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Historical Background of Agriculture and Science In India

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Science is more than an accumulation of facts; it is not simply positive knowledge, but systematized positive knowledge; it is not simply unguided analysis and haphazard empiricism, but synthesis; it is not simply a passive recording, but a constructive activity (Sartor, 1975). Throughout the way of human civilization, science and society maintained a dynamic and reciprocal relationship.[1] Great cultural events happened at the same time in many parts of the World- in Greece, in Mesopotamia, in India, in Egypt and in China. Some of these events influenced directly the development of science and their impact was bound to be felt sooner or later all over the World. In the society of ancient civilizations, the nature was largely elucidated by the whims of gods or the imaginations of man. Against this setting, the earliest scientists and philosophers tried to clarify the natural world based on their observations and interpretations. Science in its modem outlook and layout was generally regarded as the contribution of seventeenth and eighteenth centuries' transformation of Europe. When the intellectuals began to divert their attention from unknown world of heavenly bodies to the world of nature around them, a momentum was set for a scientific revolution. Unlike the observations made earlier to the condemns of other worldliness, modem studies of science indulged mainly into the investigation of the natural phenomena and ways of its utilization.[2] As the science improved in the core subjects of astronomy, mathematics and physics, it moved out further to the investigation of less known disciplines of botany, geology, zoology and also agriculture. The eighteenth century may be treated as the most constructive period of modern science. Industrial revolution was the most remarkable occurrence in the eighteenth century. Natural philosophy and rational mechanics were developed to a remarkable extent in this century. By nineteenth century, Europe had made transforn1ation from a traditional empirical method to the modem approach of scientific observation and experimentation. Progress in science had brought great socio-economic changes in Europe. However, its transforn1ation did not occur in one single stage. The transformation to the scientific progress, as Butterfield described was not that "could be completed in a single stage."[3]

Scientific progress involved of effmis advanced collectively of the scientists as well as merchants, artisans, and even despotic rulers who reflected in the nature and scope of science and teleology. Constructivists attributed major role to the societal conditions in shaping the nature and scope of science and technology. 2 It is also true that science interacts with the society as much as the interaction of society with the science. According to J.D. Bernal science was an output of an organized product of industry and government. In the nineteenth century science flourished mainly in the sphere of chemistry because textile industry was the most important industry during this period. During the first phase of the nineteenth century, France took the active role in the progress of physical sciences. In the nineteenth

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century the scientific revolution took place as advance in pure knowledge was depended intimately with the industrial revolution (Schlager, 2000). The discovery and study of the polarization of light was the most remarkable events of this century. Michael Faraday, George Ohm, Hans Christian Oersted, and others studied the behavior of electricity and magnetism. In 1847, James Prescott Joule stated the law of conservation of energy. W. R. Hamilton made his noteworthy contribution in classical mechanics in this period.[4] The first research laboratories for physics were founded between 1850 and 1870. Great name such as those of W. Weber, H. V. Helmholtz, H. A. Lorentz and many others made their remarkable contribution in physics (Britannica, 1978). In 1855, Maxwell propounded the theory of electromagnetism, described by Maxwell's equation. The last phase of this century was enriched with the contribution by a number of scientists in physics. During this time, Rontgen analyzed and discovered x-ray. Becquerel discovered Radioactivity in 1896. [5]

Science and technology (S&T) has been flourishing rapidly since the last three centuries, but scientific investigation has started its journey from the dawn of civilization. Indian civilization, the most ancient civilization has a good heritage of science and technology especially in the arena of astronomy and mathematics. Indians were primarily used both mathematics and astronomy for religious purpose. Besides this, the construction of building and monuments was guided by mathematical measurements also. The Sulba-sutra-s was the earliest codified documents for the making of mathematics, especially geometry in India. The most popular researcher in the field of astronomy and mathematics was Aryabhatta. His work Aryabhatiya' is a mathematical-astronomical text with four sections. The first two sections contain mathematical interpretations in arithmetic, geometry, algebra, and trigonometry and the rest two are deals with explanation of several astronomical phenomena, like the motions of the sun, moon, and planets along with computation of the solar and lunar eclipses. A number of eminent personalities were associated with the tradition of mathematical-astronomical progress during this period is one of the earliest well known texts regarding astronomy.[6] It contains a number of trigonometric concepts. Besides it, there are a lot of astronomical texts which deals with trigonometric notion and relations, like, Varahamihira's Pancha Siddhanta, Brahmagupta's Brahma Sputa Siddhanta and Siddhanta Siromoni by Bhaskara II. Aryabhata I, Brahmagupta and Munjala propounded the concept of instantaneous motion. Mahavira discussed the operations of addition, subtraction, multiplication, and division. The Rig-Veda presents several fundamental concepts related to physical science. Gradually, the principle of five fundamental elements i.e. Prithvi (earth), ap (water), tejas (fire), vayu (air), and akasa (a non-material substances became known, as seen in the Vedic literature of around 700 BC (Johnson, 2007). Kanada was responsible for popularization of the Nyaya-Vaisesika school. The concept of five elements and a theory of atoms were advocated by Kanad and his followers. The practice of agriculture was fairly well developed in the Vedic period of ancient India. A very comprehensive treatise called Krishi-Parasara of 5th century AD gives a more or less detailed account of the art and science of agriculture in ancient India (Ray, 1951).[6] It is noted that the field of science and technology bloomed largely during the pre-Christian era in India as the Great scholars were able to go on their research work in astronomy, mathematics, medicine could function under favorable social and economic conditions and with the support of religious leaders, kings and traders. But such progressive situation in respect of science and technology came to a halt since 8th century because of disharmony between the rulers and the ruled. A notable development in astronomy, mathematics, medicine and other branches of science was noticed in medieval India. There were commercial as well as cultural relations between India and Greece and Central Asia since ancient times. With the onset of Muslims invasion in India a hybrid form of scientific and intellectual thoughts began[7]. Sen (2009) argued that with the establishment of the Ghaznavi and Mughal rule in India the Greek or rather more advanced Ptolemaic astronomy in an Arabic version reached in India and began to be

studied and taught among the Muslim and Hindu astronomers . During the early part of the Middle Ages physics was treated as a separate discipline of study. A huge number of texts were translated into different languages. Al-Baruni (973 AD) was one of the most remarkable scholars at this time, studied the original Sanskrit texts as the source Indian 67 science and translated some of them into Arabic.[8] His book Kitab-al-Hind presents precious information about astronomical methods and Indian astronomers. Arabo-Persian-Greek literature initiated a new development in astronomy in medieval India. Just after the Muslims invaders arrival, the introduction of use of astrolabes was started. Sultan Firoz Shah Tughlaq was constructed an astrolabe, known as Asturlab-i-Firoze Shahi in 1370.

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