Trailblazers of Wisdom in Science of Ancient India, Who Shaped the World

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Abstract:- Many scientific concepts were developed thousands of years ago in ancient India. Ancient Indians made significant contributions to the highly developed science and mathematics during this time. At that time, medical science was also very advanced. The indigenous medical system known as Ayurveda was created in the Ancient Period and is the science of wellness and long life. If a separate school to look up ancient knowledge had been established right away after independence and employed, India might have attained the highest level of growth in the world.

> *Objective:*
  To examine an in-depth study to find out the contributions of some ancient Indian scientist from 9th century BCE to 8th century CE.

> *Methodology:*
  We have studied, which is basically descriptive by nature based generally on secondary data.

> *Results and Discussion:*
  The contributions of 11 Indian ancient scholars have been shown this paper in very brief.

> *Findings:*
  How much the ancient Indian scientists have contributed primarily in the field of Mathematics, Physics, Astronomy, Chemistry, and Medical Science respectively from antiquity. It is a matter of surprised that their contributions are not documented and also Indian discoveries/inventions are either looted or stolen frequently by the foreign invader or sometimes destroyed.

> *Conclusion:*
  For us, the contributions of these scientists have permanently changed several fields of science. It is our moral duty to study and respect their contributions and should go ahead for further development.

Keywords:- Scientific Knowledge, Indigenous System, Ayurveda, Contributions, Indian Scientist.

I. INTRODUCTION

Ancient India definitely was the centre of knowledge in all respects. If a separate school to look up ancient knowledge had been established right away after independence and employed, India might have attained the highest level of growth in the world. Given that the majority of our ancient texts, including the Purana, Vedas, Upanishads, Ramayana, Mahabharata, and other epics, were written in Sanskrit, the primary goal of this school will be to locate, make use of, and conserve the ancient wisdom. The topic expert would make an effort to explain the Sutra (Law) and how it is used. The book "Purana" describes the sage Maharshi Bhardwaj's accomplishments. He belonged to the Rishis or Seven Great Sages. He is still respected for his knowledge today. Aeronautic inventions, a field that was highly developed at the time, were utilised in the distant past in the Mahabharata and Ramayana. The method that aircraft or spacecraft arrived, vanished, and moved between planets was found by Maharshi Bhardwaj, who also wrote about it. One of India's most admired and revered sages was Vishwamitra. He created missiles thousands of years ago and taught his followers how they operate. He described several different kinds of missiles. There were many types of weapons like fire weapon, smoke weapon, radiation weapon, electric spark weapon, etc. The missile could not fail the target to hit. Again the counteract of missiles was also described. Suppose, the counteract of Agni weapon was water weapon. Till today the water weapon has not been invented.

We will be shocked to learn that ancient India was the birthplace of a great deal of scientific knowledge. Ancient Indians made significant contributions to the highly developed science and mathematics during this time. At that time, medical science was also very advanced. The indigenous medical system known as Ayurveda was created in the Ancient Period and is the science of wellness and long life. Even the science of Yoga was created as an affiliated branch of Ayurveda to promote physical and psychological healing without the use of drugs. We will thus examine the contributions of several ancient Indian scientists in this article. The study of mathematics includes looking at concepts like quantity (numbers), structure, space, and change. The classical Indian mathematicians Aryabhata, Brahmagupta, Mahavira, Bhaskara II, Madhava of Sangamagrama, and Nilakantha Somayaji are among those whose works have immortalized them. We will now talk about a few of the contributions made by Indian

mathematicians in ancient India. Examples include the decimal system, zero's concept as a number, negative numbers, arithmetic, algebra, trigonometry, etc. From ancient through medieval India, Sanskrit was utilized to produce mathematical writings, particularly sutras that described a system of rules or issues. The great scientific tradition of our country has significantly influenced the course of history. Scientists in long ago made important discoveries and developed outstanding theories in fields ranging from Physics, Astronomy, metallurgy and Mathematics to medicine. Our perception of the world is still influenced and inspired by their knowledge and thoughts.

