

Contribution Of Physics to Ancient Indian Knowledge System

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Received:

01/10/2025

Revised:

09/10/2025

Accepted:

25/10/2025

Published:

11/11/2025

ABSTRACT

Indian knowledge system (IKS) is a collection of scientific and technological knowledge which has been deeply rooted in ancient texts of Vedas, Upanishads, and Puranas. This knowledge system has strongly contributed to philosophy, religion, science, medicine, astrology, and literature. There is a fear of losing this indigenous knowledge because of globalization. The purpose of IKS is to identify indigenous knowledge related to modern science and technology. Physics is a branch of science which deals with the study of matter, energy, and the interaction between them. Concepts incorporated in physics began at the very moment of the creation of the material world. Knowledge about various physics concepts such as motion, light, sound, electricity, magnetism etc., were recognized in ancient era. We cannot say that the ancient world was unaware of all kinds of modern science concepts. It has very rich knowledge heritage of science concepts. This review paper focusses on the role of physics in ancient Indian knowledge system.

Keywords: Energy, Indian knowledge system, Laws of motion, Light, Magnetism, Sound



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INTRODUCTION

The Indian knowledge system (IKS) is an historic and rich series of conventional understanding, practices, and scientific perceptions advanced in India over lots of years ago. Physics explores nature's essential principles through observation, experimentation, and metaphysical replication. To develop a complete frame of knowledge, historical Indian scientists skillfully combined physics with mathematics, astronomy, chemistry, and philosophy. The base of the Indian knowledge system lies within the ancient texts of the Vedas, that are the oldest scriptures in the world. The Vedas contain a sizable amount of knowledge in variety of areas ranging from medicine, astronomy, mathematics, psychology, and politics, to spirituality and philosophy. They throw light on Indian way of life and emphasize the cost of peace, stability, and brotherhood in society [1].

This ancient knowledge was preserved on Palm leaves, Birch bark, Papyrus, Bamboo, Clay tablets, Animal skin parchment and transferred from one generation to next generation orally. However, this indigenous knowledge was lost due to surprising shifts within the manner of expertise transformation throughout time [2]. In this article emphasis is given on principles, concepts of physics used in historical society.

MATERIALS AND METHODS

This paper is based totally on study of contemporary physics principles used in ancient Indian knowledge system. The study and comparison are performed in systematic way and concluded the importance of Indian

knowledge system from ancient time to modern generation. The data was collected from secondary assets like research articles, books, and websites.

RESULTS AND DISCUSSIONS

Mechanics: Newton's laws of motion are a set of three laws that describe the connection between the motion of an object and the forces acting on it. In historic India Rishi Kanad formulated Vaisheshika Sutras describing Newton's laws of motion. First sutra- "Vegah Nimitta Visheshat Karmano Jayate." This sutra states that change of motion is because of force acting on the body, that is identical as Newton's first law of motion which states that a body remains at rest, or in motion at a consistent speed in a straight line, except it is acted upon by an external unbalanced force. Second sutra- "Vegah Nimitta Pekshat Karmano Jayate Niyatdik Kriya Prabandha Hetu" This second sutra states that change of motion is proportional to the impressed force and is in the direction of the force. This resembles Newton's second law of motion. Third sutra - "Vegah Sanyog Vishesh Virodhi" which states action and reaction are equal and opposite." This is Newton's third law of motion [3].

Atomic theory: Kanada's Vaisheshika Darshan which is more than 2500 years antique proposed that matter is made from indivisible particles. Consistent with the 'Vaisheshika,' parmanu is the smallest particle responsible for world formation. We can correlate parmanu with the atom [4].

Astronomy: Distance between the Sun and the Earth discussed in Hanuman Chalisa written by Tulsidas, a poet-saint, logician, and reformer, within the fifteenth century. The line "Yug Sahastra Yojan Par Bhanu" of "Hanuman Chalisa" allows to determine the distance between the Sun and the Earth. According to this literature the Sun (Bhanu) is at Juug Sahastra Yojans from Earth. Here Yug = 12000 years, 1 Sahastra = 1000, 1 Yojan = 8 Miles. According to this calculation, the distance between the Sun and the Earth = $12000 \times 1000 \times 8 = 96,000,000$ miles = 153,600,000 Kms (1 mile = 1.6 kms). This interpretation is very much closer to the calculations made by the modern scientists [3].

