The Circulation of Astronomical Knowledge in the Ancient World by John M. Steele

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In April 2014, John Steele invited leading scholars of the ancient astral sciences to Brown University for a conference entitled 'The Circulation of Astronomical Knowledge in the Ancient World'. The result is this edited collection, which presents technical studies in the circulation of astronomical and astrological knowledge in and between the ancient Egyptian, Greek, Indian, and, especially, Mesopotamian and Chinese traditions. The chapters are of high quality and will no doubt become essential reading for specialists in these individual areas.

Steele's introductory chapter is short. He offers only one paragraph on the theme of the text before discussing the contributions of the individual chapters, and so the reader might wish that he had offered more on what broader conclusions are to be drawn from the amalgamation of these chapters. Yet, in that single paragraph Steele makes clear a historiographical point significant to the volume. He explains his deliberate use of the term 'circulation', as opposed to 'transmission', and he notes that the transfer of knowledge is not a unidirectional process. Astronomical knowledge is not imposed on one group by another but instead entails a process of negotiation between groups. Reception involves adaptation—making the knowledge relevant to and compatible with the existing scholarly practices of the recipients. On this point, Steele cites Jamil Ragep, Sally Ragep, and Steven Livesey's *Tradition, Transmission, Transformation* [1996]. In this way, Steele signals that he is developing the historiographical approach of Ragep, Ragep, and Livesey in the specific domain of the ancient astral sciences.

Although it stands apart from the chapters that follow, Francesca Rochberg's 'The Brown School of the History of Science: Historiography and the Astral Sciences' is a welcome contribution to the volume. It could have been a dry

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biography of the forefathers of our discipline, but instead the chapter examines and evaluates the historical approaches of Otto Neugebauer and David Pingree during their time in Brown's Department of the History of Mathematics. Rochberg illuminates Neugebauer's role in disabusing contemporary scholars of the belief that science started with the Greeks. She draws our attention to how Neugebauer and the Brown School more broadly brought to light scientific sources outside of the Greek corpus and paved the way for our understanding of the complexities of the Hellenistic world, including the Babylonian, Egyptian, and Indian astral sciences. This volume, with its attention on the technical aspects of ancient astronomy and astrology, extends the program established by Neugebauer.

With regard to Pingree, Rochberg illuminates his focus on the context of science. She quotes Pingree:

> One of the most significant things one learns from the study of the exact sciences as practiced in a number of ancient and medieval societies is that, while science has always traveled from one culture to another, each culture before the modern period approached the sciences it received in its own unique way and transformed them into forms compatible with its own modes of thought. Science is a product of culture; it is not a single, unified entity. [11]

This book continues Pingree's approach. The chapters analyze the reception and transformation of astronomical knowledge circulated between and within cultures, between scholars in disparate cities, between 'elite' and 'popular' astronomical traditions, between different genres of scholarship, and between practitioners of earlier and later time periods.

Several chapters examine the adaptation of knowledge appropriated from another culture. Alexander Jones, in 'Interpolated Observations and Historical Observational Records in Ptolemy's Astronomy', analyzes how Ptolemy interpolated observations from a set of actual observations and how he used and modified observational reports, including Babylonian observations of lunar eclipses and planetary positions. Jones concludes that Ptolemy had limited and indirect access to historical observation records, which rendered them problematic for the interpolation of observations. In particular, the historical observations available to him could not have supplied a record of greatest elongations of the inferior planets adequate for his purposes in the *Almagest*. Zoë Misiewicz's 'Mesopotamian Lunar Omens in Justinian's Constantinople', which derives from her dissertation research at the Institute for the Study of

the Ancient World, addresses John Lydus' appropriation of omen-literature descending from the Mesopotamian tradition. Misiewicz argues that Lydus did not have direct access to cuneiform texts or a scholar trained in reading cuneiform; rather, he participated in a shared tradition, where concepts that arose in Mesopotamian omens were adapted to disparate scholarly contexts.

Shenmi Song's and Weixing Niu's 'The Twelve Signs of the Zodiac during the Tang and Song Dynasties: A Set of Signs Which Lost Their Meanings within Chinese Horoscopic Astrology' and 'On the Dunhuang Manuscript P.4071: A Case Study on the Sinicization of Western Horoscope in Late 10th Century China', respectively, examine the Chinese adaptation of Indian astrology. While most scholars examining the 12 zodiacal signs in China have focused their discussion on Chinese star maps, in comparison with their counterparts in ancient Greece and India, Song explores the 12 signs of the zodiac in several sources—Chinese Buddhist scriptures, Taoist scriptures, horoscopic/astrological books, and Dunhuang manuscripts—and shows how this initially foreign astrological concept developed through the Chinese tradition into a mature divinatory system. Niu focuses on Dunhuang Manuscript P.4071, a detailed natal horoscope chart which, Niu argues, demonstrates the sinicization of western horoscopy.

In 'Were Planetary Models of Ancient India Strongly Influenced by Greek Astronomy?', Dennis Duke argues that the lack of any evidence from Indian texts of knowledge of the equant, the geometrical basis of the equant, or the analytical skills to approximate the equant with the four-step method indicates that the four-step method was derived outside of India, most likely in the Greco-Roman empire.

Several of the chapters examine the circulation of astronomical and astrological knowledge within single cultures. These especially include the chapters on the Mesopotamian world, such as John Steele's 'The Circulation of Astronomical Knowledge between Babylon and Uruk', in which he argues that Uruk scribes promoted their self-identity through a process of 'Urukization'. They received astronomical knowledge from Babylon, where the various schemes of mathematical astronomy were developed according to Steele, and attempted to make this knowledge their own. John Z. Wee, in his 90-page 'Virtual Moons over Babylonia: The Calendar Text System, Its Micro-Zodiac of 13, and the Making of Medical Zodiology', discusses the complex interactions of Calendar Texts, related cuneiform astrological tablets, and select

astrological and medical features. In 'On the Concomitancy of the Seemingly Incommensurable, or Why Egyptian Astral Tradition Needs to be Analyzed within Its Cultural Context', Joachim Freidrich Quack argues, as the title suggests, for the place of the Egyptian in the study of Greco-Roman Egypt and calls for the examination of Egyptian-language astral texts, a program which Andreas Winkler carries out in 'Some Astrologers and Their Handbooks in Demotic Egyptian'.

The individual chapters, of which there are even more than I have mentioned here, are excellent technical and contextual studies of the ancient exact sciences. To make the chapters on Mesopotamia more accessible to the non-specialist, I would have recommended including maps; and to make Clemency Montelle's 'The *Anaphoricus* of Hypsicles of Alexandria' more convenient for the specialist, I would have included not just the translation of the *Anaphoricus* but also the original Greek. I also would have liked to have seen a list of short biographies of the contributing authors to give some context to their contributions.

Finally, I note that Brill is offering review copies first in digital format rather than hard copy. Although having PDF files of books has proved useful in my scholarship, reading and annotating a nearly 600-page book on a screen is difficult and does not allow for the easy flipping through of a book, where one has a structural memory of where the previous sections are located. Studies on how we navigate various types of text have shown that we have more control over a material book than an ebook, and, for me at least, the hard copy provides the sort of manipulability conducive to writing a review. Furthermore, since many scholars have access to PDF files of Brill books through their university libraries, it would be a shame if we do not receive something additional and tangible in recognition of the work that we contribute in reviewing books.

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