➢ *Objectives*
This paper seeks to examine an in-depth study to find out the contributions of some ancient scientist in India from 9th century BCE to 8th century CE.

II. METHOD AND MATERIALS

This study is basically descriptive by nature based on secondary data. The data is gathered through secondary sources of ancient knowledge in India, say scriptures, like Bhagavata Purana, Bhagavad Gita, Upaniṣads, articles, websites and web-based journals published in different times, etc.

➢ *Analysis:*
The different materials collected from the different sources have been scrutinized, verified and set up systematically under appropriate heading in such a way to hold requisite presentation and conclusion.

III. RESULTS AND DISCUSSION

Here we discuss the contributions in brief of some ancient scientists in India from 9th century BCE to 8th century CE.

➢ *Yajnavalkya (9th –8th Century BCE)*
The birth place and year of birth of Yajnavalkya is not exactly known to us. He might be a Rishi of 9th or 8th century BCE. His contributions at that time are very charming to us.

• *Contributions:*
He accepted that the Earth is spherical and held that the Sun, as represented in the Vedas, is the center of the spheres. According to his astronomical work Shatapatha Brahmana, "The sun strings these worlds - the earth, the planets, and the atmosphere - to himself on a thread." He understood that this early heliocentric theory would have been affected by the Sun's size, which was far larger than the Earth. He also correctly calculated the distances of the Sun and Moon from the Earth to be 108 times their diameters, which is almost exactly the same as the current estimates of 107.6 for the Sun and 110.6 for the Moon. Yajnavalkya proposed a 95-year cycle to synchronize the motions of the Sun and the Moon based on his heliocentric model, which gives the average length of the tropical year as 365.24675 days, which is so accurate that only 6 minutes longer than the modern value of 365.24220 days. For more than a thousand years, this estimation of the length of the tropical year remained the most precise one available elsewhere in the globe. The rest of the world finds it incomprehensible that there was no modern instrument available. With the Sun's distance from the Earth slightly greater and the Moon's distance from the Earth slightly less than the current measurement, his computation is accurate. It demonstrates how the knowledge of astronomy was established by the ancient Indians. Table 1 below compares his measurement of the Sun's and Moon's distances to more recent measurements.

Table 1 Comparison between Yajnavalkya's Measurement and Modern Measurement for the Distance of Sun and Moon from the Earth

Heavenly Body	Diameter	Distance from Earth as per Yajnavalkya's measurement = Diameter × 108	Distance from the Earth as per modern instrument	Difference in Yajnavalkya's measurement
Sun	1392680 km	150409440 km	1392680 km× 107.6 = 149852368 km	557072 more
Moon	3474.2 km	375213.6 km	3474.2 km × 110.6 = 384246.52 km	9032.92 less
Source: Yajnavalkya (9th–8th century BC)'s Treatise 'Shatapatha Brahmana' (8.7.3.10) and Modern Measurement				

➢ *Sushruta (8th Century -7th Century BCE):*
During the sixth century BCE, Sushruta resided in the Kingdom of Kashi. He created the "Sushruta Samhita," a guide for doctors on how to treat their patients holistically. He is regarded as the "Father of Surgery" and was a pioneer of surgery in ancient India. He made outstanding contributions to the medical industry. His Sushruta Samhita is a collection of surgical techniques, covering orthopedics, medicine, dentistry, obstetrics, and gynecology in addition to plastic and ocular surgery. Sushruta's extensive knowledge of medical science was demonstrated by his use of anesthetic, high-tech surgical equipment, and a focus on surgical ethics. For creating and developing surgical techniques, a doctor from ancient India is referred to as the "Father of Indian Medicine," the "Father of Surgery," and also the "Father of Plastic Surgery."

