



Scientific Power of Ancient India

¹Dr. Satyendra Singh, ²Shivam Tiwari

¹HOD, ²Lecturer

^{1,2}Shri Rawatpura Sarkar College Jhansi (U.P.) - India

Abstract

The Indian science tradition is one of the oldest scientific traditions in the world. Science originated in India about five thousand years ago. The evidence of the Indus Valley obtained from the excavations of Harappa and Mohenjodaro shows the scientific attitude of the people there and the use of scientific instruments. In ancient times, the discoveries made in the field of medical science, astronomy and mathematics have a very important contribution. His discoveries are still being used today in some form or the other. Science and its continuous innovations are not new, The evidence of science and its discovery is available since ancient times, from the destiny of human life, the evidence of scientific research in ancient times in India can be seen in detail in the religious Vedic texts. On the basis of research, it is known that science and technology are seen in their excellent form in Indian civilization, one of the oldest civilizations in the world. Along with being the land of sages and saints, ancient India was also home to scholars and scientists, as well as advanced science, technology and innovation in India can be seen since ancient times. Today, we are behind in technical and advanced knowledge from western countries like America, France, England etc. but it probably does not mean that the sages of ancient India have not contributed to the world of science. On the contrary, the reality is that in ancient times, when the people of the rest of the world were engaged in fulfilling the basic needs of their lives, at that time Indian knowledge, science and technology were achieving their excellence and establishing higher dimensions, many of which were discovered. Today's modern science has been put in awe.

India has made an incomparable contribution in religion, philosophy, literature as well as mathematics, astronomy, science, Ayurveda, yoga etc. Here we will see about some of the scientific achievements of ancient India, which pave the way for today's scientists to do research and make them think about the achievements of ancient India.

- **Maharshi Sushruta**

If you also consider the technology related to plastic surgery or human body operation to be a gift of western countries, then it is wrong, but it is not your fault, in fact, whenever we were given deep knowledge about medicine, its exponent was given to us by a western Only the country was told and our glorious history and its contribution were hidden from us whereas the truth is that it has already started in India before 500 BC Maharishi Sushrut had done plastic surgery about 2600 years ago. Maharshi Sushruta is supposed to be born around 6th or 7th century BCE. Not much information is available about his early life, only this much is known that He practiced medicine around the region of modern day Varanasi by the bank of the Ganga River. According to legend, the Gods passed their medical insight down to the Sage Dhanvantari who taught it to his follower Divodasa, who the instructed Sushruta. In this way, Sushruta became a doctor and used to treat the injured soldiers in the war. Seeing the condition of these injured soldiers, Sushruta was inspired to do surgery because the soldiers' limbs were often cut off in the war. decided to become a master.

The practice of surgery was already long established in India by the time of Sushruta but in a less advanced form that what he practiced. He also introduced about 300 new surgical procedures. His speciality was Rhinoplasty, the reconstruction of the nose. At that time, people's noses were cut off as a punishment, which became a sign for life that these humans are not worthy of trust. Many times women's noses were cut off in the name of adultery, even if this allegation is false, in such a situation, getting nose surgery for these people was no less than a boon for these people, so that their respect and honor could be regained. Sushrut shows them this ray of hope because he was expert in it. Apart from Rhinoplasty Sushruta mastered various other surgical procedures like Cataract removal, caesarian section, birth etc. Hence he is also known the father of all surgery. Sushruta also invented more than 120 surgical instruments like scalpels, lancets, needles, etc. Sushruta attracted a number of disciples who were known as Saushrutas and were required to study for six years before they even began hands on training in surgery. After this, Sushruta used to make him perform surgical practice on dead creatures. Once students had proven themselves capable with vegetation, animal corpses, etc. and had carefully observed actual procedures on patients, they were then allowed to perform their own Surgeries. We get information about his contribution from Sushruta Samhita. The Sushruta samhita describes more than 300 surgical procedures, 120 surgical instruments in addition to the 1120 diseases and their instruments in great detail. Sushrut samhita is considered the oldest text in the world on plastic surgery. Sushruta samhita was unknown outside of India until around the 8th century when it was translated into Arabic by The Caliph Mansur, it was named Kitab Shah Al Hind or Kitab i Susurud. Sushruta Samhita was translated into Latin by Dr. Franciscus Hessler and into German by Max Muller in the 19th Century. Royal Australasian College of Surgeons erected a statue of Maharshi Sushruta in the campus in 2018.

