

# Indian Ancient Knowledge: Foundations of Modern Science

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### *Abstract*

*India boasts one of the world's longest continuous histories, marked by Neolithic settlements unearthed in Mehrgarh, Baluchistan, dating back to approximately 7000 BC, showcasing early human ingenuity in agriculture and craftsmanship. The Harappan civilization, flourishing around 2700 BC along the banks of the Indus River, Ghaggar-Hakra, and their tributaries, demonstrated advanced urban planning, metallurgy, and standardized weights, laying the groundwork for systematic knowledge. Sources of ancient Indian history divide into literary and non-literary categories, with the bulk of scientific wisdom preserved in literary forms such as religious scriptures, secular treatises, historical chronicles, and accounts from foreign visitors like Megasthenes and Fa-Hien.*

Religious literature from Vedic, Buddhist, Jain, and contemporaneous traditions forms the core, embedding profound insights into cosmology, medicine, and mathematics. For recent eras, printed and handwritten records on paper prevail, but pre-paper times relied on inscriptions on dried palm leaves, birch bark (bhojpatra), copper plates (tamrapatra), and engravings on rocks, pillars, stone walls, clay tablets, and megaliths, ensuring knowledge's endurance. Ancient India teemed with brilliant thinkers, researchers, and philosophers who, sans modern laboratories or supercomputers, achieved feats rivalling today's precision—calculating light speed, Earth's diameter, and planetary distances with astonishing accuracy.

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Vedic Mathematics, for instance, simplifies extracting cube roots, fourth roots, or higher roots of massive numbers manually, techniques now revived for computational efficiency.

The Vedas—etymologically “knowledge”—encapsulate both *apara vidya* (material, empirical sciences) and *para vidya* (spiritual, metaphysical truths), from atomic theory to cosmic cycles. As Max Muller observed: “Whatever may be the date of the Vedic hymns, whether 1500 or 15,000 B.C.E., they have their own unique place and stand by themselves in the literature of the world.” Vedic literature poeticized mathematical formulae and scientific principles in rhythmic verses, a mnemonic strategy universal then, facilitating oral transmission across millennia without script degradation. Thus, India’s ancient lore passed faithfully from guru to shishya, positioning the subcontinent as the era’s knowledge epicentre.

Alas, relentless foreign invasions and temporal erosion buried much treasure, yet gems persist. The world’s inaugural university, Takshashila (circa 700 BC, or 800 BC per some), drew over 10,500 pupils globally for 60+ subjects: Vedas, grammar (*vyakarana*), logic (*nyaya*), philosophy, medicine (*ayurveda*), surgery, archery (*dhanurveda*), economics (*arthashastra*), astronomy (*jyotisha*), and statecraft. Nalanda, from 5th to 13th century, rivalled it—a towering Mahavihara with four-story edifices housing 10,000 residents, sustained by 200 villages’ endowments, imparting grammar, epistemology, metaphysics, and sciences to scholars from China, Korea, Tibet, drawing Hiuen Tsang’s awe. Georges Ifrah (1994) marvelled: “The Indian mind has always had for calculations and the handling of numbers an extraordinary inclination, ease and power, such as no other civilization in history ever possessed to the same degree. So much so that Indian culture regarded the science of numbers as the noblest of its art. A thousand years ahead of Europeans, Indian savants knew that zero and infinity were mutually inverse notions.”

### **Scientists of Ancient India and Their Discoveries**

Prominent luminaries—Baudhayana, Aryabhata, Brahmagupta, Bhaskaracharya, Kanad, Varahamihira, Nagarjuna, Sushruta, Charaka, Patanjali—propelled India in mathematics, physics, chemistry, medicine, Ayurveda, yoga, astronomy, astrology, and

beyond. Northern sages comprehended the gravitational binding of the solar system, positing the Sun—massive central orb—2,000 years pre-Pythagoras.

India originated the modern numeral system: Pingalacharya devised zero (200 BC), decimal place-value (100 BC), now dubbed “Arabic numerals” despite Indian genesis, aptly “International Form of Indian Numerals” per India’s Constitution (Art. 343). Algebra, trigonometry, and calculus germinated here; Sridharacharya resolved quadratics (11th century). Vedic cosmogony mirrors Big Bang (Nasadiya Sukta, Rigveda 10.129). Rigveda (over 6,000 years old) delineates light’s spectrum via Surya’s seven-horse chariot.

