

of a plurality of worlds and hypothesized the possibility of life on comets. Such philosophical discussions of comets are thought-provoking and could have been addressed more thoroughly. By confining his study to physical theories of comets, Heidarzadeh often neglects interesting social and astrological theories, many of which were entwined with the physical explanations of comets.

Heidarzadeh does a fine job of examining how theories about the natural world combined with theories about comets; however, a fuller conclusion that commented on the interaction between cometary theories and astronomical, physical, electrical, and meteorological theories would have enriched the work. Nevertheless, this book is a valuable and original addition to the literature on the history of astronomy. It provides useful images and tables and Heidarzadeh's descriptions of often complicated and technical theories are detailed and clear. His book offers an engrossing and thorough survey of the history of cometary theories that will appeal to both the specialist and to those new to the topic.

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INDIAN MATHEMATICS AND ASTRONOMY

Mathematics in India. Kim Plofker (Princeton University Press, Princeton, 2008). Pp. xii + 357. \$39.50. ISBN 978-0-691-12067-6.

This is a much needed and splendidly executed book, a history of mathematics in the Indian subcontinent that embraces the full breadth of its rich subject, tracing the evolving complex of scientific traditions in relation to their social and intellectual contexts while also providing a lucid but technically uncompromising exposition of the content of Indian scientific texts. Plofker's chronological range is immense, starting in earnest in the mid-first millennium B.C. and ending with the British colonial period. For reasons of scope and competence she draws almost entirely on source material in Sanskrit to the exclusion of most of the vernacular tradition, but she shows a secure grasp of this huge and not very accessible corpus and its modern scholarship, and her discussions of the many controversial topics are models of fairness and intellectual honesty.

Historians of astronomy have often pointed out the neglect, in many surveys and sourcebooks devoted to the history of mathematics, of mathematical methods that developed and were transmitted in astronomical contexts. To separate Indian mathematics from astronomy is particularly detrimental, since even 'pure' mathematics was intertwined with astronomy in the classification of sciences, with both subjects often treated in a single work. On the other hand it is often impossible to explain the motivation of astronomical mathematics without saying a lot about the rest of the astronomy. Greatly to her credit, Plofker takes this logic to its natural consequences, so that her book also turns out to be the best general introduction to the history of astronomy in India that we currently have. The present review is limited to this

aspect of the book.

The controversies, which mostly hinge on questions of dating and transmission, are particularly acute for the earliest stages of Indian astronomy. Plofker deftly summarizes arguments that have been used to identify precise and datable astronomical statements in the Vedas while pointing out uncertainties of interpretation and apparent conflicts in the resulting datings that argue for scepticism about whether these are legitimate ways to read the texts. On the question of whether texts of the later Vedic period reflect transmission of astronomical parameters and methods from Mesopotamia, as David Pingree maintained, she remains neutral; in the absence of indisputable evidence for transmission such as loan words or precise parameters, such hypotheses can be no more than a “coherent and plausible explanation of at least some of the features of Indian mathematical astronomy” during this time (p. 42). Turning to the medieval Siddhāntas, Plofker shares some of Pingree’s criticisms of Roger Billard’s method of dating the observational foundations of treatises to the time when the errors in their mean motions are more or less coincidentally minimal, but she also finds inadequacies in Pingree’s theory that these mean motions were derived from more precise mean motions of Greek origin. She concludes, cautiously but reasonably, that Hellenistic influences were originally very important in the formation of the mathematical astronomy of the Siddhāntas but were combined with original research in a complex way that cannot be entirely sorted out relying on our present knowledge. For anyone acquainted with the scholarly literature on these disputes, it is refreshing to read a discussion of them that keeps to the evidence, is frank about the evidence’s limitations, and eschews charges of personal incompetence or bias (a pardonable exception being John Bentley, whose early nineteenth-century anticipations of Billard are characterized as having “absurd if not somewhat deranged” motivations).

Most of the chapter in which Plofker addresses the arguments about the origins of the Siddhāntas is devoted to the more congenial business of explaining the workings of their mathematical astronomy. The coverage is, appropriately for an introductory survey, less comprehensive than Pingree’s essay in vol. xv of the original *Dictionary of scientific biography*, but much more approachable. There was enough consistency in the goals and methods of this tradition so that this chapter can serve as at least a first approximation for the technical, mathematical aspect of more than a millennium of Indian astronomy. The subject resurfaces in later chapters more episodically, in the context of the Kerala school (but the truly remarkable material there belongs to non-astronomical mathematics), the interactions between Indian and Islamic science, and the confrontation of the European and Indian traditions since the seventeenth century. Plofker closes with a reminder of how little we still know about the rationale of the exact sciences in India, and how much fundamental research remains to be done. We should look forward to this book’s eventual revised editions.