- **Maharishi Charak**

Maharishi Charak has illuminated the name of India in the whole world by his work in the subject of Ayurveda. Charak was the first physician who mentioned the concept of digestion, metabolism and body immunity. According to him, the root cause of most diseases are the three doshas (Vata, Pitta, Kapha), and diseases are born due to their imbalance. Charak told that even a similar food can create different defects and qualities in different persons. The Charak Samhita composed by him is a famous Ayurveda book. In this, there is mention of curative and prophylactic medicines and there is description of ashes and their use of metals like gold, silver, iron, mercury etc. He wrote 'Charak Samhita', the main book of Ayurveda. At present, Indian Ayurveda is being adopted in the country as well as abroad and is considered effective. The Ayurveda we see today is the result of the labor and meditation of Maharishi Patanjali and Maharishi Charak. Ayurveda is one of the world's oldest medical systems. Ayurveda is the Indian medical science. Medicine is that branch of science which is concerned with keeping the human body healthy, getting rid of the disease or curing it and prolonging the life span. Alberuni has written that "the best book of the Hindus on medicine is the Charak Sahinta". This book, written in Sanskrit language, is divided into 8 places and 120 chapters, containing 12 thousand verses and 2000 medicines.

- **Maharshi Patanjali**

Patanjali was an eminent physician and master of chemistry. The credit goes to Patanjali for introducing mica, metallurgy and iron science in the field of chemistry. Raja Bhoj had adorned Maharishi Patanjali with the title of doctor of mind as well as body. Yoga is one of the six philosophies of Hinduism but it has nothing to do with religion. Yoga is combined with meditation. In Buddhism too, meditation is considered important. Meditation is also related to Islam and Christianity. This book has been written in thousands of languages so far. Patanjali was the first and only person who gave yoga a systematic form by taking it out of faith, superstition and religion.

- **Bodhayan**

You will be surprised to know that many of the theorems and concepts of modern mathematics were known to the mathematicians of ancient India, but due to lack of documentation and dissemination, they did not get the place that the western world has got like we have from the ancient Greek mathematician Euclid. We are familiar but we do not know the mathematician of India.

Bodhayana was a Sanatani sage who used mathematics in religious rituals and Bodhayana is considered to be the creator of the Shulva Sutras. Bodhayan's name is at the pinnacle in the field of geometry. We should know that the word English geometry was born from our Sanskrit word Jyamiti. Even before the Greek geometer Euclid, Indian mathematicians had discovered the main rules of geometric geometry, in which Bodhayan's name is the main one. Bodhayan was the first Mathematician to calculate the value of Pi. He also provided equations similar to Pythagoras theorem in his book Sulva sutra, much before Pythagoras.

- **Aryabhata**

Aryabhata was a great mathematician, astronomer, and physicist of the fifth century. At the age of 23 Aryabhata authored a book named Aryabhatiya which was a collection of advanced Mathematical concepts. The book was a treatise on decimal system, Number system, Geometry, Trigonometry, Square root, cube root, parallelogram, Algebra & Astronomy. The invention of zero was his most notable contribution in the field of Mathematics. It led him to calculate the distance between Earth and Moon. He discovered the value of Pi (π), The value of Pi (π) is $22/7$ or 3.1416. Apart from this, Aryabhata also discovered the decimal system. In the context of astronomy, Aryabhata presented many theories, he told that the earth rotates on its axis and revolves around the sun. This is the reason why there are day and night on the earth. Aryabhata had told that Earth's orbit is elliptical and a day is not of 24 hours but of 23 hours, 26 minutes and 1 second. A full year is of 365 days and 6 hours. Because of this, every fourth year increases by one day. He explained Solar eclipse and lunar eclipse scientifically. According to Aryabhata, a solar eclipse occurs when the shadow of the moon falls on the earth. The bigger the shadow that falls on the earth, the bigger the solar eclipse. In the context of a lunar eclipse, he told that when the shadow of the earth falls on the moon, a lunar eclipse occurs. Aryabhata had made an unprecedented contribution in the field of mathematics and astronomy. Due to his achievement, India's first artificial satellite was named 'Aryabhata'.