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- *Main Contributions:*

He has described various reconstructive procedures for different types of defects. His works are compiled as Sushrutaa Samhita. He describes 60 types of upkarma for treatment of wound, 120 surgical instruments and 300 surgical procedures, and classification of human surgeries in eight categories.

➢ *Maharshi Kanada (600 BCE):*

Acharya Kanada was born in 600 BCE. His birth place was at Prabhas Kshetra near Dwaraka in Gujarat of Eastern India. His father was a philosopher. Kashyapa or Aulukya was his original name. His actual childhood name is not known. He was a sixth century scientist of Vaisheshika School. He was given the name Kanada because, even as a young boy, he was fascinated with extremely tiny particles known as "kana." It is India's own scientist "Sage Kanad" who deserves to be highly loved and honored when the entire population attributes the Western World with contemporary physics' invention. About 2600 years prior, he discovered the atomic structure, the atomic theory, and even subatomic particles. The "Father of Atomic Theory" honors him in this regard. One of the greatest works in the realm of physics, the Kanada Sutras, was translated by him. Along with Hinduism, Jainism and Buddhism also hold high regard for him and his ideas. He gained notoriety for his valuable contributions to the atomic theory and atomic structure of matter. He used realistic reasoning and logic to describe his theory. Rishi Kanad was the first to present a concise explanation of this idea; other philosophers and thinkers produced in-depth theories on how atoms interact to form compounds in the later period.

- *Contributions:*

His atomic theory can be a matched to any modern atomic theory. He is the pioneer of the atomic theory in the world. He created the Vaisheshika atomic theory. He postulated the idea that matter is made up of unbreakable particles known as "anu" or atoms. The atom, the tiniest particle, permeates the entire cosmos. According to Maharshi Kanad's explanation of atomic structure, atoms (parmanu), the tiniest particles that can maintain their original form in all contexts and circumstances and cannot be destroyed, are the basic building blocks of matter.

- *Rishi Kanada's Sutra:*

Now we discuss Rishi Kanada's Sutra (law) one by one. The Kanada Sutra, also known as the Vaisheshika Sutra, was composed in ancient India in Sanskrit. The Vaisheshika Sutra addresses how gravity affects items that are falling. It explains using the analogy of an arrow. It first explains the projectile (i.e., mechanism) of the arrow projection in Sutra 5.1.17. The arrow's initial impulse causes its first action; its second action is the resulting energy of its first action; and so on. Then it clarifies why it appears in the following sutra. Now, we go into further detail.

- *First Sutra (Law): Vegah Nimitta Visheshat Karmano Jayate.*

✓ *Translation:*

Change of motion is due to impressed force. (The law states that an object at rest tends to stay at rest and an object in motion tends to stay in motion with the same speed and in the same direction unless acted upon by an unbalanced force.)

- *Second Sutra (Law): Vegah Nimitta Pekshat Karmano Jayate Niyatdik Kriya Prabandha Hetu.*

✓ *Translation: Change of motion is proportional to the impressed force and is in the direction of the force.*
✓ *Third Sutra (law): Vegah Sanyog Vishesh Virodhi.*
✓ *Translation: Action and reaction are equal and opposite.*

➢ *Maharshi Charaka (4th Century BCE -3rd Century BCE):*

The date of Birth and death of Maharshi Charaka was not known exactly. Indian medicine has a storied and extensive past. The ancient texts known as the Vedas, particularly the metrical sections of the Atharvaveda, which may have been written in the second millennium BCE, contain its earliest concepts. The Charaka Samhita and Sushruta Samhita, two medical treatises attributed to Maharshi Charaka and Sushruta, respectively, marked the start of the golden age of Indian medicine, which lasted from 800 BCE to roughly 1000 CE. The foundation of all later works on Indian medicine was laid by these classics. A book on herbal medicine called "Charaka Samhita" was written by Maharshi Charaka. Charaka served as King Kanishka's personal physician. Hence, the period of Charaka may be taken as second century BCE. He served as a Raj Vaidya (Royal Doctor) of king Kanishka. His outstanding work on medicine is the Charaka Samhita, in which he provides numerous descriptions of illnesses and ways for determining both their causes and procedures for treatment. He was the first to discuss the immune system, metabolism, and digestion. He was also familiar with genetics' foundations. Ayurveda, the conventional form of Indian medicine, was practiced by Maharshi Charaka. It is believed that Charaka flourished between the 2nd century BCE and

