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Origin and Development of Science in India

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Abstract: The paper deals with the origin and development of science in the Indian subcontinent. How people started to observe nature and develop technologies for their betterment. Science is simply a systematic study of the natural and physical world through observation and experiment, whereas technology is defined as the application of knowledge in practice. As it can be seen in the subcontinent that the people of the Palaeolithic period were well aware of tool making, which involves different techniques, so it could be said that the beginning of science in the Indian subcontinent started from the Palaeolithic period itself and developed continuously from time to time.

Keywords: *tool making, pottery, agriculture, domestication of animals, metallurgy, astronomy,*

Introduction

The beginning of science and technology in the Indian subcontinent could be traced back to the Palaeolithic period only as the people of that period started to use stone tools with different technologies and from then on, continuously develop. The advancement in the techniques and the introduction of new techniques imply the abovementioned statement. From making stone tools to astronomy and medicine, we show the development in the field of science in the subcontinent. Every period of the subcontinent has its own story in the field of science. The Palaeolithic is about making tools, the Mesolithic is about the science of painting, the Neolithic is about farming and taming animals, the Bronze Age is about metallurgy, and the Iron Age is about literature and astronomy. Each period has its unique characteristics in the fields of science.

The Palaeolithic period

The period goes back to 2 million years ago and continues till 10,000 years ago in the Indian subcontinent. The very first evidence yielded from the subcontinent was the hand axe (stone tool), which was discovered by the geologist of the Geological Survey of India named Robert Bruce Foote in the summer of 1863 from Pallavaram near Madras (modern Chennai). As the name itself implies, "palaeo" means old and "lithic" meaning stone, integrated as the old stone age, that stone was probably the most used source of the period and, accordingly, the primary source of information for the period.

The techniques used for the making of the stone tools in the period suggest the scientific mind of the people of that period and could be dated to the inception of science in the subcontinent. The Palaeolithic stone tool-making techniques like primary fabrication such as a block on block, direct percussion, hollow hammer technique, and resolved flaking would not have been possible without science (Bhattacharaya, 1991). The involvement of controlled force, pressure, and projection in these techniques involve science as well.

Mesolithic Period

The period stretches from 10,000 to 8,000 years ago. The period is recognised for the microlithic tools, which vary from 1 cm to 5 cm. The smaller size and ease of portability of these tools suggest the development in the field of science in that period. Previously, tools were not made for a particular purpose but a single tool was used for various purposes, but as time went by and the advancement in technology took place and new advanced techniques for tool making were introduced, a particular tool for a particular purpose was crafted.

The development in science in the period could be traced to the methods used to make the paints for the rock art paintings, which were found in abundance in the subcontinent. The selection of the raw material for the paint followed by the grinding and mixing it with other elements was the result of observation, experiment and implication. Because the paint used in these paintings was highly pigmented, it has survived to this day. On the other hand, the science of making handmade potteries was introduced. Clay preparation, pot shaping, and drying all necessitate extensive knowledge. The very first evidence of pottery showed up in this period, though the numbers are less.

Neolithic period

The phase is considered revolutionary (Childe, 1939) as there occurred a drastic change in every aspect, from tool making to permanent settlement to agriculture and domestication of animals. People started to follow the rules of nature, and with the right education and knowledge, they put those rules to use in agriculture. This turned them from nomads into permanent settlers. The study of the behaviour of the animals made them capable of domesticating the animals. All these developments pushed them a step toward science.

Bronze Age

The use of bronze (an alloy of copper) itself shows the high knowledge of metal and its casting into objects. The extraction of metal from their ore and making the alloy by heating and mixing them was well known to the people of the bronze age. They knew the benefits of bronze over copper. Bronze is harder than copper and easy to cast(i.e. more fusible) as well.

The best example to see the achievement of science and technology of this period is the Harappan civilization which is considered one of the oldest civilizations in the world.