- **Brahmagupta**

Born in the 7th century, Brahmagupta provided the highest peak of mathematical knowledge in India. He got the biggest achievement in the field of mathematics from the essential square equation.

In the western world, the credit of this theory goes to John Pell (1688 AD), but the reality is that 1000 years before Pell, Brahmagupta had presented the solution of this equation. Brahmagupta discovered the rules for the use of zero. Bhaskaracharya has considered the works done by him as the basis of Siddhant Shiromani. To give a special achievement to mathematics, he presented many opinions, due to which the famous astro-mathematician Bhaskaracharya honored him with the title of Ganak Chakra Chudamani in the 12th century. Brahmagupta got the education of astrology and composed two famous books, the names of these books are Brahma Sphut Siddhanta and Khand khadyak. These compositions composed by Brihamagupta became so famous that during the time of Arabic Caliphs they were translated into Arabic language and Brihamagupta's texts were known as Al Sind Hind and Al Arkand in Arabic language. It was through these texts that the Arabs got the knowledge of Indian mathematics and astrology for the first time. In this way, Brahmagupta was the teacher of Arabic astrologers and mathematicians. Brahma Sphut Siddhanta was his first book in which zero has been described as a separate book. In this book, all the rules of mathematics on negative numbers and zero are described. He also developed algebra and used it to solve the problems of astrologers.

- **Bhaskaracharya**

A thousand years ago, the world may find this question surprising that planets are suspended in space. It is more important for a daughter to ask her father. The answer he gave was known to the world 600 years after this incident as the law of gravity, that too by the name of Newton. This is not a story but a Dialogue between Bhaskaracharya and his daughter Lilavati. Bhaskaracharya was born in 1114 in Karnataka. His father Maheshwar was a mathematician, astronomer and astrologer who taught him mathematics. After receiving his initial education, he continued in this work. Later, he also became the chief president of Astronomy Jantar Mantar of Ujjain. This Jantar Mantar was the biggest Jantar Mantar of that time. Bhaskar composed Siddhanta Shiromani when he was 36 years old. In this Siddhanta Shiromani, he has presented the basic knowledge and formulas of many branches of mathematics. He composed Karan Kutuhel when he was 69 years old. There are mainly four parts of Siddhanta Shiromani. All these parts are branches of mathematics. Lilavati (Arithmetic), Algebra, Planetary math, Goladhyay. Over 500 years before Newton and Leibniz, Bhaskara created the first calculus. He is most recognised for discovering the fundamentals of differential calculus and applying them to calculations and issues in astronomy. He Performed derivative calculations for trigonometric formulas and functions and Computing the same area in two different methods to demonstrate the Pythagorean theorem. After learning about the derivative and differential coefficient, developed differential calculus. Lilavati (Book written by him) provides explanations for the solutions of indeterminate quadratic, cubic, and quadratic equations. He Discovered negative and irrational solutions to quadratic equations with several unknowns. Introduction to infinitesimal calculus and significant advances in integral calculus. He also Stated Rolle's Theorem, a specific instance of the mean value Theorem, one of the most significant analytical Theorems. As per Surya Siddhant 365.2588 days are needed for Earth to complete one orbit around the Sun, The discrepancy between the old and new measurements is only 3.5 minutes, or 365.2563 days. The first section of his Siddhanta Shiromani mathematical astronomy work discusses mathematical astronomy, while the second portion discusses the sphere. The 12th century AD saw the life of Indian astronomer and mathematician Bhaskaracharya. He was regarded by some as the greatest mathematician of mediaeval India.

- **Mahaviracharya**

Mahaviracharya was an Indian mathematician born in the 9th century, possibly in or close to the present day city of Mysore. He is widely considered to be a prominent Indian mathematician, who made many significant contributions to the development of algebra. The Ganita Sara Samgrahaby of Mahaviracharya is the earliest Indian text they have dedicated to mathematics. He developed formulas for approximating the area and circumference of ellipses and found a method for calculating the number square and the cube root from numbers. His importance extended beyond southern India, and his work proved inspiring to other mathematicians in the region. Mahavira was expert in Algebra, Calculus and analysis, Geometry and topology, Combinatorics, Logic, Number theory, Dynamical systems and differential equations. He worked on the same subjects on which Aryabhata and Brahmagupta worked, and he expanded the subject. He coined the terms equilateral and isosceles triangle, rhombus, circle, and semicircle. Ganita Sara Sangraha. He wrote this books in 850 CE. Ganita Sara Sangraha has nine chapters of about 1100 slokas. These slokas are from arithmetic, mensuration, geometry, and algebra. He mentions everything about triangle, rhombus, circle, and semicircle. He also proves many of the theories of Aryabhata and Brahmagupta's works. In these books, he shows many of his works. These books have been translated to English by M. Rangacharya.