Sayana’s Rigveda Bhashya (I.50.4) pegs light speed at 300,000 km/s, matching modern metrics. Binary logic underpinning computers traces to Pingala’s Chhandasutra (8.24-25). Shukla-Yajurveda Samhita avers Moon borrows sunlight via Susumna ray, with no intrinsic luminescence. Baudhayana pioneered pi approximation and Pythagoras theorem in the Sulba Sutras. Mahaviracharya’s Ganit Sara Sangraha (850 AD)—archetypal arithmetic text—detailed LCM computation, predating Napier.

Aryabhata, a 5th-century polymath (mathematician-astronomer-astrologer-physicist), penned the Aryabhatiya at 23, post-Nalanda studies: measured the Earth-Moon distance precisely, declared Earth spherical/rotating, debunked the apparent solar east-west motion, affirmed the lunar/planetary reflected light, and scientifically parsed eclipses. Kanad (6th century, Vaisheshika darshana; orig. Kashyapa/Aulukya) fixated on “kana” (atoms) from childhood; posited the universe from indivisible, indestructible, invisible anu (atoms).

Brahmagupta (7th century) authored Brahmasphutasiddhanta, disseminating Indian math to Arabs; employed place-value multiplication akin to today, discerned gravity (598 AD), pioneered negative numbers/zero arithmetic. Bhaskaracharya (12th century) composed Siddhantashiromani—Lilavati (arithmetic), Bijaganita (algebra), Goladhyaya (celestial spheres), Grahaganita (planets)—unveiling Chakravala for Diophantine equations, “rediscovered” as inverse cycles by Europeans; James Taylor translated Lilavati (19th century).

Varahamihira (Gupta era, one of Vikramaditya's Navaratnas, titled 'Varaha' for prescient forecasts) enriched hydrology/geology/ecology: termites/plants signal aquifers (six fauna, 30 flora); Brhatsamhita Ch. 32 theorises earthquakes via planetary pulls, submarine quakes, groundwater shifts, anomalous clouds, faunal frenzy. Jyotisha ("light science," Vedic-rooted), systematised by Aryabhata/Varahamihira, elevated astrology scientifically.

Nagarjuna (10th century) pursued transmutation (base to gold, like Western alchemists) via Rasaratnakara: extracted gold/silver/tin/copper, crafted gold-sheened alloys for jewellery—technique persists.

### **Ayurveda, Yoga, and Allied Sciences**

Ayurveda and Yoga remain ancient India's enduring boons. Sushruta, surgery trailblazer, cadaver-dissected for anatomy; Sushrutasamhita catalogs 1,100+ maladies (26 fevers, 8 jaundices, 20 urinary), 760 botanicals (roots/bark/juice/resin/flowers), masterpieces in rhinoplasty (nose reconstruction) and cataract extraction—with precise procedural/instrumental directives.

Charaka, Kanishka's royal vaidya, fathered Indian medicine via Charakasamhita: vast pathology, aetiology, therapies; pioneered digestion/metabolism/immunity/genetics for holistic health, prioritising causation over palliation. Yoga, Ayurveda-auxiliary for non-pharmaceutical healing, derives from "yuj" (yoking mind to atman, detaching senses); bifurcates hathayoga (physical, disease eradication/restoration) and rajayoga (mental, self-realisation via psychosomatic-spiritual equilibrium). Patanjali canonised via Yogasutras, plus the medical treatise and Panini grammar's Mahabhashya.

Indians unearthed arithmetic/geometric progressions (Yajurveda); Govindaswami anticipated Newton-Gauss interpolation (1,800 years prior); Vateswaracharya backward variant (1,000 years early); Nilakanta infinite series convergence. Maharishi Bharadwaja detailed light rays, spectrometer, 100+ instruments in Yantrasara (850 AD arithmetic primer, LCM methods pre-Napier).

Repetitions in lore underscore profundity: Aryabhata's rotations/eclipses, Kanad's atoms, Brahmagupta's gravity/zero, Bhaskaracharya's algebra, Varahamihira's predictions, Nagarjuna's

chemistry, Sushruta/Charaka's medicine, Patanjali's yoga—all reiterated for emphasis.

### **Bridging to Modernity**

Integrating ancient lore with modern science proves invaluable; medieval library incinerations (Nalanda et al.) cost irreplaceable codices from centuries' toil, penalising insularity from global trends. Vedic math accelerates AI: neural nets, edge detection, speech recognition (Sanskrit phonetics), genomics-Ayurprakriti fusion for personalised meds. AI Panchangam via Surya Siddhanta, Nakshatra CNNs for farming, ARTAF astrological analytics.

2025-2026 scholarship reaffirms: atomic/test-tube insights, sustainable tech, logic in reasoning. Takshashila/Nalanda's multidisciplinary pedagogy inspires global universities.

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