the 2nd century CE. The ancient medicinal science of India known as Ayurveda is described in the Charaka Samhita, which is the oldest and most reliable dissertation on medicine. It provides useful information on the geographical, sociological, and economic situations of India in addition to information on medical disorders and their treatments. Famous Indian doctor Maharshi Charaka is revered as the "Father of Medicine." His work, the Charaka Samhita, is a thorough compilation of medical knowledge that covers subjects including Anatomy, Physiology, and the treatment of diseases. Charaka had a profound understanding of the value of holistic treatment methods and preventive medicine, which he shared with the world. He is regarded as the founder of the prehistoric Indian medical sciences.

➤ *Maharishi Patanjali (200-300 BCE):*

Little is known about Maharishi Patanjali's life narrative. It is rife with myths and inconsistencies. When it comes to the Maharshi Patanjali's birth, there is no solid evidence. The estimated dates for Patanjali's birth and death are off by a thousand years. Most academics place his existence between the second and third centuries BCE, however some maintain that he existed between the fourth and seventh century BCE. Maharishi Patanjali is thought to have resided in Nepal, Kashmir, Sri Lanka, as well as many locations throughout India. Maharishi Patanjali, a respected sage, created the practice of yoga as a type of physical exercise to combat illness in ancient India. Indian guru Patanjali have written several Sanskrit texts, including the *Yoga Sutras*, an important yoga text dating to 200 BCE – 200 CE. The Yoga Sutras were the product of Patanjali, a famous spiritual teacher of antiquity, who purified the essence of the spiritual path. He outlined the stages each soul must take to return to the infinite spirit. Rishis used to live for thousands of years and were extremely skilled with yoga power. They had the capability of living or dying according to their wish. Shri Patanjali is one of these strong Rishis, and according to the Puranas, their lives are believed to be for many ages. The Yoga Sutras, a fundamental treatise on the theory and practice of yoga, were written by the ancient sage Patanjali. The methodical explanations of the eight limbs of yoga by Patanjali, coupled with his recommendations for mental and spiritual growth, have had a significant influence on the understanding and practice of yoga around the world. The Sanskrit word Yoktra is where the word yoga is derived from. It is an associated branch of Ayurveda that was created in ancient India to treat physical and mental ailments without the use of drugs. Like other sciences, it has its roots in the Vedas. It also defines Chitta, or the process of a person's consciousness dissolving their ideas, emotions, and wants and coming to a state of harmony. Yoga combines mental and physical practice. Physical yoga is known as Hath yoga and mental yoga is known as Raja yoga. As the author of 195 Yoga Sutras, he is referred to as the "Father of Yoga." He was the pioneer in methodically presenting yoga as a great science. Aum is used as a representation of God in Patanjali's Yoga Sutras. A cosmic sound, according to him, is Aum. Pranaayaama makes use of A-U-M. Naval breathing is denoted by "A," thoracic breathing by "U," and upper body breathing by

"M." It is pronounced as OM in its capacity as a *Beejaakshara* (the origin of all sounds). He was a writer who has written about the traditional Indian medical system known as Ayurveda. He also studied medicine.

