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RESEARCH ARTICLE

A study of the scientific approach inherited in the Indian knowledge system (IKS)

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Abstract

This article aims to examine the practices that, were prevalent in ancient Indian time, whether encouraged or hindered the development of a scientific mindset. A review is conducted of the contributions made during the ancient and medieval periods in the fields of astronomy, mathematics, medicine, physics, and technology. The term "Indian knowledge tradition" refers to the vast and diverse body of information that has been acquired, preserved, and transmitted throughout thousands of years throughout the Indian subcontinent through various indigenous learning and inquiry methods. The Indian Knowledge System (IKS) is a systematic method of passing down knowledge from one generation to the next. The NEP, 2020 acknowledges this great heritage of ageless Indian philosophy and knowledge as a guiding principle. The knowledge systems of Jnan, Vignan, and Jeevan Darshan in India have evolved via experimentation, observation, experience, and in-depth study. The Indian knowledge tradition has a long history of scientific investigation and discoveries dating back thousands of years. Many disciplines fall under the umbrella of science in the Indian knowledge system, including biology, physics, chemistry, medicine, astronomy, and mathematics. Overall, an integrated methodology, integration with philosophy and spirituality, and real-world applications targeted at enhancing human well-being are what define science in the Indian knowledge tradition. Although the scientific contributions made by ancient Indians have been recognized, research is still being done to fully comprehend the breadth and depth of their achievements in relation to the history of science worldwide. The present article presents a deep analysis of science as being an integral part of IKS.

Keywords: Indian knowledge System (IKS), Scientific approach , NEP, 2020, Jnan, Vignan, Vedas , Mathematics , Astronomy & Ayurveda.

Introduction

The rich and varied body of knowledge that has been acquired, maintained, and passed down through numerous indigenous learning and inquiry systems over thousands of years across the Indian subcontinent is referred to as the "Indian knowledge tradition." Knowledge is passed down systematically from one generation to the next through the Indian Knowledge System (IKS). Rather from being a custom, it is an organized system and a method of knowledge transfer.

The Bhartiya approach is tenacious and aims to promote everyone's well-being. It is critical that we recover the extensive knowledge base of our ancestry and teach the rest of the world the "Indian way" for accomplishing things. To do this, generations of scholars must be educated to illustrate and represent to the rest of the world a way of life that is so distinctive from the rest of our great civilization.

This rich legacy of timeless Indian knowledge and philosophy is acknowledged as a guiding element in the NEP, 2020. The Jnan, Vignan, and Jeevan Darshan knowledge systems of India have developed from experience, observation, experimentation, and thorough analysis. Our education, Philosophy, spirituality, science, mathematics, literature, art, medicine, governance, and social organization are just a few of the many fields that have a been touched by this legacy of validating and putting into practice. The following are significant facets of the Indian knowledge tradition:

(A)Philosophy and Spirituality

Indian philosophy delves into basic inquiries of existence, morality, consciousness, and the essence of reality. Different schools of thought on these subjects include Buddhism, Samkhya, Yoga, Nyaya, Vedanta, and Vaisheshika. The idea of dharma, or duty or justice, and the quest for moksha, or release, is fundamental to Indian philosophy.

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(B)Vedas and Upanishads

Hindu philosophy and spirituality are based on the Vedas, which are among the world's oldest scriptures and date back more than 3,000 years. The philosophical works known as the Upanishads, which examine the nature of reality and the self, are regarded as the pinnacle of Vedic philosophy.

(C)Ayurveda

The ancient medical system known as Ayurveda places a strong emphasis on maintaining a healthy balance between the mind, body, and spirit. It consists of exercises including yoga, meditation, diet, and herbal treatment. Texts on Ayurveda, such as the Sushruta Samhita and Charaka Samhita, give thorough explanations of ailments, cures, and surgical techniques.

(D) Yoga and Meditation

Yoga is a physical and spiritual practice that aims to bring the practitioner into oneness with the divine. It consists of exercises including breathing exercises, postures called asanas, and meditations called pranayama.

(E) Mathematics and Science

Significant advancements in algebra, geometry, trigonometry, and the notion of zero were developed by Indian mathematicians. Ancient Indian astronomy flourished, with scientists developing improved observational methods and mathematical representations of the universe.

(F)Literature and Arts

Indian literature includes a wide range of writings in many languages, such as Hindi, Tamil, Sanskrit, and others. Classical works like Kalidasa's dramas and Rabindranath Tagore's poems, together with epics like the Ramayana and Mahabharata, are renowned representations of Indian literary heritage. Indian classical dance, music, painting, and sculpture are examples of art forms that showcase the richness and diversity of Indian culture.

