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**THE ARCHAIC AND THE EXOTIC : Studies in the History of Indian Astronomical Instruments, SREERAMULA RAJESWARA SARMA, Manohar Publishers, New Delhi.**

Dr. S. R. Sarma has written an interesting and important book that discusses the various astronomical instruments used in India in historical times.

Astronomy has been an important aspect of Indian culture right from the Vedic period and the Rgveda itself declares astronomy as a crown jewel of learning. From then to the Siddhantic period, astronomy makes a steady and systematic progress in India, supported by myths, observations and knowledge gained from other fields. The Siddhantic period is famous for its meticulous astronomical calculations and prediction of astronomical events.

However, one of the dark corners in our understanding of the history of the growth of astronomy in India has been our lack of clarity on the manner in which astronomical data was received and recorded. We are not

clear how they measured equinoxes, stellar coordinates and the rise and setting time of sun, moon and stars. In fact even the nature and accuracy of measuring time are not clear. We have few records of actual astronomical observations that must have been used in creating the knowledge about astronomy.

Through this well designed, short book, Dr. S. R. Sarma has tried to fill this gap in our knowledge. He has discussed various astronomical and time-keeping instruments used by Indians in pre-Siddhantic and Siddhantic period. Dr. Sarma is a very distinguished scholar and has spent several decades studying this subject and his scholarship is clearly revealed in this highly readable book. The book throws light on the astronomical and time-keeping instruments, their origin, their accuracy and their modification. In the first chapter, several of his earlier published papers are reproduced in part that put the entire problem in perspective. They illuminate the reader on the present knowledge of this subject and put it in the context of general intellectual enquiry and astronomical needs. Discussions on various astronomical instruments in detail in later chapters then allow the reader to explore the working and importance of various instruments. This adds significant information to the earlier chapter which outlines the historical growth. Hence depending on the choice of the reader, he or she may get a quick idea about the historical growth without being cluttered with details of individual instruments while a more serious reader may get details of the working of each instrument against the historical perspective to obtain detailed information on this interesting subject.

The book is therefore an important source of basic information on the astronomical and time-keeping instrumentation. Its style is lucid and provides a wealth of related information of great interest and value to the readers. It also has many little bits of information scattered all over the book which provide interesting insights into the subject. His promised large volume with details of instrumentations of 26 different categories (listed on page 27 of the book) only whets the appetite of the reader.

However, the picture that emerges from the book is a disappointing one. As pointed out by the author himself, while on one side Indians toyed with such complex ideas as perpetual motion machines which had deep impact on science across the world and especially in China and Europe, they seem to have completely ignored instrumentation for astronomical observations (page 56). Indeed, to highlight this contrast Dr. Sarma has even dedicated a chapter to the design and idea of perpetual motion machine and its impact on the scientific world. Why this should be so, continues to be a mystery. It seems

that the Indian astronomers never went beyond a gnomon and a water clock for their observations. This contempt for observations may well have arisen from a great confidence in the older method of observation and the unchanging nature of the sky that the later observers did not find it necessary to observe again, except for the most rudimentary checks. Even the use of complex astronomical instruments such as the astrolabe for navigation seems to have been ignored. The only exception to this seems to have been the Mughal kings who had several astrolabes made in Urdu and Sanskrit and several of their instruments find place in the miniatures painted during that period. Indeed, it is only the reemphasis on observations by Raja Jai Singh at the Jantar Mantar that this state of mind changed. Yet, Indians were aware of complex and useful instruments. Several Arab instruments like the astrolabe and the celestial globe were indigenised and rewritten in Sanskrit even if some of the commentaries are too cryptic to reveal the manner of their use.

The book highlights these issues, sometimes with explicit discussions and sometimes in a more subtle manner as when he points out that the water clocks had a whole series of limitations and accuracy problem but the astronomers of that period seem to have done precious little to improve their technology. This disdain of technology and instrumentation over pure abstract theoretical work has been the bane of Indian science for a long time and the present work provides an excellent starting point to look for answers to such puzzles. His complete catalogue therefore will be eagerly awaited by serious workers in the field.

However, one point on which this book disappoints is that there is no discussion on the astronomical instruments used by mariners. We know that the maritime traditions in India are rich and at least from 14<sup>th</sup> century onwards, there is verifiable data on the tools used by the mariners in the west and south coasts of India. The instruments they used for navigation also had strong links to astronomy and a chapter on them would have given a more complete history of India's astronomical tradition.

In spite of this limitation, I would strongly recommend this book to any person even peripherally interested in the history of astronomical instruments in India. It is an excellent point for general readers and interested researchers to begin their enquiry and we must thank Dr. Sarma for this excellent and balanced book.

*Mayank Vahia*