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# A PEEP INTO THE HISTORY OF SCIENCE AND ITS DEVELOPMENT IN INDIA

(Dedicated to the memory of late Prof. D. P. Khandelwal, as an anniversary tribute)

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**ABSTRACT :**

Science and technology is an essential element for the development of society and its level of development is inter-related with the cultural evolution of society. History of evolution of science in ancient, medieval and modern period is traced and how it took roots in Indian soil.

## Introduction

The development of science started with the evolution of human species in the world. It is study of natural phenomena based on daily observation of man in and around his environment. The earlier primitive science was little different than magic. During the Greek age, Science and Philosophy were almost synonimous. Logic was introduced in science and it was classified into Physics, Chemistry and Biology. It was Greek philosopher, Aristotle, who wrote the first book 'Elemets of Physics' more that 2500 years ago. In fact, he was a tutor of Alexander the Great and accompanied him during his conquest of Asia. He has recorded his observations of flora and fauna of the countries vanquished by Alexander who could reach only Punjab. Aristotle also established first Science Academy in Athens to propagate his ideas in Europe. Geometry was highly developed as a branch of mathematics by the Egyptians as it was being used in mensuration for measurement of land. Algebra and Arithmetics was developed both by Indians and Arabs. Even Trignometry and Calculus were highly developed in ancient India and used for astronomical observations and calculations of solar and lunar eclipses. From archaeological excavations in Mexico and some other Latin American countries, it is established that Aztec and Maya civilisations were well versed in science and used a system of solar calendar. The same story is true for Assyrian and Babylonian civilizations and Indus valley civilization in India.

## Modern Era of Science

After the fall of ancient civilisations in Egypt, Greece and India, the fall of science also began. Science became subservient to religion with the spread of Christanity and during the rise of Roman Empire in Europe. This era is known as the 'Dark Age' of Science in Europe. The modern science is a by-product of reformation and renaissance movements during fifteenth century; what is known as 'Age of Reason, in Europe. There was all round development at cultural level giving birth to new art forms, poetry, architecture and science. Renaissance had its origin in Italy and it spread to whole of Europe. Copernicus, Galileo and Newton became torch bearers and founders of modern science in Europe. Modern Science had a paradigm shift from the Greek Science as it was based on both observation and experimental verification. In fact, most of the hypotheses and theories of Aristotle were proved to be wrong on the touchstone of experimental method in Science. Francis Bacon in England was a great promoter of modern scientific method. France and Germany also contributed to development of modern science immensely. There was flood of innovative ideas and a new scientific philosophy was born, which catapulted Europe as a leader of the whole world. Modern science led to industrial revolution in Europe which further led to empire building by the nascent nation states of Europe. India & whole of Asia, Africa and America was colonised by the Europeans. *The victory of*

*European nations was not due to a sueprior culture but due to a superior science and technology.*

My several visits to Central Asia and Europe convinced me that our history books need to be rewritten as they do not reveal the whole truth. When Babur conquered India in 1526 defeating Ibrahim Lodhi in the battle field of Panipat, it was through use of superior armament technology. Mongols in Samarkand, during the rule of Ulug Beg, a cousin of Babur, became world leaders in astronomy and science. Again, when the British conquered India in the battle of Plassey in 1757, it was on the sheer strength of better science and technology. How a small English nation could rule all over the world by exploiting science and technology to their advantage is well established.

## Lessons for India

Modern science known as European science took roots in India after 1850 when universities were set up at Calcutta, Bombay and Madras. The British education policy was to promote classical Indian languages and culture. It was however the wisdom of Raja Ram Mohan Roy and Sir Syed Ahmed Khan (forerunners of Indian renaissance movement) who insisted on introduction of European science and English language in Indian University set up. Towards the end of nineteenth century, European science took roots in Indian soil. Memoirs of Survey of India, Geological Survey of India and Asiatic Society of Bengal reveal the high level of Indian scientific research produced by joint collaboration of British and Indian scientists. The memoir of C. Middlemiss about 1905 Kangra Earthquake is a classic example in Seismology. Scientists in GSI, Calcutta developed sophisticated instruments for recording earthquakes. Dr. P. C. Ray and Ruchi Ram Sahni were two great science popularisers who set up their own manufacturing units also.

'Calcutta School' produced several doyens of science, viz. J.C. Bose, P.C. Ray, S.N. Bose, C.V. Raman and M.N. Saha, to name a few stalwarts who brought laurels to Indian science. During the 'golden era' of nineteen thirties, Indian science was rewarded with a Nobel Prize won by C.V. Raman Remember, Raman was for many years neither a full time professional scientist nor a Ph.D. degree holder when he won the Nobel Prize. He moved to Bangalore in 1933 and Tata Institute of Science (now called Indian Institute of Science) became centre of his scientific research. Before India gained independence, schools of physics were flourishing in Calcutta, Bangalore, Allahabad and Bombay.

Indian science got a big leap after 1947 in the Nehruvian era. A chain of scientific laboratories was created for research and development. But one big drawback of this master plan was to divorce Indian Universities from doing big science. After 50 years, we have started pondering about the decline of science in Indian schools, colleges and universities. Where did we commit the blunder ? It is obvious we starved our universities and stuffed national laboratories with talented scientists and infrastructural facilities.

It was to rectify this sorry state of affairs that the idea of Indian Association of Physics Teachers (IAPT) was concieved and propagated by late Prof. D.P. Khandelwal. I have echoed his concern in one of my articles. 'What ails Indian science and some suggested remedies' published in Current Science (Vol. 74, 1998, pp. 817-818). There is no denying the fact that if we follow the ideals of that great visionary of science in India, we can promote science at all levels in the twentyfirst century, the century of science and technology in the world.