(G)Social and Political Thought

Indian philosophers have studied social structure, ethics, and governance concepts. Books like the Manusmriti and Chanakya's Arthashastra offer insights into the political and social conventions of ancient India.

In general, the richness, variety, and integration of various viewpoints define the Indian knowledge legacy. It continues to provide ageless wisdom and insights into the human condition, inspiring academics, professionals, and seekers worldwide.The scientific research and discoveries made by the Indian knowledge tradition go back thousands of years. An intricate system of weights and measures was developed during the Harappan period (Indus Valley Civilization) as a result of extensive trade. Additionally, archaeologists have discovered proof of the existence of a primitive astronomical system.

As we travel farther back in time to the Vedic age, we see that the book of the Vedas has left us with sufficient proof that the Vedic practitioners were not only astute and astute observers of the sky, but also made highly significant use of that knowledge in their daily lives. Hymn collections, descriptions of rituals, and philosophical conjectures found in Vedic literature point to practices that we can today classify as astronomy. A considerable amount of motivation and support for a methodical study of celestial entities came from the requirements for specific religious practices, particularly the desire to ascertain the precise time for performing sacrifices.

In the Indian knowledge tradition, science includes a wide range of fields, such as biology, physics, chemistry, medicine, astronomy, and mathematics. Important facets of science in Indian knowledge traditions include the following:

Mathematics and Astronomy

Since ancient times, mathematics and astronomy have been an integral part of the Indian knowledge system for thousands of years, these are some significant domains in Indian history and culture these have played a significant role:

- Knowledge of mathematics and astronomy signaled a move away from past reliance on religion a few centuries after the Vedic era. The most famous literature from this era is the 400 AD Surya Siddhant, which is a compilation of astrological knowledge. The usage of an angle's sine was a significant innovation that came about as a result of the Surya Siddhanta. During this time, the astronomer and mathematician Aryabhatta (c. 499 AD) as well as his two well-known disciples Varahamihira (505–587 AD) and Bhaskara I (c. 600 AD) were born. Brahmagupta, who was born in 598 AD, is another well-known expert from this era in mathematics and astronomy.
- Aryabhata created trigonometric functions, presented the idea of sine, and gave an estimate of π (pi). He also solved quadratic equations Indian mathematicians, particularly Aryabhata and Brahmagupta, are credited with creating the decimal system and zero, which transformed mathematics worldwide and served as the basis for contemporary algebra and arithmetic. One of the first books to address mathematical ideas like zero, negative numbers, and quadratic equation solutions was the Brahmasphutasiddhanta, which was penned by Brahmagupta.
- The Sulbsutras, which were produced and organized between 800 and 600 B.C., contain the development of geometrical, mathematical, and astronomical concepts. Indian mathematicians also made strides in geometry, algebra, and trigonometry
- As the first millennium went on, astronomy advanced more, and we are familiar with figures like Mahavira (d. 850 AD). Aryabhatta II (b. 950 AD), Bhaskara II (1100 AD), and Sridhara (b. 900 AD).

- Advanced geometric principles are frequently displayed in Indian architecture, especially in buildings like temples and palaces. For instance, it is commonly known that complex patterns in temple building are created using fractal geometry. These designs are elegant in mathematics, but they also frequently have spiritual and metaphorical meaning.
- Jaina Mathematics: The study of permutations and combinations as well as combinatorics is two areas in which Jain mathematicians made major contributions to Indian mathematics. Algebra, geometry, and permutations are only a few of the mathematical subjects covered in the treatises written by the Jain mathematician Mahavira (9th century AD).
- Kerala School of Mathematics: The Kerala School of Mathematics, which flourished between the 14th and 16th centuries, made important contributions to calculus, infinite series expansions, and trigonometry. South India's rich mathematical and astronomical legacy is shown in the writings of Madhava (1340–1425 AD) and Nilakantha Somayaji (1444–1545 AD). Madhava of Sangamagrama, a prominent mathematician from this school, developed early concepts of calculus, including the series expansion of trigonometric functions.
- These examples highlight the rich history and significant contributions of mathematics within the Indian knowledge system, spanning various periods and disciplines.
- Indian astronomy has a long history, with observations of celestial phenomena documented in ancient texts such as the Vedas and the Siddhantas.
- The heliocentric model of the solar system and the calculation of planetary orbits by renowned Indian astronomers have influenced modern astronomical understanding.

