WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH
www.wjpmr.com

SANSKRIT AND THE SCIENCES

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ABSTRACT

Sanskrit, an ancient Indian language, is often viewed as having a unique connection to scientific and philosophical thought. It's seen as a language of knowledge, with its rich tradition and scientific linguistic structure making it a unique repository of information, including scientific ideas. Sanskrit texts contain various scientific and philosophical concepts related to astronomy, physics, engineering, mathematics, Ayurveda, and agriculture, among others.

KEYWORDS: Sanskrit language, astronomy, mathematics, Chemistry, Architecture Engineering and medicine.

INTRODUCTION

Sanskrit literature is vastu and includes religious texts, poetry, drama, and works on various sciences, including astronomy, mathematics, Chemistry, Architecture And Engineering and medicine. The Scientific Literature covers Lexicography, Metrics, Grammar, Law, Science of Politics, Love, Philosophy and Religion, Medicine, Astronomy, and mathematics etc.

Astronomy

Sanskrit texts explain astronomical principles like calculating planetary positions, eclipses, and calendars. Astronomy was called 'Nakshatravidya', 'Jyotirvijnyanam' or Jyotish in ancient India. The word 'Nakshatradrashta' is used for an Astronomer in Shuklayajurveda (30/10) and 'Nakshatravidya' for Astronomy in Chhandogya Upanishad (7/1/2).

The earliest references of Astronomy are found in the Rigveda. The Vedic Seers always appreicated the appearance of the light in the sky. Many stars are mentioned in Atharvaveda. We also find natural scientific observations regarding the course of the planets. The Aitareya Brahmana (3/44) says that the sun actually neither rises nor sets but through it's revolution round the earth, causes day and night. To perform the Vedic rituals and sacrifices, calculation of appropriate time was necessary and this need introduced The Vedang - 'Jyotish' in the history of Indian Astronomy. 'Vedanga Jyotish' of Lagadha the first treatise on Astronomy, contains two parts: Arch Jyotish in 36 shlokas and Yajush Jyotish in 43 shlokas. It is exclusively devoted to calculation of time. An attempt to cast a calander is also found in this vedang. 'Panchasiddhantika' of Varahmihira mentions five siddhantas of earliar Astronomy in which a complete system of Astronomy is presented. They are – Pitamaha siddhanta, Vashistha siddhant, Paulisha siddhanta, Surya siddhanta and Romaka siddhanta.

Surya Siddhanta is the most prominent treatise of Siddhant period. According to the introductory verses Surya the Sun God disclosed it to Asura Maya in the city of Romaka. The cosmological timecycles and the Solar Planetary cycles are described here. The average length of the Sideral year (the length of the Earth's revolution round the sun) is 365.2563627 days which is only 1.4 seconds longer than the modern value of 365.2563627 days.

The following works and the authors have an eminent place in the history of Astronomy.

- ❖ Aryabhatiyam of Aryabhata also called the Arya siddhanta, consist of four parts – the Dashagitika sutra, Ganita Pada, Kalkriyapada and Golapada. The first and second part are related to Mathematics. The Third part, in 25 verses contains the basic principals of astronomical time – calculations. The fourth part, in 50 verses deals with the celestial sphere.
- ❖ Arya Siddhanta of Aryabhata IInd, is a voluminous work on astronomy.
- ❖ Brahma-sphuta-siddhant of Brahmagupta, treats the astronomy more elaborately and more methodically.
- ❖ Siddhantshiromani of Bhaskaracharya is divided into four parts – Lilavati, the Bijganita, the Grahaganitadhyaya and the Goladhyaya. Goladhyaya contains a section, in which difficult austronomico – mathematical problems are posed and solved. It also deals with astronomical instruments and description of the seasons.

- ❖ Rajmriganka of Bhoja
- ❖ Bhasvati of Shatananda
- ❖ Grahalaghava or the siddhantrahasya of Ganesha
- ❖ Siddhantatattva viveka of Kamalakara
- ❖ Karanapaddhati of Nilakantha somayaji.

The Indian Astronomy is closely associated with astrology. According to Varahmihira there are three branches of jyotish shastra.

Tantra, the astronomic- mathematical branch, that is devoted to the calculative astronomy; Hora, that is devoted to casting of horoscopes and.

Shakha or Samhita, that teaches the natural Astrology; the discipline about forecasts that are deducible from natural incidents.

MATHEMATICS

Sanskrit has been used to describe and transmit mathematical concepts like algebra, geometry, and calculus. 'Ganita' the term used in Sanskrit for mathematics; is derived from the root 'gana', which means to count or to enumerate. Mathematics in India has been cultivated in connection with Astronomy. Like the other streams of knowledge, the early references of mathematics, are also found in the vedic literature. The word 'Rashividya' is used for mathematics in Chhandogya Upanishad (7.1.2). Some hymns of Shuklayajureda reveal the knowledge of odd numbers and tables (18/24,25). The Brahmana texts like ; 'ekaya svaha, dvabhyam svaha, tribhyah svaha' reflect the vedic concept of arithmetical progressions. In Pingal sutra there is a discourse on the calculation of squares and square roots.