- **Kanada**

Acharya Kanada, originally known by the name of Kashyapa. He was the son of a philosopher named Ulka. As a young boy, he once accompanied his father on a pilgrimage to Prayaga. He noticed that thousands of pilgrims in the town were littering its roads with flowers and grains of rice which they offered at the temples by the shore of river Ganges. Fascinated by the tiny particles, Kashyap began collecting the grains of rice from the ground while everyone else was busy offering prayers or bathing in the Ganges. Noticing this behaviour from a boy of a well-to-do family, an inquisitive crowd gathered around him and started wondering why he was acting in such a strange manner. When questioned about why he was collecting grains of rice that even a beggar wouldn't touch, Kashyap replied that one grain in itself may seem worthless but a collection of some hundred grains make up a person's meal. The collection of many meals would feed an entire family and ultimately the entire mankind was made up of many families. And for this reason alone, a single grain of rice was as important as all the riches in the world. People started calling him Kanada after this incidence as 'kan' translates to the smallest particle in Sanskrit. It was Kanada who first realized the idea that "anu" (atom) was an indestructible particle of matter.

He was Indian natural scientist and philosopher, formulated the theory of atoms 2500 years before John Dalton's discovery. Modern science credits the atomic theory to an English chemist and physicist named John Dalton (1766-1844). However, not many people are aware that a theory of atoms was formulated approximately 2500 years before Dalton by an Indian sage and philosopher named Acharya Kanada. He founded the Vaisheshika school of Indian philosophy that epitomized the earliest Indian physics. The concept of Dalton (6 September 1766 – 27 July 1844) surprisingly matches with the concepts that Kanad Muni exposed in relation to atoms 600 years before Christ. Kanada had exposed the theory related to the creation of matter about 2400 years before John Dalton. Maharishi Kanad not only considered atoms as the smallest indivisible unit of elements in which all the qualities of this element are present, but he also gave it the name 'Paramanu' and also said that atoms can never remain independent. Maharishi Kanad also said that two atoms of the same type can combine to form 'Dvinuk'. This binary seems to be the 'winery molecule' of today's chemists. He also said that atoms of different substances can also combine with each other. In the Vaisheshika Sutra, the atoms are also considered to be in constant motion and conservation of matter has also been talked about.

- **Varah Mihir**

Varah Mihir was born in Kapitha village near Ujjain. His father's name was Adityadas. They named him Mihir which means Sun, as his father was a worshiper of the Sun. Mihir predicted that the son of King Vikramaditya would die at the age of 18. Even after taking all kinds of precautions, the prince died on the day told by Mihir. The king called Mihir and said, 'I lost, you won'. Mihir humbly replied, 'Maharaj, in fact I have not won the science of 'Bhavishh Shastra' of 'Astronomy'. Maharaj gave Mihir the highest honor of Magadha country, Varah and from that day onwards Mihir became known as

Varah Mihir. King Vikramaditya II placed Varaha Mihir among the nine gems of his court because of his contribution to astrology and astronomy. At Kusumpur (Patna), young Mihir met the great astronomer and mathematician Aryabhata. This inspired him so much that he made astrology and astronomy the goal of his life. Under the Gupta rule, many centers of art, science and culture were flourishing there. Mihir came to live in this city because scholars from other places also used to gather here. When the time came, Vikramaditya Chandragupta II came to know about his astrological knowledge. The king included him in the Navratnas of his court. Mihir traveled to faraway lands, even as far as Greece. Like Aryabhata, Varah Mihir also said that the earth is round. He was the first person in the history of science to state that all objects are attracted to the earth thanks to some unknown force. Centuries later, 'Newton' named this unknown force as 'gravitational force'. He wrote three important books Brihajjataka, Brihatsamhita and Panchasiddhantika. Important formulas of trigonometry are given in these books, which are indicative of Varahamihira's knowledge of trigonometry. Panchasiddhantika describes the five principles prevalent before Varahamihira. These theories are: Polish theory, Romaka theory, Vasistha theory, Surya theory and Pitamah theory. Varahamihir has written the important points of these pre-existing principles and has also instructed the ritual called 'seed', so that the planets calculated by these principles can be visible. He has also written three texts of Falit astrology named Laghujataka, Brihajjataka and Brihatsamhita. Brihatsamhita includes subjects like Vastuvidya, building-construction-art, nature of atmosphere, Vrikshayurveda etc.