Ayurveda & Medicine

- In India, a variety of medical systems evolved and prospered alongside these scientific facets. Of them, Ayurveda is the most well-known today; it literally translates to "the Knowledge of long life." With a materialist perspective serving as its theoretical foundation, this is undoubtedly a fantastic beginning for science consciousness in India
- The important books Susruta Samhita and Charaka Samhita were assembled over a protracted period of time, from 200 BC to 400 AD.: Ayurvedic treatments encompass a wide range of therapies, including massage (abhyanga), detoxification (panchakarma), and dietary interventions. These treatments aim to restore balance and harmony within the body to promote health and well-being
- The ancient Ayurvedic scholars saw man as matter(the Indian term 'bhuta'), and considered his health, growth, decay, and the very phenomena known as life (or prana). Ayurveda emphasizes holistic health and the balance of bodily humors (doshas).
- Modern integrative medicine incorporates, some ayurvedic practices, such as herbal remedies and mindfulness techniques. The growth of medical knowledge also stimulated the development of a number of auxiliary systems of knowledge, which might be labeled as botany and chemistry in the modern period.
- Ayurveda also incorporates the use of metallic preparations known as bhasmas, which are obtained through processes like calcination and are used for therapeutic purposes. These preparations are believed to enhance the medicinal properties of metals and minerals while reducing their toxicity.

Physics

- Indian scientists in ancient times explored various aspects of physics, including theories of matter and energy. The concept of atoms (anu) and the theory of the five elements (panchabhuta) are central to Indian physics.
- The Nyaya and Vaisheshika schools of philosophy also made significant contributions to the understanding of matter and motion.

Chemistry

- The ancient Indian practice of alchemy (rasa shastra) involved the study of metals, minerals, and chemical processes. Alchemists aimed to transmute base metals into gold and develop elixirs of immortality.
- Medicinal Chemistry: Ayurvedic books go into great detail about making medicines out of natural ingredients. These methods include extraction, purification, and formulation processes that are similar to those used in contemporary medicinal chemistry and pharmaceutical industries.
- Chemical Procedures: Detailed procedures for the distillation, sublimation, alloying, and purifying of substances are described in Indian scriptures, including those ascribed to Nagarjuna and others in the Rasashastra school. The development of useful chemical techniques was aided by these techniques.

Biology

- Indian knowledge tradition includes a deep understanding of biology, particularly in fields such as botany and zoology.
- The ancient text, the Charaka Samhita, contains detailed descriptions of medicinal plants and their properties.
- Indian scholars also classified animal species and studied their behavior.

Engineering and Architecture

- Water Management: Ancient Indian civilizations developed sophisticated water management systems, such as step wells (like the Rani ki Vav in Gujarat), which

are admired for their engineering prowess and are studied for sustainable water solutions today.
- Temple Architecture: Temples like the Brihadeeswarar Temple in Tamil Nadu showcase advanced architectural principles that are studied for their structural stability and design elegance

Environmental Science

- Traditional Indian knowledge systems, such as Vedic ecology and Gandhian principles of sustainability, emphasize the interconnectedness of humans with nature.
- Concepts like "Vasudhaiva Kutumbakam" (the world is one family) reflect an ecological worldview that promotes harmony with the environment.
- Indigenous practices in India, rooted in ancient wisdom, offer sustainable approaches to agriculture, biodiversity conservation, and resource management. These are increasingly recognized for their potential in addressing modern environmental challenges

Yoga and Meditation

- Yoga's historical roots can be discovered in ancient India, with the Indus Valley Civilization having the oldest known records (3300-1900 BCE). The classical treatise known as the Yoga Sutras of Patanjali describes the fundamental ideas and techniques of yoga.
- The recognition and attractiveness of yoga and meditation as beneficial practices for general health has led to their widespread adoption worldwide. In the last few years, there has been a notable surge in the number of individuals, in both the East and the West, who integrate yoga and meditation into their daily routines.
- There are several explanations for why these actions are so often admired and sought after like the scientific community has thoroughly investigated and confirmed the benefits of yoga and meditation for mental, emotional, and physical well-being. Studies have also shown that consistent yoga practice improves strength, endurance, flexibility, and balance. It has also been demonstrated to improve overall health and reduce stress, anxiety, and depressive symptoms.

Surgical Techniques

- The ancient Indian text Sushruta Samhita, attributed to the physician Sushruta, contains detailed descriptions of surgical procedures, including plastic surgery, cataract surgery, and various other surgical interventions.
- Sushruta's contributions to the field of surgery are considered remarkable for their time and have had a lasting impact on the development of surgical techniques.

