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Panini:- An Ancient Vedic Mathematician

DR. JAI NANDAN SINGH
H.O.D MATHEMATICS
KOSHI COLLEGE KHAGARIA
MUNGER UNIVERSITY, MUNGER

Abstract:-

Panini was an ancient Vedic Indian Mathematician and Father of linguist. After all he is widely regarded as the father of Sanskrit grammar. His magnum opus, the Aṣṭadhyaya is a comprehensive and systematic treatise on Sanskrit morphology, phonology, and syntax. Panini's work had a profound impact on the development of Indian linguistics and literature. His rules and principles were adopted by later grammarians and scholars, and his influence can be seen in the works of many classical Indian authors. Panini's work also had a significant impact on the development of modern linguistics, and his ideas are still studied and debated by scholars today.

In addition to his contributions to linguistics, Panini also made significant contributions to the development of mathematics. He introduced the concept of zero and developed a system of mathematical notation that is still used in India today. He also made contributions to the study of astronomy and physics. Panini's work is considered to be one of the most important contributions to Indian culture and scholarship. He is remembered as a brilliant and innovative thinker whose work has had a lasting impact on the world.

Key Words: - Comprehensive, Morphology, Phonology, Syntax, Linguistics, Literature, Significant, Contributions, Culture.

Introduction:-

Paṇini was a Sanskrit grammarian, logician, philologist, and revered scholar in ancient India, variously dated between the 7th and 4th century BCE. With his most notable work, the Aṣṭadhyayi, Paṇini has been considered the "first descriptive linguist", and even labelled as "the father of linguistics". His approach to grammar influenced many foundational linguists in the modern time. The name Paṇini is a patronymic meaning descendant of Paṇina. His full name was Dakṣiṇputra Paṇini. According to verses Patanjali's Mahabhaṣya, with the first part suggesting his mother's name was Dakṣi.

Paṇini has been lived between the seventh and fourth century BCE. George Cardona in his authoritative survey and review of Paṇini-related studies, states that the available evidence strongly supports a dating not before 400 BCE, while earlier dating depends on interpretations and is not probative. Based on numismatic findings, von Hinuber and Falk place Paṇini in the mid-4th century

BCE. Paṇini's rupya mentions a specific gold coin, the niṣka, in several sutras, which originated in India in the 4th-century BCE.

Hinuber and Falk, we now know that Paṇini lived, in all probability, far closer in time to the period of Asoka than had hitherto been thought. According to Falk's reasoning, Panini must have lived during the decade following 350 BCE, that is, just before the invasion by Alexander of Macedonia.

It is not certain whether Paṇini used writing for the composition of his work, though it is generally agreed that he knew of a form of writing, based on references to words such as lipi and lipikara in section 3.2 of the Aṣṭadhyayi. The dating of the introduction of writing to present day North West Pakistan may therefore give further information on the historical dating of Paṇini. Paṇini cites at least ten grammarians and linguists before him: Apisali, Kasyapa, Gargya, Galava, Cakravarmaṇa, Bharadvaja, Sakaṭayana, Sakalya, Senaka, Sphoṭayana and Yaska. According to Kamal K. Misra, Pāṇini references Yaska's Nirukta, "whose writings date back to the middle of the 4th century B.C".

The Sanskrit epic Brihatkatha and the Buddhist scripture Manjusri-mula-kalpa both mention Paṇini to have been a contemporary with the king Dhana Nanda, the last monarch of the Nanda Empire before Chandragupta Maurya came to power. Cardona offers an earlier date for Paṇini, by arguing the compound word yavanani discussed in sutra 4.1.49, instead of referring to a writing (lipi) c.q. cuneiform of the Achaemenid Empire, or the Greek of Alexander the Great, refers to Greek women; and that Indus valley residents possibly had contacts with Greek women before Darius's 535 BCE, or Alexander's 326 BCE conquests. K. B. Pathak in (1930) argues that the kumarasramaṇa, of sutra, derived from sramaṇa, which refers to female renunciates, c.q. "Buddhist nuns", could also refer to Jain Aryika, of unknown origin, possibly permitting Paṇini to be placed before the, 5th century BCE, Gautama Buddha. Others, based on Panini's linguistic style, date his works to the sixth or fifth century BCE, as Follows:-

- According to Bod, Paṇini's grammar defines Classical Sanskrit, so Paṇini is chronologically placed in the later part of the Vedic period, corresponding to the seventh to fifth century BCE.
- According to A. B. Keith, the Sanskrit text that most matches the language described by Paṇini is the Aitareya Brahmana Between 8th and 6th BCE.
- According to Scharfe, "his proximity to the Vedic language as found in the Upanishads and Vedic sutras suggests the 5th or maybe 6th c. B.C."

