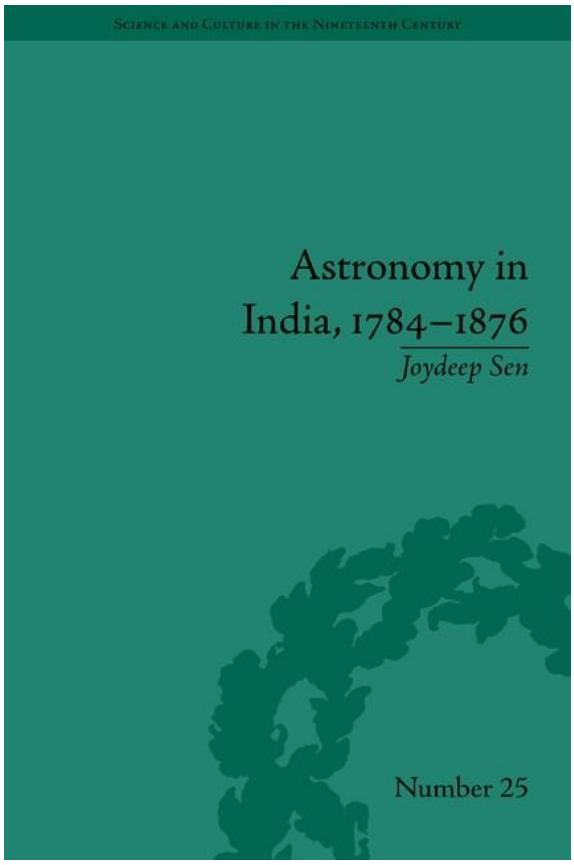
BOOK REVIEWS

***Astronomy in India 1784–1876,* by Joydeep Sen. (Pickering and Chatto, London, 2014; Science and Culture in the Nineteenth Century Number 25). Pp. xiii + 268. ISBN 9781781440780, 16 × 24 cm, UK 60 pounds.**

Indian science experienced a major renaissance with the arrival of the British in the late eighteenth century. Till then, astronomy in India was largely restricted to either computational astronomy of Solar System bodies or stars and corrections in the computational tables based on direct observations. The biggest advancement till then had been to build large observatories



called Jantar Mantar to measure the locations of stars. Maharaja Jai Singh II of Jaipur constructed five Jantar Mantars in total, in New Delhi, Jaipur, Ujjain, Mathura and Varanasi; they were completed between 1724 and 1735. However, before they could be fruitfully used, telescopes arrived and these made the Jantar Mantars superfluous.

Although the first known astronomical use of the telescope in India occurred in 1618 (see Kapoor, 2016), telescopic astronomy only flourished with the 1761 and 1769 transits of Venus (Kapoor, 2013). At that time the value of the Astronomical Unit and the relative distances between the Earth, Venus and the Sun were not known with great accuracy. High precision measurements of the exact start and end times of the transits would provide valuable measurements of these parameters. Hence observing the transits was of great scientific importance. Neither of the transits would have been visible in Europe but they would have been easily visible from southern India. During that period the British and the French had colonies in India and both were in competition. Hence the transit observations were driven both by the needs of science and by political competition.

The 1761 transit was widely observed from India, but in 1769 the monsoon restricted observations to just a few centres. However, these transits proved a boon for Indian astronomy with the arrival of new modern observational instruments and techniques.

Soon after that, the British decided to undertake the Great Triangulation Survey of the Indian subcontinent and for that they needed accurate determination of longitudes of various places. This heralded the establishment of astronomical observatories, starting with one in Chennai. The roles of these observatories were later expanded to include solar observations and the creation of sky charts. The Madras Observatory was eventually shifted to Kodaikanal and is still operational today, but with new and improved instrumentation. These observatories have been credited with several insightful observations. For example, the British astronomer John Evershed first observed the radial motions in sunspots known today as the Evershed Effect from the Kodaikanal Solar Observatory. These activities also resulted in the spread of observational, and in particular telescopic, astronomy to colleges in India and played an important role in the evolution of a scientific approach to nature in the subcontinent.

Joydeep Sen's book on *Astronomy in India, 1784–1876* meticulously records the British contribution to this development as understood from British archives. The book is detailed and provides numerous quotes and references from documents of this period.

However, this book evolved out of Dr Sen's Ph.D. thesis, and this limitation shows up in the book. The treatment of the pre-1784 period in India is sketchy and taken from a handful of European and American scholars. Many of these references are incomplete and do not do justice to the quality of the observational astronomy that was being carried out in India at that time. For example, while the author seems to be aware of the *Indian Journal of History of Science*, no attempt has been made to summarise papers published in that journal from time to time about astronomy of the period. Similarly the research of Indian scholars such as

Rajesh Kochhar who have extensively documented the period in a systematic, objective and scholarly manner (e.g. see Kochhar, 1985a; 1985b; 1989; 1991a; 1991b; 1991c; 1993; 2002) finds no mention in the book. Similarly, the seminal research of British astronomers who worked to document Indian astronomical practices of the period (e.g. Kaye, 1998) also does not find an important place in the book.