Concept of Doshas

- Ayurveda conceptualizes health as a balance between three doshas or bioenergies: Vata, Pitta, and Kapha. Imbalances in these doshas are believed to lead to illness
- Ayurvedic treatments aim to restore equilibrium through lifestyle modifications, dietary changes, and herbal remedies.

The integration of IKS across all fields in both elementary and higher education was stressed by the National Education Policy 2020. A holistic worldview that takes into account all aspects of life can be provided to pupils through education that is imbued with the IKS approach. The ongoing endeavor of Indian higher education institutes (HEIs) is to integrate IKS into higher education. Thorough planning, extensive teacher training programs, and the acquisition of reliable study materials that are available in multiple Indian languages are all necessary. A large number of universities and colleges in India already providing IKS courses, the push to introduce them have gained momentum.

The importance of fusing IKS with contemporary methods to solve today's problems is becoming more widely acknowledged. The National Innovation Foundation (NIF) and the Honey Bee Network are two Indian efforts that attempt to record, authenticate, and support community-based inventions based on IKS. It also provides frameworks that illustrate the relationships among people, the natural world, and the universe. We can create more sustainable technologies, creative healthcare solutions, and urban planning strategies that put human flourishing and environmental balance first by fusing IKS with contemporary scientific knowledge.

One proactive step done by IIT Kanpur is the establishment of the Study Centre for Indian Knowledge System for Holistic Advancement. The objective of this effort is to investigate IKS and effectively incorporate it into academic curriculum and multidisciplinary research projects. The scientific study of Indian knowledge systems is called SandHI. It seeks to actively participate in the conservation, analysis/interpretation, and sharing of these systems with the corpus of current scientific knowledge and application contexts. An interdisciplinary approach to the discourse of culture with relevant, acceptable, and sustainable technologies is encouraged by like-minded faculty members at IIT Kanpur, where it is envisioned as a dynamic network of collaborations rather than an institutional infrastructure.

Analogously, the Centre for Indian Knowledge Systems at IIT Madras functions as a vibrant center for diverse study delving into India's abundant scientific, technological, and cultural legacy.

Conclusion

Thus in concluding points we can say that by uncovering the basic concepts of IKS and its related practices, we can show their effectiveness, and apply it resolving contemporary issues by using scientific approaches to research them. IKS analysis can also be used to inspire contemporary innovation in a variety of fields.

Community wellness and quality of life are very important for any individual, especially in rapidly changing and technology driven society and world. In the modern era, thinkers and scientists as diverse as Ralph Waldo Emerson, Johann Wolfgang von Goethe, Johann Gottfried Herder, Carl Jung, Max Müller, Robert Oppenheimer, Erwin Schrödinger, Arthur Schopenhauer, and Henry David Thoreau have acknowledged their debt to ancient Hindu achievements in science, technology, and philosophy. The Indian knowledge system views the world as a manifestation of the divine and emphasizes the importance of living in harmony with nature. This is reflected in practices such as yoga and Ayurveda, which focus on holistic health and well-being, and in the reverence for nature and its elements (Shukla, 2022). Overall, the scientific concepts embedded in ancient Indian knowledge tradition are characterized by a holistic approach, integration with philosophy and spirituality, and practical applications aimed at improving human well-being. While ancient Indian contributions to science have been acknowledged, there is ongoing research to further explore and understand the depth and significance of these contributions in the context of global scientific heritage. It continues to influence and find application in various aspects of the modern world, ranging from mathematics and medicine to architecture and ethics. Integrating these insights with contemporary scientific understanding can offer innovative solutions and foster a deeper appreciation of diverse cultural contributions to global knowledge. The responsibility of propagating traditional Indian knowledge through various channels, including books, seminars, and workshops, has been taken up by numerous NGOs and educational institutions. As a result, interest in and use of traditional Indian sciences like Yoga, Ayurveda, and Vastu Shastra. The younger generation's growing understanding and appreciation of Indian knowledge systems is one of the main elements that has contributed to their resurgence. Indian Knowledge System (IKS) suggests a number of thematic areas of IKS, where lot of research and studies are needed. This includes study of health and wellbeing, and consciousness; art and culture; mathematics and astronomy etc.

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Declaration

Since the growth of science depends on our ability to critically assess theories and make the required adjustments in light of new findings, this article is open to criticism and revision. According to IKS, the Nyaya philosophical disputes from ancient India are a magnificent illustration of methodical thinking and the guts to defy accepted wisdom. In a similar vein, the author is open to recommendations and critiques aimed at improving the contribution of this work to science and research.

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