The Harappans used new techniques in handicrafts such as carnelian products, seal carving, and copper, bronze, lead, and tin in metallurgy (Kenoyer, 1999). The cities of the Harappan civilization were very well planned and built, with baked bricks being used to build houses and buildings in rows on both sides of the road. Some houses were also built in the streets. Their buildings also contained two-room houses. Some houses also had private bathrooms with earthen pots in the walls, which also had a drainage system. In some cases, there was also a provision for a cradle to sit on the toilet. In the Indus Valley Civilization, the drainage system was in very systematic order, with every household using a drainage system for the best convenience. The drainage point of each house was made of bricks. The architecture of well-planned urban centres based on fixed layout patterns with scientific roads, drainage systems (with the use of corbel technology), and public structures (such as granaries and great baths), was far ahead of its time and a precursor to the modern concept of architecture and civil engineering. The Harappan civilization also built the world's first "tidal port" at the head of the Gulf of Cambay in Lothal, Gujarat, a testament to their high level of knowledge regarding the ebb and flow of tides. The Indus Valley Civilization was devoid of major advances in transportation technology. These advances could include bullock carts similar to the boats seen today throughout South Asia. Most of these boats were probably small, flat-bottomed crafts, probably propelled by sails, which can be seen today on the Indus River. However, there is secondary evidence of sea-going craft. Archaeologists have discovered a huge, dry canal as a docking facility in the coastal city of Lothal in western India (Gujarat state). An extensive canal network, which was also used for irrigation,

The Indus people were the first to use complex multi-cropping strategies in both seasons, growing foods such as rice, millet, beans, etc. during the summer and wheat, barley, and pulses in the winter, which required separate pruning management (Bates, 2016).

The Indus Valley Civilization was technologically advanced and had a good understanding of metallurgy; they also used standardised burnt bricks, precise weights, and cotton. Many subdivisions also had a standardised system of weights and measurements with calibration. According to the evidence found in the excavation, they used gold, silver, copper, lapis lazuli, turquoise, amethyst, alabaster, jade, etc.

The Harappans learned new ways to work with metal and made copper, bronze, lead, and tin. A stone touching gold streaks was found at Banawali, which may have been used to test the purity of gold, a technique still used today in parts of India.

The people of the Indus Civilization had achieved great accuracy in measuring length, mass, and time (Singh,2008). A comparison of available items shows large-scale variation in the Indus regions. Their smallest division, marked on an ivory scale found at Lothal in Gujarat, was about 1.704 mm, the smallest recorded on a Bronze Age scale. For all practical purposes, Harappan engineers used the decimal system to measure everything, including the weight of hexahedrons, which they used to measure mass.

He also had a stone to weigh, whose weights were 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, and 500 in the ratio of 5:2:1. Unit and smaller items were weighed in equal proportions with 0.871 units, each unit weighing 28 grams, roughly the same as the English Imperial ounce or Greek unit. However, as in other cultures, the actual weights were not uniform across the region. The weights and measures used in the later Kautilya's Arthashastra (4th century BCE) are similar to those used in Lothal.

The Harappans were very modern in mathematics; the numerical system developed by them included symbols for most numbers and many innovations for mathematical numbers, such as addition and multiplication. The Harappan numerical system in use has decimal and an additive multiplier. There are also numerical symbols for 4 to 100, 1000 and their derivatives. The numerical systems that were first used by the Harappans were later found in other ancient civilizations as well.

The Harappans were familiar with medical science and used various herbs and medicines to treat diseases. The people of the Indus Valley Civilization practised trephination which is a type of medical intervention, in which a hole is made in the skull to treat skull and brain disorders. Evidence of traction (a set of mechanisms to straighten broken bones or reduce pressure on the spine and skeletal system) has also been found at Lothal, Kalibangan, and Burzahom, but not at Harappa or most other sites.

According to a report published in the journal Nature, the oldest evidence of tooth extraction in a living person is found in Mehrgarh around 7000 BC. This tooth drilling involves dentition with drills operated by skilled bead craftsmen. It is a great example of proto-dentistry.

The people of the Indus Valley were familiar with the use of pottery and also knew pottery painting and glazing. He also knew using lime as plaster. He used pyro-technology to heat the lime. The people of the Indus Valley had also made 'fans' by heating silica to 1200 °C.

He had good knowledge of making pots and bricks in furnaces and was also an expert in bead making. In fact, he knew the art of bead cutting, drilling, and polishing. In addition, Mehrgarh shows evidence of local copper ore (Singh, 2008), containers made of bitumen, domestication of plants and animals, and tools with tanning.

The Iron Age and later periods

The period provides an abundance number of written evidence of science and this evidence itself implies the advanced sciences of that period. Following are the works which give a detailed account of the science of the period:

The Atharvaveda has the oldest mention of medicines (Singh and Girish, 2012). However, as in other ancient societies, suggested treatments were laced with supernatural charms and spells, and medicine could not progress scientifically.

The word "mathematics," which implies the science of calculation, appears frequently throughout Vedic literature. Astronomy, arithmetic, and algebra were all included in the phrase (Mathematica).