Aryabhata supplied an in-depth clarification of how the Earth rotates on its axis, leading to the apparent actions of stars within the night sky. He attributed the phenomenon of rising and setting to the collective westward motion of the stars and planets, pushed by what he termed the "cosmic wind" [5]. Aryabhata anticipated the Earth's circumference to be 39,968 kilometers, slightly smaller than the actual size of 40,075 kilometers. He also made specific calculations in the Earth's sidereal rotation, calculating it as 23 hours, 56 minutes, and 4.1 seconds, which is very close to the current-day cost of 23 hours, 56 minutes, and 4.091 seconds, with a minimal 0.09-second error. Further, Aryabhata determined the length of a sidereal year to be 365.25858 days, only off with the aid of 3 minutes and 20 seconds compared to the modern calculation of 365.25636 days. These calculations by Aryabhata had been taken into consideration some of the maximum correct inside the world at that time [6].

Varahamihira skillfully mixed astrology with astronomy, showcasing a movement of celestial bodies affects lifestyles on this planet. He was convinced that the alignment of stars and planets could shed light on human experiences, that is a key idea in astrology. The Brihat Samhita, tackled numerous issues, inclusive of the movements of planets, eclipses, and their astrological significance. He took extraordinary care to note how celestial occasions could affect climate, agricultural practices, and personal destinies [7]. Historical Indian astronomers like Bhaskara I worked on planetary motions, eclipses, and gravity-like thoughts. He also evolved a brand-new approach for calculating the position of the planets and eclipses [8].

Optics: The Indian Philosophers of ancient India additionally tried to provide theories on the character of light and eye became assumed to be a source of light and this error turned into no longer corrected until the first Century AD when Susruta proposed that it was light returning from an outside source on the retina that illuminated the arena around us. Susruta Samhita mentioned vision, reflection, and refraction with regards to the human eye. The ancient philosophers were more accurate in other ways. For example, Cakrapani proposed that light and sound both traveled in waves, but light travelled at much higher speed. Mimamsakas imagined light to incorporate of minute particles (photons) in consistent movement and spreading

through radiation and diffusion from the original source [9].

Sound: Music has been an indispensable a part of performance arts inside the Hindu lifestyle since Vedic times. Many Puranas, like the Markandeya Purana, contain the music theories found in the Natyashastra. The ancient Indian tradition classified musical instruments into four groups based solely on their acoustic precept before the Natyashastra was completed. The Natyashastra accepts these four classes as given, and dedicates 4 separate chapters to them, one every on stringed gadgets (chordophones), hollow units (aerophones), solid devices (idiophones), and protected gadgets (membranophones). Chapters 15 and 16 of the textual content tackle Sanskrit prosody in a manner like that found in the Pingala Sutras and other older Vedanga texts. Chapter 28 discusses the harmonic scale, calling the unit of tonal size or audible unit as Sruti, with verse 28.21 introducing the musical scale 'Sa Re Ga Ma Pa Dha Ni Sa'. The track concept in the Natyashastra revolves around 3 issues – sound, rhythm and prosody implemented to musical texts. The textual content discusses scales and modes, bringing up three scales of seven modes (21 in total), a few of which are like the Greek modes. The textual content also discusses which scales are exceptional for specific varieties of performance arts. The Natyashastra describes from chapter 28 onwards, 4 styles of everyday musical devices, grouping them as stringed giving the example of veena, included giving the instance of drums, strong giving the instance of cymbals, and hollow giving the instance of flute. In Chapter 33, the term "kutapa" (orchestra) is used to describe a performance group that consists of one male and one female vocalist and nine to eleven musical devices that are played by performers [10].