The Indians; earlier than other nations; became familiar with the system of place value of numerals. Undoubtedly the Europian system of enumeration is of Indian origin. India is the birth place of several mathematical concepts including zero, the decimal system, algebra, algorithm, square root and cube root etc. The origin of calculus was in India, even more than three centuries before Leibnitz and Newton introduced their own theorems.

The concept of zero, i.e. shunya, which means 'void', a figure to indicate the absence of a position of number is virtually void. A round figure, symbol for zero, i.e. '0' had emerged to represent the philosophical concept of void.

Mathematics in India might have started more than five thousand years ago. Since 1000 B.C. almost for a period of two thousand years, many a number of mathematical works were produced in India. Since the 5th centruay A.D., the method of graduated calculation had been introduced in India. By that time, the geometric theories were known to the Indians. We may see some displays of motifs on the walls of ancient temples. Those motifs ideally reflect the patterns available in Indian architecture, as we see the admixture of floral and wall pattern of geometric method. These concepts, were collected and developed further by the mathematicians like Aryabhata who flourished in the 5th Century A.D. His work Aryabhatiyam is equally important for Mathematics and Astronomy. The first part of the book explains the special system of writing numerals that was introduced by Aryabhata alone. The Second part gives a small anthology of mathematical teachings of Aryabhatta. He deals in his work with evolution and revolution, area and volumes, progressions and algebraic identities.

Brahmagupta's work 'Brahma-sphuta-siddhanta' covers very briefly the arithmetical operations, square and cube roots, interest, progressions, geometry and simple algebraic identities. Bhaskaracharya the great astronomer, enjoys high reputation as a mathematician also. His work Lilavati, in which a lovely maiden is addressed and problems set to her, is a famous book on mathematics. The second book Bijaganita, is the fullest and most systematic account of Indian algebra Ganitasarasangraha of Mahaviracharya, Trishati of Shridhara, Bijaganita of Narayan are some prominent Sanskrit treatises on Indian Mathematics.

Chemistry

Chemistry is the branch of science, which deals with the study of elements of organic as well as inorganic nature. In India the knowledge of chemistry was current since the Vedic era, praising Agni (The fire), as we see in the first sukta of the Rigveda. It is believed that the basic idea of smelting reached India since the Rigvedic period. Metallurgy, one of the main branches of chemistry has remained as the central key to all the civilizations from the Bronze Age to the Iron Age.

Ancient India's advanced chemical science was distinct feature in the Vedic contents like the Brahmanas. The chemical action was known as the pakaprakriya. The science of chemistry, due to its Vedic antiquity might have been first recognized in India, as a separate discipline. Alchemy and the science of medicine gave rise to the study of chemistry in India. The ancient masters as mentioned in connection with chemistry are: Patanjali, Bhavya Dattadeva, Vyadi, Svacchanda, Damodara, Vasudeva, Caraka, Sushruta, Harita and Vagbhata. Ancient Sanskrit documents about the advanced chemical science find the expression in activities like distillation of perfumes and fragrant ointments. It is also found in activities like manufacturing of dyes and chemical preparation of pigments and colours and polishing of mirrors. In India itself, certain objects testify to the high level of metallurgy.

There are around fifty Sanskrit works in original found on chemistry. A few of them are as follows.
- ❖ The Rasaratnakara Author: Nagarjun —8th century A.D.
- ❖ The Rasarajamriganka Author: Bhoja —11th century A.D.

❖ The Rasendracudamani Author: Somadeva —12th century A.D.
❖ The Rasaprakasa-sudhakara Author: Yasodhara —13th century A.D.
❖ The Rasasara Author: Govindacarya —14th century A.D.
❖ The Rasarajalaksmi Author: Vishnudeva —14th century A.D.
❖ The Sharngadharasamhita Author: Sharngadhara —14th century A.D.
❖ The Rasendrasarasangraha Author: Gopalakrishna —14th Century A.D.

The Arkaprakasha by Ravana; Arka is the Sanskritized form of the Persian word arrak meaning tincture. Distillation of liquor is mentioned in the Sanskrit work called Madirarnava. The Carakasamhita mentions about the Ancient Indians who knew how to prepare sulphuric acid, nitric acid, the oxides of copper tin and zinc, the sulphate of copper, zinc and iron and the carbonates of lead and iron. The weapons mentioned in the Mahabharata and the Ramayana were actually the products of Chemistry.

Indian chemists knew the production of gunpowder and it was called as aurbagni, which was attributed to Aurba, the preceptor of Sagara. The work called Niticintamani discusses about the ingredients and power of fire of Aurba. It says; "combining burnt wood, saltpeter and sulphur by parts gradually lessened, a terrible fire is produced by which even water and others are burnt."