The Vedic people devised innovative methods for converting squares to the area of triangles, rectangles, and circles, as well as for converting the sum and difference of squares to the sum of the area and difference of the square. These references and descriptions can be found mostly in the Shulbasutras, but also in the Satpatha Brahmana and Taittiriya Samhita to a lesser extent.

Thoughts on the Cosmos: According to the Rigveda, the universe is made up of three parts: Prithvi (Earth), Akash (literally "the region under the stars"), and Divya or Dyaus (heaven). The Rigveda contains a discussion concerning the earth's expansion. From what it said, the earth was thought to be round and to float in the air.

The Shatapatha Brahmana refers to it as Parimandala (globe or sphere). The Rigveda has evidence of knowledge of the earth's axial rotation and yearly rotation. The Sun is recognised to be the cause of these motions. According to Rigveda, there is only one sun, which created day and night, twilight, month, and year.

The word ayas is used in Rigveda to refer to copper or bronze rather than iron (Singh & Girish, 2012). Later Vedic terms like Krishnaya, Kalyasa, or Syamaya, which mean 'dark metal,' were used to refer to iron; iron (literally, red) or iron is a generic term for the metal, and often means iron.

Vriddha Garg was the first Indian astronomer. His name is mentioned in the Mahabharata. Vriddha Garga was already considered a brilliant Indian astronomer who lived several centuries earlier when the Mahabharata was published in its current form (4th century AD). Aryabhatt discovered that the Earth spins on its axis. He used the Babylonian method to compute the planet placements.

Ayurveda, the traditional Indian medical system, is a specific field of knowledge about life that deals with both the body and the mind. It comes from the parts of the word "Ayurveda" that mean "life science": "Ayu" means "life" and "Veda" means "knowledge". Ayurveda's focus extends beyond physical health to encourage overall physical, mental, and spiritual wellness in the context of man's interaction with his environment.

Conclusion

From the above, it could be concluded that the emergence of science in the Indian subcontinent is not new but prehistoric. It started from the very Palaeolithic and continues till date, from tool making in Palaeolithic to pottery making in mesolithic to agriculture and domesticating animals in Neolithic to metallurgy in bronze age to literature and astronomy in Vedic and later period. The process of learning and acquiring knowledge and implicating it in the practical world is age-old.

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Reference

McIntosh, J. 2008. *The ancient Indus Valley: new perspectives*.

Agrawal, D. 2000. Contributions of Science to Archaeology. *Bulletin of the Deccan College Research Institute*, *60*, 311-327.

Kenoyer, J. M. 1997. Trade and technology of the Indus Valley: new insights from Harappa, Pakistan. *World Archaeology*, *29*(2), 262-280.

Kenoyer, J.M. 1999. "Scientific and Technological Contributions of the Indus valley civilization".

Bisht, R.S. 1982. "Excavations at Banawali: 1974–77". In Possehl Gregory L. (ed.). *Harappan Civilization: A Contemporary Perspective*. New Delhi: Oxford and IBH Publishing Co. pp. 113–124.

Singh, U. 2008. *A History of Ancient and Early Medieval India*. p. 157.

Hasenpflug, R. 2006. *The Inscriptions of the Indus civilization.* Norderstedt, Germany.

Bates, J. 1986. "Approaching rice domestication in South Asia: New evidence from Indus settlements in northern India". *Journal of Archaeological Science*. 78 (22): 193–201.

Bates, J. 2016. "Rice farming in India much older than thought used as 'summer crop' by Indus civilization". Research. Retrieved 21 November 2016.

Åströms, P. 1993. *Archaeology and natural science, p. 118*. Retrieved 9 June 2011.

Hesse, R. W. & Hesse (Jr.), Rayner W. 2007. *Jewellery making Through History: An Encyclopedia*. Greenwood Publishing Group. 35.

McNeil, Ian 1990. *An encyclopedia of the history of technology*. Taylor & Francis. 852.

Rhind, J. P. and David, P. 2012. *Essential Oils: A Handbook for Aromatherapy Practice*. Singing Dragon. p. 14.

Sergent, B. 1997. *Genèse de l'Inde* (in French). Paris: Payot. p. 113.

Martin, P.N. 2017. *Transdisciplinary Journal of Engineering & Science.*

Childe,G. 1939. *Man makes himself.*

Bhattacharya, D.K. 1991. *Indian prehistory.*

Singh, B.R., Girish, N., Singh, U.K. 2012. *Science and technology in ancient Indian text.*