they existed and hence do not show evidence of wholesale transmission.

Lehoux has provided the most exhaustive study of parapegmata to date with an engaging discussion of the historical and intellectual implications of these sources. This work will be essential for anyone working on ancient astronomy, calendrics or related areas.

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EARLY INDIAN ASTRONOMICAL INSTRUMENTS

The Archaic and the Exotic: Studies in the History of Indian Astronomical Instruments. Sreeramula Rajeswara Sarma (Manohar, New Delhi, 2008). Pp. 319. Rs 795. ISBN 81-7304-571-2.

Although much has been written on the gigantic masonry instruments of Sawai Jai Singh, there is hardly anything comprehensive and insightful on their antecedents. The book under review rightly fills the long-felt need to have an authentic account of Indian astronomical instruments from the time of Āryabhaṭa (5th cent. A.D.) until the end of Mughal period (17th cent.). It is a formidable task to prepare such a volume, as it requires not only scholarship in Sanskrit but also a detailed survey of a wide range of material spread all over the world in libraries, museums, art galleries and private collections. Nonetheless, S. R. Sarma has been quite successful in his endeavour.

This volume is essentially a collection of papers previously published by Sarma, long-time editor of the *Indian journal of history of science*. Its title is apt — "archaic" as it describes very old instruments like the sinking bowl variety of water clock (*ghaṭī-yantra*), and "exotic" as it describes highly ornate and versatile instruments such as the astrolabe. The book consists of 15 chapters organized into four parts. The first part, beginning with a detailed account of the context in which the author undertook studies on Indian instruments, emphasizes the need for studying the instruments together with Sanskrit astronomical texts. Here, besides explaining some of the astronomical instruments described by Brahmagupta (*c.* 627 A.D.), Bhāskara II, Parameśvara and others, the author emphasizes the role played by instruments in the development of scientific thought and technology. In the chapter on perpetual motion machines, Sarma traces how ideas spread from India first to the Islamic world and then to Europe. He asks: "In today's world of narrow loyalties, one is accustomed to ask to whom the credit should go: is it due to Brahmagupta for the origin of the ideas, or to the Islamic World for its elaboration and spread, or to the Occident for its practical application?" (p. 75).

The four chapters in Part II are devoted to the bowl that sinks and tells time, a variety of water clock used in India from about the 4th cent. A.D. until perhaps 1900. Sarma describes interesting rituals associated with the setting up of this device for determining auspicious moment for weddings, etc. He concludes with a note of

caution: "Regrettably, no basins seem to be extant in which the bowl was set afloat, ... unless anthropologists and local museums systematically begin to collect artifacts of daily use like these, an important aspect of India's past will be irretrievably lost" (p. 135). This part, with extensive citations and translations from primary sources, can be heavy reading in places.

Part III, consisting of five chapters, deals with the astrolabe, that exotic instrument that seems to have been held in high esteem in all cultures from Spain to India, where it was hailed as the "King of Astronomical Instruments [*Yantrarāja*]". These chapters trace how, starting from its promotion by Sultān Firūz Shāh Tughluq around the fourteenth century, the astrolabe reached its technical as well as artistic pinnacle during the Mughal period. Technical details required for the construction of astrolabes, the families involved in producing these instruments, their patronage, use of *Kaṭapayādi* notation for marking latitude, altitude etc., are discussed at great length. Several photographs of astrolabes give readers a feel for these exquisitely crafted instruments; I only wish the publisher had included a few colour photographs!

The last two chapters, forming Part IV, discuss the transmission of the celestial globe (Sanskrit: *bhagola*; Latin: *globus coelestis*; Arabic: *al-Kura*) from the Islamic World to India. Although at the end of fifth century Āryabhaṭa speaks of a rotating (*svayaṃvaha*) globe (*gola*), globes with stars' positions marked on them seem to have been first introduced into India by Humāyūn in the mid-sixteenth century. Again Sarma emphasizes the "urgent need for locating and documenting the scientific instruments manufactured in pre-modern times in India, before such instruments are lost for ever due to our neglect" (p. 303).

Nothing short of great passion for the subject would have provided the necessary impetus for the author to gather information from so many sources — Sanskrit texts, extant astronomical instruments from all over the world, miniature paintings and so on — and to present it in so coherent and attractive a form. Sarma obviously cares for details.

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GALILEIAN SELECTIONS

The Essential Galileo. Edited and translated by Maurice A. Finocchiaro (Hackett Publishing Company, Indianapolis, 2008). Pp. x + 380. $12.95 (paperback). ISBN 978-0-87220-937-4.

In an era in which the discoveries, conjectures, strategies, and fate of Galileo Galilei seem essential to the education of scientists, social scientists, and humanists, it is a pleasure to encounter *The essential Galileo.* In this volume Maurice Finocchiaro offers a collection of the most significant texts concerning Galileo's work in astronomy and physics, his notions of methodology and of the proper relationship of scientific