Energy: Thomas Young coined the term "energy" in 1800, but it comes from Indian Vedic physics; during the ancient Vedic era, it was known as "Agni Vigyan." Yajurveda first added the conservation of energy as "Ushik paavko aratih sumedha matyreshwa agnir amrito ni dhaayi, iyarti dhumam arusham bharibhrad uchukren shochita dayaaminakshan." "Drishano rukam aururbyaa durmarsham aayu shriye ruchaanaah, agnir amrito abhawad vayobhir yadenam dayor janyat suretaah". It means energy is indestructible. Transformation of energy was mentioned in Rigveda as: "Steernaa asyaa sanhato vishwaroopa ghritasya yono sravthe madhunaam, asthuratra dhenav maanapinv mahi dasmasya maatra sameechi." Right here the phrase energy is named as "Vishwaroopa" i.e. energy possess all possible forms like motion, light, sound and so on [11].

Electricity: Thomas Edison has admitted that the book "Agastha Sahita" written with the aid of Agastha Rishi was full of electricity knowledge. The Shlokas inside the "Agastha Sahita" are shown under. Shloka in Sanskrit: Samsthapya mrinmayam patram tamrapatram susamskritam | Chadayet sikhigrivena cardrabhih kasthapamsubhih || Translation: After putting earthen

How to cite: Shailendra B. Kolhe, Contribution Of Physics To Ancient Indian Knowledge System, *Advances in Consumer Research*, vol. 2, no. 5, 2025, pp. 1254-1257.

vessel in addition to the copper vessel securely, near (the vessels) with copper sulphate and saw dirt, Shloka in Sanskrit: Dastalosto nidhatatva hparadacchaditastatah | Utpadayati tanmitram samyogastamradastayoh || Translation: Lumps of gems generate electricity by using the union of copper and zinc [12].

Applied Physics: Vishwamitra become one of the maximum commemorated and favored sages of India who invented missiles. Hundreds of years in the past, he taught his disciples how the missiles work and function. These missiles were of many sorts, a few had fire; others had smoke, radiation, electric spark, or different weapons, and so on. similarly, there have been additionally missiles just like the moon and solar. The missile could not fail the goal to hit [12]. Use of astronomical observatories (Jantar Mantar, India) shows implemented physics in architecture, time-keeping, and astronomy [13].

Metallurgy and Magnetism: The best example of magnetism and metallurgy is the Somnath Temple in Gir Somnath district of Gujarat, India. First Somnath temple was built around the 9th century CE. The Shiva-lingam made of iron-nickel meteorite fragment is inside this temple. This Shiva-lingam float using magnetic levitation mechanism. This magnetic levitation technology was also used in Konark Sun temple which is a 13th-century CE Hindu Sun temple at Konark Odisha, India. Magnetic levitation suspends objects using magnetic fields to counteract gravity, eliminating mechanical contact. The method of Zinc extraction from its ore was known to ancient people since 2nd century AD. This process which was described by Nagarjuna [166-203 AD] in his book *Rasratnakar*. Ancient Indians used the “wootz” steel to fabricate the fabled Damascus swords [14].

CONCLUSIONS

Indian knowledge systems, that encompass an array of areas, offer a comprehensive understanding of life. Modern science knowledge is mostly correlated with ancient knowledge. Many equipments, concepts, laws, formulae etc. were described in Vaisheshika Sutras, Kanada's Vaisheshika Darshan, Hanuman Chalisa, Susruta Samhita, Natyashastra, Pingala Sutras, Agni Vigyan, Agastha Sahita. Ancient Indian experts like Vishwamitra, Bhaskara I, Chakrapani, Mimamsaka, Aryabhata, Varahamihira, Susruta also introduced concepts of physics in ancient era. Ancient Indians used metallurgy and magnetism skillfully as described by Nagarjuna. Historical science will certainly have a significant impact on how we develop both presently and in the future. A lot of scientific knowledge may be in ancient scripts. We can refer this knowledge in ancient Indian knowledge system to make innovations in it.

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