THE STUDY OF THE SCIENCES IN ANCIENT INDIA - A BRIEF SURVEY BASED ON SANSKRIT TEXTUAL EVIDENCE

by

S Weeratunge
Department of Sanskrit, University of Kelaniya

One of the earliest of the prose Upanishads[1], the *Chhandogya*, which according to modern critics is pre-Buddhistic[2], contains an interesting passage[3] dealing with the various disciplines of study in ancient India. This is, perhaps, the earliest and also the most comprehensive list of subjects of higher studies given in any Sanskrit text. In this passage, Narada approaches Sanatkumara for metaphysical instruction and places before him an impressive list of mundane subjects he had already mastered. Among them are *Rasi (Vidya)*, (mathematics) and *Nakshatra Vidya* (astronomy). Out of these, *Rasi Vidya* came to be known as *Ganita* and an old text[4] says, "as are the crests on the heads of peacocks, as are the gems on the hoods of snakes, so is the *Ganita* at the top of the sciences known as the *Vedanga*." It must be noted that *Ganita* during this period included not only arithmetic and algebra but also astronomy. Geometry (Sulva) was also explored but it was placed in a different group of sciences known as the *Kalpa*[5], which is the name of the *Vedanga* connected with the sacrificial rites of the Vedas. The word *Sulva,* which formed the basis of a branch of literature called the Sulva Sutras dealing with the construction of the sacrifical altar, is the name given to the measuring tape used in such constructions. It is interesting to note that the technique of measuring the sacrificial altar, as prescribed in the Sulva Sutras, constitutes the first steps in the development of the science of geometry in ancient India. In geometry, a theorem which is associated in the European tradition with Pythagoras (6th century B.C.) seems to have been worked out by Bauddhayana as far back as 800 B.C.[6] Aryabhata (c.end of the 5th century), who was a pioneer in the field of algebraic studies, discovered the method of finding out the area of a triangle, a trapezium and a circle.

Algebra, the other constituent of the science of mathematics, was developed in India by the great astronomers, Aryabhata, Brahmagupta (7th century) and Bhaskara (12th century). It was Bhaskara who invented most of the algebraic symbols which were freely used in later times. These authorities discovered and used the concept of a negative quantity, without which algebra would have remained very limited in its scope. The same poetic sensibility which made an old text use the imagery of the peacock's crest in referring to the important place occupied by mathematics (referred to above) made the ancient Indian scientists resort to poetic form and concrete imagery in writing their treatises. Thus, Bhaskara, posing a problem in algebra in his *Lilavati*, says, "eight rubies, ten emeralds and a hundred pearls, which are in thy ear-ring, my beloved, were purchased by me for thee at an equal amount, and the sum of the prices of a set of the three sorts of gems was less than half a hundred; tell me the price of each, auspicious woman."[7]