➤ *Aryabhata (476- 550 CE):*

In 476 CE, Aryabhata was born. Astronomical and mathematical theories are presented in his book, the Aryabhatiya. He has gifted 0 "zero" to the world. Aryabhata, a brilliant mathematician, astronomer, astrologer, and physicist who lived in the fifth century, is frequently referred to as the "Father of Indian Mathematics." He introduced the idea of zero, decimal notation, and an exact approximation of π (Pi) in his fundamental book, Aryabhatiya. Accurate predictions of planetary positions, eclipses, and Earth rotation were made possible by Aryabhata's astronomy treatises. The two volumes, "Aryabhaiya" and "Arya Siddhanta" were written by him has brought a remarkable progress in the field of Mathematics and Physics. His main contributions are shown below in brief.

• *Main Contributions:*

✓ When he was 23 years old, he published Aryabhattiya, a summary of mathematics of the period.
✓ He determined Pi's (π) value for the first time, which was 3.1416 and is still widely used today.
✓ He demonstrated that 0 was both a symbol and a number. Aryabhatta was actually able to determine the precise distance between the earth and the moon thanks to his discovery of zero. Negative numbers now have a new dimension thanks to the discovery of zero.
✓ Aryabhatta is regarded as the "Father of Astronomy" for his numerous contributions to science, particularly astronomy. As is well known, astronomy was a highly developed field in ancient India. The term used was Khagol shastra. There was a famous astronomical observatory at Nalanda, where Aryabhatta studied Khagol shastra.
✓ He also rejected the prevailing belief that the earth was immobile. The idea that "the earth is round and rotates on its axis" was put forth by Aryabhatta. He computed the earth's circumference to be 62,832 miles and made suggestions on the earth's axial rotation.
✓ He mentioned that planets shine because of sunlight reflection.
✓ He also provided examples to demonstrate why it is untrue for the sun to appear to move from east to west. The trees on the coast seem to move in the opposite direction, as if one were in a boat. It wanted to say that the earth is movable and the sun is immobile.
✓ He explained scientifically the solar and lunar eclipses. He invented a method for continuously counting solar days before any other astronomer.
✓ He created the equation for figuring out the areas of triangles and circles.
✓ His calculation of circumference of the earth was 99.8% accuracy.

Thus, we now understand the significance of Aryabhatta's name being given to the first satellite sent into orbit by India.

➤ *Varahamihira (505-587 CE):*

Varahamihira, also known as Varaha or Mihira, was born in Ujjain (Madhya Pradesh, India) in 505 CE, where he was brought up until his death in 587 CE. Six animals and thirty plants were listed by him as potential indicators of the existence of water. He provided highly crucial information about termites (Deemak or insects that damage wood), including the fact that they travel very deep to the surface of water level to bring water to keep their homes moist. The seismic cloud theory proposed by Varahmihira in his Brihat Samhita is another theory that has caught the attention of scientists. This Samhita's thirty-second chapter is devoted to earthquake warning indicators. He has made an effort to connect earthquakes to animal odd behavior, undersea activities, underground water, anomalous cloud formation, and the effect of planets. Astrology is another area where Varahamihira's contributions are noteworthy. He was one of Yashodharman Vikramaditya of Malwa's "Nine Jewels" of the court. He was inspired to pursue a career as a mathematician and astrologer after meeting Aryabhatta. He attended Kapitthaka to study. Varahamihira's forecasts were so precise that King Vikramaditya granted him the title "Varaha." He was the first scientist in history to suggest that a "force" might be keeping bodies stuck to the round earth. It is now known as gravity. His well known contributions are shown below.

- *Main Contributions:*

✓ The moon and planets are lustrous not because of their own light but rather because of sunlight, according to Varahamihir's work "Panch Siddhant".
✓ Brihat Samhita is Varhamihira's best-known piece of writing. This book covers a wide range of subjects, including astrology, cloud formation, eclipses, timekeeping, agriculture, mathematics, gemology, temples, planetary motions, and many others. He provided the earthquake cloud hypothesis in his Brhat Samhita, which caught the attention of the entire globe.
✓ He also published 'Brihat Jatak' in which he discussed his scientific discoveries in the fields of geography, astronomy, botany, and animal science.
✓ Varahamihir described the methods for treating numerous diseases that affect plants and trees in his treatise on botanical science.
✓ Aryabhatta and Varahmihira introduced the astrology science of light in a methodical, scientific manner.
✓ He had made significant contributions to the sciences of mathematics, ecology, hydrology, and geology.
✓ The first scientist to suggest that termites and plants might be signs of subsurface water. He actually revealed crucial information about termites, which are insects that eat wood or dimak. They travel extremely far below the water's surface to bring water to maintain their homes moist.
✓ He also suggested that sunlight, not the Moon or planets' own light, is what gives them their glossy appearance.

