BOOK REVIEW

T.A. Sarasvati Amma, *Geometry in Ancient and Medieval India*, Motilal Banarsidass, Delhi, 1979, pp.xi + 279, Rs. 60.

The present book is the Ph.D. thesis of Dr. Sarasvati Amma, prepared under the direction of the eminent Sanskrit Scholar, Dr. V. Raghavan, who has also written a preface for this book. It was intended to be the third of a series of books on Indian Mathematics. The first two *viz.*, *History of Hindu Mathematics*, vols. I and II by B.B. Dutta and A.N. Singh were, first published in 1935 and 1938 by Motilal Banarsidass, Lahore and were later reprinted by Asia Publishing House, Bombay in 1961. These books were mainly concerned with Hindu Arithmetic and Hindu Algebra. As such, the author chose Hindu Geometry for her Ph.D. thesis research.

However, subsequently to the publication of the present book, two scholarly articles on 'Hindu Geometry' and 'Hindu Astronomy' have appeared. These were originally written by B.B. Dutta and A.N. Singh and were later revised by K.S. Shukla. These have been published in *Indian Journal of History of Science*, **15**(2), 121-188, 1980 and **18**(1), 39-108, 1983 respectively. In addition, chapter III of the book *Mathematics in Ancient and Medieval India* by A.K. Bag, published by Chakhambha Orientiala, Delhi in 1979, almost simultaneously with the present book, also deals specifically with Hindu Geometry. As such, we now have a rich literature on Hindu Geometry available for all those students and teachers who may not be very familiar with Sanskrit and Prakrit. These three works become all the more valuable because these have been prepared independently.

Dr. Saraswati Amma seeks to repudiate the statement that Hindu mathematicians were mainly interested in arithmetic and algebra and their interest in geometry was marginal. In fact, their main interest was in the construction of sacrificial altars and in astronomical calculations, for both of which geometry was essential. It is true however, that Hindu mathematicians did not take any interest in the axiomatic method developed by the Greeks. They gave only heuristic proofs and these were also given only in the commentaries of the main texts.

There is some evidence of some intraction between Hindu and Greek mathematics in the development of Trigonometry, but this was mainly motivated by the needs of Astronomy. As such Hindu mathematicians completely overlooked Greek axiomatic method since it has apparently no relevance to astronomy. It is an open question as to what direction Hindu Mathematics would have taken if our mathematicians had not ignored the

powerful axiomatic method. This has relevance for the development of science in India today. Too much preoccupation with applied sciences at the cost of basic sciences may be counterproductive.

The present book contains ten chapters, a glossary of geometric terms, a bibliography, an index, and corrections covering three pages.

The first chapter gives a general survey of the development of geometry and mathematics in India. The second chapter deals with *Śulbasūtra* geometry. This was mainly motivated by geometrical problems arising from construction of altars. It deals with the theorem of the square of the diagonal, drawing the perpendicular bisector of a given line, construction of squares, rectangles, and trapezia, combination of areas and geometrical truths implied in the constructions, and properties of similar figures. Chapter III gives the contributions of Jain mathematicians to geometry. In particular it discusses the approximation $\sqrt{10}$ for π.

In the next four chapters, instead of dealing with contributions of individual mathematicians, the author has dealt with the growth of the geometry of the trapezium, the quadrilateral, the triangle, and the circle, respectively. Special attention is given to Brahmagupta and Nārāyaṇa Paṇḍita's treatments of the cyclic quadrilateral, Nilakaṇṭha's logical demonstration for the concurrence of the perpendicular bisectors of a triangle, Nārāyaṇa's treatment of the rational trapezium, derivation of the values of π by the method of exhaustion and Mādhava's discovery of the so-called Gregory series.

Chapter VIII discusses some important achievements of Kerala school of mathematics from 14th to 17th centuries A.D. These include a method of integration based on subtle geometric analysis and ingenious methods of summing up series, used to get infinite series for $\sin\theta$, $\cos\theta$ and π The methods are also successfully imployed for finding the volume and surface area of a sphere. Chapters IX and X deal with geometric algebra and shadow problems and demonstrate the interaction between algebra and geometry.

Altogether, the book is a good scholarly work which deserves to be in every school and college library and which deserves to be read carefully by mathematicians, scholars of Sanskrit and all lovers of our ancient culture. The prerequiste for understanding this book is mainly high school mathematics. It is hoped that the publishers will be encouraged to bring out a cheaper edition for interested individuals.

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