In summary, the book would have been far more potent if it had discussed in detail issues such as the dramatic impact of the arrival of European astronomers in India, and the cultural conflict that followed the arrival of telescopes (a point that is mentioned more in passing). The language and content of the book are more focused on bringing out the contents of individual communications rather than the exciting impact of these developments on Indian science. The book therefore provides valuable insights into the exact dynamics of the evolution of telescopic astronomy in the subcontinent, but it does not document its impact in India, which was very significant. However, within the limited focus of documenting the debates and discussions in Britain about supporting astronomy in India the book does provide valuable research material.

References

Kapoor, R.C., 2013. Indian astronomy and the transits of Venus. 1: The early observations. *Journal of Astronomical History and Heritage*, 16, 269–286.

Kapoor, R., 2016. Nūr ud-Dīn Jahāngīr and Father Kirwitzer: the independent discovery of the Great Comets of November 1618 and the first astronomical use of the telescope in India. *Journal of Astronomical History and Heritage,* 19, 264–297.

Kaye, G.R., 1998. *Hindu Astronomy*. Memoirs of the Archaeological Survey of India, No 18 (reprint of the 1924 original).

Kochhar, R.K., 1985a. Madras Observatory: The beginning. *Bulletin of the Astronomical Society of India*, 13, 162–168.

Kochhar, R.K., 1985b. Madras Observatory – buildings and instruments. *Bulletin of the Astronomical Society of India*, 13, 287–302.

Kochhar, R.K., 1991a. Astronomy in British India: science in the service of the state. *Current Science*, 60, 120–129.

Kochhar, R.K., 1991b. French astronomers in India during 17–19 centuries. *Journal of the British Astronomical Association*, 101, 95–100.

Kochhar, R.K., 1991c. Growth of modern astronomy in India 1651–1960. *Vistas in Astronomy*, 34, 69–105.

Kochhar, R.K., 1993. Historical perspective. In Kochhar, R.K., and Narlikar, J. (eds.). *Astronomy in India: Past, Present and Future*. Pune, IUCAA. Pp. 1–42.

Kochhar, R.K., 2002. Madras and Kodaikanal observatories: a brief history. *Resonance*, 7, 16–28.

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***Wolf Telescopes: A Collection of Historical Telescopes*, by Edward D. Wolf. (Trumansburg NY, printed for the author, 2016). Pp. 365. ISBN 978-0-9980037-1-9 (hard-back), 222 × 287 mm, US$125 (plus shippping). Place orders through www. wolftelescopes.com. An earlier soft-cover edition also is available, at US$85 (plus postage & packing).**

Historic astronomical telescopes can be found in long-established observatories, because that is where they were used, and in public museums. An example is the National Museum of Scotland in Edinburgh, which holds dozens of instruments with Scottish connections and earlier this year held an exhibition “Reflecting Telescopes” highlighting the work of James Gregory and James Short. But private individuals also collect telescopes, often in conjunction with other scientific instruments, or books. Charles Frank and his son Arthur in Glasgow come to mind, as do Robert B. Ariail in the United States and Peter Louwman in The Netherlands.

To this list must be added the name of Edward D. Wolf, Emeritus Professor at Cornell, who after a doctorate in physical chemistry followed a career in industry and academia. Since the beginning of the millennium, he has amassed a collection of 111 telescopes, or an average of a new one every six weeks. Most of them are astronomical, though some are terrestrial or marine, and there is a handful of binoculars and surveying instruments.

The principal feature of the collection is its rich variety. It boasts telescopes from many of the famous French, American, English and German makers, such as Adams, Bardou, Alvan Clark, Dollond, Grubb Parsons, Lemaire, Lerebours & Secretan and successors, Mailhat, Merz, Nairne, Negretti & Zambra, Passemant, Plössl, Ramsden, Short, Steinheil, Troughton & Simms, Utzschneider & Fraunhofer, and Zeiss. In total, some seventy makers from eight countries are represented, including instruments from five different centuries if you accept that one beautiful Japanese spyglass might just date from as early as 1690. Most, however, date from the eighteenth and nineteenth centuries.

In choosing telescopes, Wolf favoured those that retained their associated accessories, such as multiple eyepieces, filters, micrometers, dust caps, storage boxes, tripods, etc. This is valuable, because over time accessories have often been lost, or in the case of boxes, discarded. Many instruments are rare. As an example, I would cite Foucault-Secretan silvered-glass reflecting telescopes. Only a few hundred would appear to have been made, yet the Wolf collection includes three, and they were of great service in my recent study of these instruments (Tobin, 2016). As a practical matter, the coll-