✓ Among his mathematical discoveries were the trigonometric formulas. A variation of what is now known as the Pascal's triangle was also discovered by him, making him the first mathematician to do so.
✓ To determine binomial coefficients, he employed it. Around 1500 years ago, he made a prediction about the discovery of water on Mars.

➤ *Brahmagupta (598-668 CE):*

In the seventh century, Brahmagupta, a brilliant mathematician and astronomer, revolutionized the field of number theory. He may have been born in Ujjan, India, in 598 CE, and he passed away in 668 CE. In 628, he penned Brahma-sphuta-siddhanta, a 25-chapter work on mathematics and astronomy. The book contains crucial mathematical lessons on algebra, geometry, trigonometry, and computational thinking. It had a significant influence on Islamic mathematics and astronomy after being translated into Arabic in Baghdad about the year 771 CE. In 665 CE, at the age of 67, he published a second book titled Khandakhadyaka on mathematics and astronomy. He significantly improved methods for determining the positions of celestial bodies throughout time, their rising and setting, connectives, and the calculation of lunar and solar eclipses. He created arithmetic algorithms, defined zero as a numerical entity, and offered answers to quadratic problems. The contributions of Brahmagupta set the stage for the development of algebraic and numerical notions. He was the first mathematician to create formulas for calculating a cyclic quadrilateral's surface area. He made significant contributions to geometry. Brahmagupta made substantial contributions to the creation of the negative number system and was the first to offer instructions for computing with zero. He was appointed director of the astronomical observatory in Ujjain, the principal mathematical hub of ancient India at the time. There, notable mathematicians like Varahamihira worked and established a powerful school of mathematical astronomy.

His work on mathematics and astronomy brought revolutionary concepts in the world at that time when the today's developed countries stood at the initial stage of knowledge. His contributions have stood at the root of today's development of mathematics and astronomy. His contributions in his two books are many in number. He calculated that a year is 365 days, 6 hours, 12 minutes, and 9 seconds long, which is very close to the today's time duration. He mentioned 'gravity'. 'Bodies fall toward the earth because it is in the fact that the earth to attract bodies, just as it is in the nature of water to flow,' he said. It has been discovered by Sir Isaac Newton in the 16th century.

At a time when the industrialized nations of today were still in the early stages of knowledge, his work in mathematics and astronomy introduced the globe to notions that would later become ground-breaking. His efforts laid the foundation for modern mathematics and astronomy. His two volumes contain numerous contributions from him. A year, according to his calculations, lasts 365 days, 6 hours, 12 minutes, and 9 seconds, which is quite similar to the current time period. 'Gravity' was referenced by him. It is in

the nature of the earth to draw bodies, just as it is in the nature of water to flow, he continued, explaining why bodies fall toward the earth. Sir Isaac Newton made the discovery in the sixteenth century. He demonstrated that the Earth is a sphere whose circumference is approximately 36,000 km, which means 22,500 miles, which is nearly today's calculation.