- **Nagarjuna**

Talk about chemistry or metallurgy, it is also linked with modern science... while its history in India is about 3 thousand years old. If we look at the pages of history, 'Nagarjuna' was famous as India's main metallurgist and chemist in ancient times. Nagarjuna was immersed in the world of chemicals from the age of just 11 years. At such a young age, he had also carried out various researches related to it. Nagarjuna did a lot of research related to chemistry and metallurgy, some of which are written by him in 'Ras Ratnakar' and 'Rasendra Mangal'. In Rasa Ratnakara, he has written about the method of purification of metals and how to convert them into gold. He not only edited 'Sushrut Samhita' but also added a new chapter 'Uttar Tantra' to it. In Kakshaputra Tantra, 'Arogya Manjari', 'Yogasar'. In 'Yogashtak', 'Ras Ratnakar', he has described various chemical reactions in detail. These are- preparation of mixture of different metals, purification of mercury, purification of other metals, making fake gold, purification of Maharas, construction and use of different methods of chemistry and their equipments.

- **Charaka**

Not only in India but in the whole world, Charak is known as a Maharishi and Ayurveda scholar. He edited 'Charak Samhita', the main text of Ayurveda, which is the first authentic available text of Ayurveda (Ayurveda in Hindi), which mentions prophylactic and curative drugs. Along with this, the method of using bhasmas made from metals such as gold, silver, iron, mercury etc. has been explained. Some people mistakenly call Acharya Charak the creator of 'Charak Samhita', but the fact is that after editing 'Agnivesh Tantra' composed by Acharya Agnivesh, he gave it a new look by adding some places and chapters. This revised and improved version of 'Agnivesh Tantra' was later known as 'Charak Samhita'. 'Charak Samhita' is such a wonderful book, in which all the achievements of medical science of that period have been included. It has been believed that the knowledge which is not in it, is nowhere. In ancient times, those who completed their education to do medical work had to take an oath in the name of Acharya Charak. 'Charak Samhita' is still the subject of research.

Conclusion

The above described article does not describe the achievements of all the scientists and scientists of ancient India, but on the basis of whatever is described, we have seen that ancient India is passing through a golden period in terms of scientific and scientific achievements. The scientific achievements developed in India were brought to Europe by the Arabs and the Britishers also studied and observed many books like Lilavati after coming to India, after which the process of discoveries came forward effectively. Undoubtedly ancient India was technologically advanced in fields like Mathematics, Medicine, Physics, with the presence of scientists like Varahamihira, Aryabhata, Nagarjuna. Contemporary civilizations of Indus Valley do not have scientificity like Indus. Along with this, in ancient India, almost India was technically and economically self-sufficient and was the leader of the whole world in the form of Vishwaguru.

Reference

- Sarma, K.V. 1985. A survey of source materials. Indian journal of History of science
- Filiozat, J. 1970 The expansion of Indian medicine abroad.
- Dasgupta, S. 1975. A history of Indian philosophy.
- Sengupta, P.C. 1947. Ancient Indian Chronology.
- Kumawat, Dr. Khetaram. Rich ancient tradition of chemistry in India. Pathey kan (26-31) 16.05.2015.
- Kanhaiya Lal Chaturvedi, Mathematics is a unique gift of Indian intelligence. Pathey kan (32-33) 16.05.2015.
- Brihatsamhita (Varahamihir Virichitam) by Jhan Achyutananda (1959) Chaukhambha Vidyabhavan Varanasi
- <https://www.robotlab.in>
- <https://jivani.org/Biography>

-
- <https://hindi.speakingtree.in>
 - <https://www.igntu.ac.in>
 - <https://www.nios.ac.in>
 - <https://www.pathykan.in>
 - <https://greatpeoples.in>
 - <https://www.sanskritimagazine.com>
 - <https://hindi.webdunia.com>
 - <https://dhyeyaias.com>