Architecture And Engineering
The Sanskrit word for architecture is vastu, and the traditional Hindu system of architecture is called Vastu Shastra. Vastu Shastra is based on ancient texts that describe principles of design, layout, and measurements. Architecture the Vastu vidya or Sthapatya is one of the basic Arts of ancient India. The word 'vastu' is derived from 'vas' to 'reside'. Thus 'vastu' denotes all sorts of buildings – religious, residential and military like – Prasada, mandapa, sabha, shala, prapa, ranga, skandhawara and fort. It also implies town planning, planning of commercial cities, laying out gardens, making roads, bridges, dams, tanks etc. Thus architecture includes the complete science of Civil Engineering.

There are innumerable references in Rigveda which indicate a very advanced Vastushilpa in Rigvedic age. The Vedic deities Mitra and Varuna are described as residing in a great palace with thousand pillars and thousand gates. The chief development of the Indian Architecture centres round the Hindu Temple. Specimen of different styles of Temple Architecture particularly, the Northern and Dravidian are found in the two parts of India, north and south. The Temple Architecture reflects the spiritual ideals of India. Temples are the abode of gods and goddesses on earth. The main Sanskrit treatises on Architecture are the Mayamata, Manasara, Vishvakarma - VastuShastra, Samaranganasutradhara, Aparajita - Priccha, Manasollasa, Prasadamandana, Shilparatnam etc.

Mechanical Engineering is known as 'Yantra Vidya' in Sanskrit Shastras. There are many references in Sanskrit literature which speak of the mechanical skills of Indians. The samarangana-sutradhara describes three classes of yantras (i) yana yantra – conveyances like vimanas and chariots, (ii) udakayantra – water machines – variyantra and dharayantra, (iii) sangramayantra – like Agneyastra, Varunastra, bhushundi, shataghni and sahasraghni etc.

Medicine
Sanskrit is the origin of Ayurveda, the oldest system of medicine, and Sanskrit texts document its principles of anatomy, pathology, diagnosis, and treatment. Indian the medical science is popularly known as 'Ayurveda' which means 'the Veda for lengthening of the span of life'. The beginning of Medical Science goes back to the age of Vedas. The Vedic Indians, who wanted to live for hundred full years with prosperity and good health, developed a holistic approach in the field of healthcare and medical systems, which emphasizes the physical, mental, intellectual and spiritual aspects of a human being. 'Bhaishajya-suktani' of Atharvaveda reveal the knowledge of medical science in ancient India. Atanomy, embryology and hygiene were also known from the Vedic times.

Ayurveda is considered as an 'Upanga' (subsidiary) to the Atharvaveda. It is inclusive of Achar (the life style), vichar (the thinking process) and ahar (the dietetics). Ayurveda is divided into eight main branches such as : shalya –tantra (major surgery), shalakyatantra (minor surgery), kaya chikitsa (treatment of diseases of the body), bhutavidya (demonology), kumarbhritya (paediatrics), agad tantra(toxicology), rasayana (elixir) and vajikaran (aphrodisiaca). Physiology, Pathology, Materia-Medica, therapeutics, Pediatrics, Hygiene, Dietetics, the science of pulse, veterinary science, the treatments of elephants horses, cattle, ornithology etc. were the different branches of Ayurveda developed in ancient India. Atreya, Harita, Kashyapa, Agnivesha, Bhela and jivaka are the ancient scholars, who are named by traditions.

The earliest work on the Indian medicine is the Charakasamhita of Charaka in the first century A.D. It consists of eight chapters.
❖ Sutrasthan, that in general describes means of healing, diet, duities of a physician etc.
❖ Nidansthan, on the eight principal ailments
❖ Vimansthan, on tastes, food, general pathology, and medical stadium
❖ Sharirsthana, on anatomy and embryology
❖ Indriyasthan, on diagnosis and prognosis
❖ Chikitsasthan, on special therapy
❖ Kalp and Siddhisthan, on general therapy.

Charaka, Sushruta and Vagbhata are prominent contributors to the Ayurvedic Literautre. Sushrutasamhita, of Sushruta, Ashtangsangraha of Vagbhata, Madhavanidan of Madhava, Ayurvedadipika of chakrapanidatta are some other important works in this field. Ayurveda has a well- developed school of surgery. Sushruta was most probably the first surgeon in the world to deal systematically, exhaustively and elaborately with the entire subject of surgery including gynaecology, obstetrics, eye-diseases, plastic surgery, artificial limbs etc. Surgical instruments are also described, 101 kinds of blunt instruments and 21kinds of sharp instruments. Vagbhata had classified diseases into seven distinct groups. He has given a complete list of various diseases. He has enlisted 94 eye diseases, 29 ear disorders, 18 diseases related to nose and 75 diseases related to mouth cavity.