➤ *Bhaskara I (600 – 680 CE):*

Bhaskara I was a 7th-century Indian mathematician and astronomer. Bhaskara is referred to as Bhaskara I in order to differentiate Bhaskara (Bhaskara II) from the 12th-century mathematician. With Brahmagupta and Madhava Samgramagrama, Bhaskara-I is regarded as one of the three gems of Indian astronomy and mathematics. Although Bhaskara I was a well-known mathematician, nothing is actually known about his early years other from what has been deduced from his writings. Many people think he had to have been employed by a mathematicians' school at Asmaka, which was possibly in Andhra Pradesh's Nizamabad District. In other texts by Bhaskara I, locations in India are mentioned. He is thought to have been born in Saurashtra around 600 CE and thereafter relocated to Asmaka. He is regarded as Aryabhata's disciple. He is regarded as the most significant academician in the Astronomical School of Aryabhata.

The names and solutions of first-degree equations, quadratic equations, cubic equations, and equations with multiple unknowns, symbolic algebra, the algorithm method to solve linear indeterminate equations that were later suggested by Euclid, and formulating specific tables for solving equations that occurred in astronomy are just a few of the major contributions that Bhaskara I made to the field of mathematics. As a result, he made some very extraordinary contributions to the fields of Algebra, Calculus, Trigonometry, and Astronomy. He is well-known for the following accomplishments:

- Discovery of Circle for Zero, positional arithmetic, the approximation of sine.
- The three treatises he wrote on the works of Aryabhata: The Mahabhaskariya ("Great Book of Bhaskara"), The Laghubhaskariya ("Small Book of Bhaskara"), and The Aryabhatiyabhashya.
- The most important mathematical contribution concerns the representation of numbers in a positional system. The numbers were not written in figures, but in words or symbols.
- Moreover, Bhaskara I stated theorems about the solutions of today so called Pell equations.

➤ *Lalla (720-790 CE)*

Lalla was born possibly in the Lata region of modern south Gujarat of India in 720 CE and died in 790 CE. He was one of the leading Indian astronomers, mathematicians, astronomers, and astrologers of the eighth century, who belonged to a family of astronomers. Lalla was the son of Trivikrama Bhatta and the grandson of Samba. Both were famous astronomer.

- *Contributions:*

✓ The Shishyadhividdhidatantra was Lalla's most well-known work. There were two volumes. The planets' locations were calculated in the first book. There were thirteen chapters in total. It covered subjects like the mean longitudes of the planets, their true longitudes, the three issues with diurnal rotation, eclipses of the sun and moon, risings and sunsets, the shadow of the moon, the crescent moon, conjunctions of the planets with other planets, and conjunctions of the planets with fixed stars. The second volume was on the sphere. The celestial sphere, the terrestrial sphere, instruments, and other topics were covered.

✓ At this period, astrology was based on astronomical tables, and frequently, the horoscopes reveal which tables were utilized. Aryabhata I utilized the tables the most frequently. These tables were revised by Lalla, who also created a set of corrections for the Moon's longitude. Lalla did adhere to one part of Aryabhata I's work, where he calculated the value of π. His calculated value of π was 3.1416. Lalla used this value, which is a figure that is accurate to the fourth decimal point.

✓ Lalla also authored a commentary on Brahmagupta's work Khandakhadyaka. Lalla's commentary is no longer available.

✓ He wrote the *Jyotisaratnakosa* on astrology, which was a very popular work survived for next around 300 years. This book contains some of the earliest known Sanskrit astrological calculations on favorable and unfavorable dates. Despite the fact that the available manuscripts are fragmentary, this material has never been published in any edition.

➤ *Bhaskara II (1114-1185 CE)*

To set him apart from the astronomer Bhaskara I from the seventh century, the II has been added to his name. In the Indian state of Karnataka, Bhaskara II was born in 1114 CE close to Bijjada Bida (the current Bijapur district), and he passed away at Ujjain, most likely, in 1185 CE. He is also known as Bhaskaracharya. In the 12th century, he was an outstanding mathematician and astronomer. It is thought that his father gave him lessons in mathematics, which he then taught his son Loksamudra. He joined in Ujjain's "most prestigious mathematical center" at the time in India and became head of the astronomical observatory there. The concepts that would become Bhaskara II's legacy were developed by him in Ujjain.

