mathematicians in India write the "Sthananga Sutra", which contains work on the theory of numbers, arithmetical operations, geometry, operations with fractions, simple equations, cubic equations, quartic equations, and permutations and combinations
- 140 BC - Hipparchus develops the bases of trigonometry,
- 50 BC - Indian numerals, the first positional notation base-10 numeral system, begins developing in India

Ca 4000 BCE	Vedic India	Rg Veda Mandalas composed over a 500 year period
ca. 4000 BCE	Vedic India	Yajnavalkya writes the Shatapatha Brahmana, in which he describes the motions of the sun and the moon, and advances a 95-year cycle to synchronize the motions of the sun and the moon
ca. 4000 BCE	the Yajur Veda,	one of the four Hindu Vedas, contains the earliest concept of infinity, and states that "if you remove a part from infinity or add a part to infinity, still what remains is infinity"
Ca 3500 BCE – 4000 BCE	Post Vedic India Vedanga Vyakarana	Panini develops Sanskrit Grammar. considered the father of computing machines, writes the Astadhyayi, which contains the use of metarules, transformations and recursions, originally for the purpose of systematizing the grammar of Sanskrit Enunciated Panini-Backus form and is the father of Classical sanskrit as we know it today distinguished from Vedic sanskrit. There are increasing inferences that Panini

3102 BCE	India	Beginning of Kali Yuga, sheet anchor for dating Indic civilization
ca. 3100 BCE	Egypt,	earliest known decimal system allows indefinite counting by way of introducing new symbols, [5]
Ca. 3000 BCE	Post Vedic India Vedanga Jyotisha	Earliest astronomical text in India. astronomer Lagadha writes the "Vedanga Jyotisha", a Vedic text on astronomy that describes rules for tracking the motions of the sun and the moon, and uses geometry and trigonometry for astronomy
Ca. 2700 BCE	Post Vedic Vedanga KalpaSutra	Apastambha Sulva sutra
Ca. 2700 BCE	Post Vedic Vedanga Kalpa Sutra	Baudhayana Sulva Sutra
Ca.2700BCE	Post Vedic Vedanga Kalpa	Ashvalayana Sulva sutra

		used is exactly 0.028 kg
2800 BCE	The Lo Shu Square,	the unique normal magic square of order three, was discovered in China
ca. 2700 BCE	Saraswati Sindhu Civilization,	the earliest use of negative numbers (see Negative Number: History)
2700 BCE	Egypt,	precision surveying
2600 BCE	Saraswati Sindhu Civilization	objects, streets, pavements, houses, and multi-storied buildings are constructed at perfect right-angles, with each brick having exactly the same dimensions
2576 BCE	Post Vedic Classical Sanskrit	Astronomer Laureate of India Aryabhatta the Elder, postulates Heliocentric model of the solar system
2400 BCE	Mesopotamia,	the Babylonians invent the earliest calculator, the Abacus
2400 BCE	Egypt,	precise Astronomical Calendar, used even in the Middle Ages for its mathematical regularity
ca. 2000 BCE	Mesopotamia,	the Babylonians use a base-60 decimal system, and compute the first known approximate value of π at

1650 BCE	Rhind Mathematical Papyrus,	copy of a lost scroll from around 1850 BCE, the scribe Ames presents one of the first known approximate values of π at 3.16, the first attempt at squaring the circle, earliest known use of a sort of cotangent, and knowledge of solving first order linear equations

Assumptions

The Sulvasutras precede the developments in Babylon and Egypt and must therefore date at least to 2000 BCE.

The RgVeda must have been fully composed prior to 2000 BCE because of the drying up of the Saraswati River prior to 1900 BCE

Chinese (or Chinese-like) mathematics. He suggests that Old-Babylonian mathematics is a derivative of a more ancient mathematics having a much clearer geometric component (p. 104), and is "in some respects ... is derivative of a Chinese-like mathematics" (p. 109). Van der Waerden holds a similar view on this, and tells us that the mathematics of the *Chiu Chang Suan Shu* represents the common source more faithfully than the Babylonian does. Seidenberg believes that the common source is most similar to the *Sulvasutras*. He discusses how questions of the sphere and the circle were treated by the Greeks, Chinese, Egyptians, and to a lesser extent Indians. He discusses the some similarities and differences in the work on the sphere in Greece (Archimedes, with a very brief account of the application of his *Method*), and in Chinese (first in the *Chiu Chang Suan Shu*, improved by Liu Hui or perhaps Tsu Ch'ung-Chih, and then further improved by the Tsu Ch'ung-Chih's son Tsu Keng-Chih). He believes that the problem of the volume of a sphere goes back to the common source, to the first

Egyptian, Babylonian, and Chinese approaches to the volume of a truncated pyramid may have derived from the same common source. He believe that the common source also used infinitesimal, Cavalieri-type, arguments as well. It is interesting as well that Heron, who as Seidenberg notes is sometimes considered to be continuing the Babylonian tradition, gives the formula $^1/_2(s+p)p+^1/_{14}(^1/_2 s)^2$ for the area of a segment of a circle with chord *s* and height (sagita, arrow) *p* (with an Archimedean value of $^{22}/_7$ for *pi*), and "that the 'ancients' took [the area as] $^1/_2(s+p)p$ and even conjectured that they did so because they took *pi* = 3." The paper is also interesting in that he discusses the development of some of his ideas from his early papers in the 60s until much later (the paper was received soon before his death). Closely related topics: The Sphere, The Circle, The Pythagoreans, China, The *Chiu Chang Suan Shu* (Nine Chapters on the Mathematical Art), Sumerians and Babylonians, The Sulvasutras, Archimedes, Archimedes' Method, The Moscow Mathematical Papyrus, and Heron.

Abraham Seidenberg advanced a theory that mathematics arose from a common origin, and that some the mathematics was preserved by an oral tradition, and very likely a religious tradition, perhaps one like the one seen in the Indian *Sulvasutras*. Van der Waerden's book *Geometry and Algebra in Ancient Civilizations* takes a similar views, and in fact van der Waerden credits Seidenberg for making him look at the history of mathematics a new way. As Mathews notes, the Chinese *Chiu Chang Suan Shu* is very important in van der Waerden's work. Mathews relies heavily on this work as well to "give a small, coherent, and basic core of geometry concerning rectangles and their parts, ..., which may serve as what van der Waerden has called an 'oral tradition current in the Neolithic age.'" He states the he hoped "to give this hypothesized ancient core some credence through its relation to the *Chiu Chang* and its explanatory power. After giving a thorough discussion of this geometry, he then carefully analyzes the ninth chapter of the *Chiu Chang* in terms of this core. He is able to

his conjecture on, say, the Babylonian corpus, I can argue for the merits of my conjecture only on such grounds as the simplicity of explanation it allows, or its congruence with received results or figures." Closely related topics: The Neolithic Era, Religion, Geometry, The *Chiu Chang Suan Shu* (Nine Chapters on the Mathematical Art), and Abraham Seidenberg.

11 Summary

In Part II we have laid the groundwork for a new chronology. In subsequent chapters we will present the basis for the new chronology. Some of the topics we will be discussing are

The contributions of Panini

The contributions of Aryabhatta and other Mathematicians