Aṣṭadhyayi :-

Aṣṭadhyayi The most important of Paṇini's works, the Aṣṭadhyayi, is a grammatical treatise on the Sanskrit language. It is descriptive and generative with algebraic-like rules governing every aspect of the language. It is supplemented by three ancillary texts: The akṣarasamamnyaya, dhatupaṭha and gaṇapaṭha. Modeled on the dialect and register of elite speakers in his time, the text also accounts for some features of the older Vedic language. Growing out of a centuries-long effort to preserve the language of the Vedic hymns from "corruption", the Aṣṭadhyayi is the high point of a vigorous, sophisticated grammatical tradition devised to arrest language change. The Aṣṭadhyayi's preeminence is underlined by the fact that it eclipsed all similar works that came before: while not the first, it is the oldest such text surviving in its entirety.

The Aṣṭadhyayi consists of 3,959 sutras in eight chapters, which are each subdivided into four sections or padas. The text takes material from lexical lists as input and describes the algorithms to be applied to them for the generation of well-formed words. Such is its intricacy that the correct application of its rules and metarules is still being worked out centuries later.

The Aṣṭadhyayi, composed in an era when oral composition and transmission was the norm, is staunchly embedded in that oral tradition. In order to ensure wide dissemination, Paṇini is said to have preferred brevity over clarity it can be recited end-to-end in two hours. This has led to the emergence of a great

number of commentaries of his work over the centuries, which for the most part adhere to the foundations laid by Paṇini's work.

Bhattikavya :-

Indian curriculums in the late classical era had at their core a system of grammatical study and linguistic analysis. The core text for this study was the Aṣṭadhyayi of Paṇini, the sine qua non of learning. This grammar of Paṇini had been the object of intense study for the ten centuries prior to the composition of the Bhaṭṭikavya. It was Bhaṭṭi's purpose to provide a study aid to Paṇini's text by using the examples already provided in the existing grammatical commentaries in the context of the Ramayaṇa. The intention of the author was to teach this advanced science through a relatively easy and pleasant medium. In his own words:

This composition is like a lamp to those who perceive the meaning of words and like a hand mirror for a blind man to those without grammar. This poem, which is to be understood by means of a commentary, is a joy to those sufficiently learned: through my fondness for the scholar I have here slighted the dullard.

Nothing certain is known about Paṇini's personal life. In an inscription of Siladitya VII of Valabhi he is called Salaturiya, which means "a man from Salatura". This means Panini lived in Salatura in ancient Gandhara, which likely was near Lahor, a town at the junction of the Indus and Kabul rivers. According to the memoirs of the 7th-century Chinese scholar Xuanzang, there was a town called Suoluoduluo on the Indus where Paṇini was born, and where he composed the Sanskrit Vyakarana.

According to Hartmut Scharfe, Paṇini lived in Gandhara, close to the borders of the Achaemenid Empire, and Gandhara was then an Achaemenian satrapy following the Achaemenid conquest of the Indus Valley. He must, therefore, have been technically a Persian subject but his work shows no awareness of the Persian language. According to Patrick Olivelle, Paṇini's text and references to him elsewhere suggest that "he was clearly a northerner, probably from the northwestern region"

Panini: The Grammarian

Born around the 5th century BCE in Shalatula near present-day Attock, Pakistan, Panini is revered as the "father of linguistics." His magnum opus, the Aṣṭadhyayi, is a seminal work of Sanskrit grammar. This intricate treatise, composed in a highly condensed and technical style, comprises 4,000 concise rules (sutras) that describe the structure and formation of the Sanskrit language with remarkable precision.

The Aṣṭadhyayi covers a wide range of grammatical phenomena, including:-

- * Phonetics and Phonology: Rules governing the pronunciation and sound changes of Sanskrit words.
- * Morphology: Rules for word formation, including the formation of roots, stems, and suffixes.
- * Syntax: Rules for sentence structure, including word order and agreement.