Famous mathematicians like Varahamihira and Brahmagupta had contributed to the establishment of a great school of mathematical astronomy there. He is regarded as a pioneer in both the study of number systems and the solution of equations. For numerous centuries, no one else in the world could match the mastery of mathematics, number systems, and problem solving that Bhaskara had.

- *Main Contributions:*

✓ He developed new ideas of celestial motion, invented the idea of infinitesimal calculus, and determined the values of trigonometric functions. The contributions of Bhaskara II established the groundwork for later developments in mathematics in the world. He is renowned for discovering the fundamentals of differential calculus and applying them to calculations and computations in astronomy.

✓ By calculating the same area in two distinct ways and then canceling out terms, Bhaskara-II is credited with proving the Pythagorean Theorem. He was the first mathematician to use the decimal number system entirely and consistently in a piece of writing.

✓ Bhaskara II is well known for the Siddhanta Siromani (Crown of Treatises), his masterpiece from 1150 A.D., which he completed at the age of 36. The 1450 verses of the treatise are divided into four sections. Each section focused on a different area of astronomy and mathematics. They were: Lilavati: A treatise on arithmetic, geometry and the solution of indeterminate equations, Bijaganita: A treatise on Algebra, Goladhyaya: Mathematics of Spheres, and Grahaganita: Mathematics of the Planets, where he calculated the time taken for the Earth to orbit the sun to 9 decimal places, which was hundreds of years before the astronomer Smart. He calculated that time taken by the earth to orbit the sun is 365.258756484 days. The above values are compared and seen most nearest with the modern values. In the 12th century, he published the laws of gravity in the book Surya Siddhanta. As a result, the law was in existence long before Sir Isaac Newton (Newton was born in the 16th century). It was "Bhaskaracharya" and "not Newton" who initially stated the first principle of gravity. Aryabhatta also tried originally to give the same conception of gravity in his treatise "Arya Siddhanta".

✓ Additionally, he produced a work titled Karana Kautuhala.

IV. FINDINGS

How much the ancient Indian scientists have contributed primarily in the field of Mathematics, Physics, Astronomy, Chemistry, and Medical Science respectively from antiquity. It is a matter of surprised that their contributions are not documented and also Indian discoveries/inventions are either looted or stolen frequently by the foreign invader or sometimes destroyed. In the 6th century BCE, Rishi Kanada's Vaisheshika Sutra had explained the three laws of motion while Sir Isaac Newton showed the same laws in the 17th century. Like that there are so many things which the ancient Indian scientists have discovered/invented many years ago such as astronomical information like solar system, other galaxies, etc., mathematical works, and other so many works in different subjects.

The "father of Indian medicine," Acharya Charak, provided a thorough analysis of adult disorders and their medical management. He also indicated that juvenile patients could also benefit from the use of disease-specific medications, albeit in smaller doses. Along with imparting surgical expertise, Acharya Sushruta is also credited as the "father of Indian surgery" since he studied every branch of Ayurveda. Both Acharyas provided an overview of neonatology and discussed all of Kaumarbhritya's principles, including those pertaining to infant care, breastfeeding, child protection, neonatal nurseries, and toys, among other topics. A lot more hidden facts need to be investigated further, in addition to the research that has already been done. We are surprised to learn that medical science, ayurveda, yoga, and other fields were developed significantly in ancient India. How advanced India was in the past!

V. CONCLUSION

These ten outstanding ancient Indian scientists have left a lasting legacy on a number of scientific fields for us. We have a moral obligation to research their accomplishments, to honor them, and to move forward with our own progress. Our understanding of mathematics, astronomy, medicine, chemistry, and other fields has been profoundly influenced by their groundbreaking discoveries, deep insights, and innovative theories. These pioneers who pushed the boundaries of knowledge and established the groundwork for scientific advancement deserve our gratitude. Their intellectual prowess must serve as an inspiration for us as we work to build on their incredible accomplishments.

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