Panini's approach to grammar was revolutionary. He employed a sophisticated system of metalanguage, using symbols and abbreviations to express grammatical concepts with unparalleled brevity and clarity. His work demonstrates a deep understanding of linguistic principles, including the concept of recursion, which is considered a cornerstone of modern linguistics.

Impact of Panini's Work

Panini's Aṣṭadhyayi had a profound and enduring impact on:-

- * **Indian Linguistics:** It became the foundation of the Indian grammatical tradition, influencing generations of scholars and shaping the course of Indian linguistics for centuries.
- * **Indian Literature:** The Aṣṭadhyayi provided a standardized framework for Sanskrit, contributing to the flourishing of Sanskrit literature during the classical period.
- * **Modern Linguistics:** Panini's ideas and methods have had a significant influence on modern linguistics, inspiring scholars like Ferdinand de Saussure and Noam Chomsky.

Panini and Mathematics: - A Misconception

While Panini's work exhibits a high degree of logical rigor and systematic analysis, there's no evidence to suggest he made any significant contributions to mathematics.

- * **Focus on Linguistics:** The Aṣṭadhyayi is exclusively devoted to the study of language, with no discernible mathematical content.
- * **Lack of Mathematical References:** There are no known mathematical treatises or texts attributed to Panini.
- * **Confusion with Other Scholars:** It's possible that Panini has been mistakenly associated with other Indian scholars who made significant contributions to mathematics, such as Aryabhata and Brahmagupta.

Legacy

Panini is known for his text Aṣṭadhyayi, a sutra-style treatise on Sanskrit grammar, which consists of 3,996 verses or rules on linguistics, syntax and semantics in "eight chapters" which is the foundational text of the Vyākaraṇa branch of the Vedāṅga, the auxiliary scholarly disciplines of the Vedic period. His aphoristic text attracted numerous bhashya, of which the Mahabhaṣya by Patanjali is the most famous. His ideas influenced and attracted commentaries from scholars of other Indian religions such as Buddhism.

Panini's analysis of noun compounds still forms the basis of modern linguistic theories of compounding in Indian languages. Panini's comprehensive and scientific theory of grammar is conventionally taken to mark the start of Classical Sanskrit. His systematic treatise inspired and made Sanskrit the preeminent Indian language of learning and literature for two millennia.

Panini's theory of morphological analysis was more advanced than any equivalent Western theory before the 20th century. His treatise is generative and descriptive, uses metalanguage and meta-rules, and has been compared to the Turing machine wherein the logical structure of any computing device has been reduced to its essentials using an idealized mathematical model.

Conclusion

Panini was a brilliant linguist, not only a mathematician. His Aṣṭadhyayi stands as a testament to his intellectual genius and his profound impact on the history of linguistics. While he may not have contributed directly to the field of mathematics, his work demonstrates the power of rigorous analysis and systematic thinking, principles that are equally valuable in both linguistics and mathematics.

References

1. Cardona, George. 1976. Pāṇini: A Survey of Research. Motilal Banarsidass.
2. Staal, J. F. 1966. Word Order in Sanskrit and Universal Grammar. D. Reidel Publishing Company.
3. Whitney, William Dwight. 1879. Sanskrit Grammar. Harvard University Press.
4. Robins, Robert Henry (1997). A short history of Linguistics (4th Ed.) London, Longman. ISBN-0582249945. OCLC 35178602.
5. Rita Sharma; Arbind Sharma (2008). Hermeneutics and Hindu Thought: Toward a fusion of Horizons, springer publishing P.235 15BN 978-1-4020-8192-7.
6. Singh, upinder (2008). A History Ancient and Early Medieval India: from the Stone Age to the 12th centerry, pearson Longman P-258. ISBN 978-81-317-1120-0.
7. Saroja Bhate (2002). Panini, a Sahitya R_{2} + y deg Akademi P. 4 ISBN 81-260-1198-X
8. Singh, Nagendra Kr. ed. (1997), Encyclopaedia of Hinduism, New Dethi centre for International Religious Studies, Anmol publications PP. 1983-2007, ISBN-978-81-7488-168-7.
9. Patrick olivelle (1999). Dharma Sutras. Oxford University press. PP-xx vi- xxvii ISBN 978-0-19-283882-7.
10. Pamini, Sumitra Mangesh Katre (1989): Astadhyayi of Panini, Motilal Banarsidass. P.xx ISBN 978-81-208-0521-7.