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Computational Astronomy in the Middle Ages: Sets of Astronomical Tables in Latin by José Chabás

Madrid: Consejo Superior de Investigaciones Cientificar, 2019. ISBN 978–84–00–10558–7. Cloth €44.00

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Astronomical tablets have been a major focus of study by historians of science since the middle of the 20th century. Building upon the pioneering work of E. S. Kennedy, O. Neugebauer, and others, recent scholars have applied a range of techniques drawn from the exact sciences (e.g., computer-aided statistical analysis of tabular data to uncover the mathematical functions underlying a table's construction), cognitive studies (e.g., examination of how practitioners use a table and what makes a table user-friendly or not), and manuscript studies (e.g., studies of tabular layout and visual clues to the use of tables, such as the presence of color as an indicator or specific final digits to numbers in the column of a table that indicate the nature of the table) to answer questions about the construction, use, and transmission of astronomical tables and the astronomical knowledge that they incorporate. For the past 20 years or so, José Chabás, often working in collaboration with B. R. Goldstein, has been at the forefront of work on early European astronomical tables.

The book under review represents a digest of Chabás' work on medieval Latin astronomical tables. This period begins with the first set of astronomical tables constructed in Europe—the Toledan Tables—and ends around the year 1500 with some of the last astronomical tables built before the new astronomy of Copernicus' *De revolutionibus*. The aim of the book is to provide a survey of astronomical tables over this period. As the author notes, the book complements E. S. Kennedy's *Survey of Islamic Astronomical*

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Tables [1956], which was the first attempt to provide a detailed account of the content of *zīj*es.[1] It also complements the recent study of astronomical tables in India by Montelle and Plofker [2018] and the ongoing work of the ALFA project on Alfonsine astronomy at the Paris Observatory run by Matthieu Husson, José Chabás, and Richard Kremer.

Chabás begins with a brief survey of the three principal sources on which all pre-Copernican sets of astronomical tables in Latin rely to greater or lesser extents: the tables in Ptolemy's *Almagest* and *Handy Tables*; the *zīj al-Sindhind* of al-Khwārizmi and its later revision by Maslama al-Majrīṭī, which was twice subsequently translated into Latin; and the *Ṣābi' zīj* of al-Battānī. As Chabás discusses, European table makers drew on these sources for the general structure and for much of the specific content of their tables. Over time, new innovations in the formatting of tables were developed that made calculation easier, and refinements were occasionally made to the parameters underlying certain tables.

The main body of Chabás' book is a detailed account of all known sets of tables. For each set of tables, Chabás first gives a short discussion of its author (if known), the date and place of construction (again, if known), and the relationship of the tables to other sets of tables. Following this introductory material, Chabás presents a detailed summary of the content of the tables, going through each table in turn and explaining its underlying parameters, their source, and the table's method of presentation. Finally, Chabás presents a bibliographical summary of the surviving manuscripts, modern editions, and studies of the set of tables. These accounts are detailed and, as far as I can tell, accurate and, as such, provide exactly what is needed as a starting point for other scholars working on this material.

The book is divided into three parts: pre-Alfonsine tables, early Alfonsine tables, and later tables. The pre-Alfonsine tables include the Toledan Tables and their derivatives, as well as tables by Ibn al-Kammād and some other sets. A key feature of all these tables is their reliance on Islamic sources: the *zīj*es of al-Khwārizmī and al-Battānī. Indeed, the Toledan Tables themselves were constructed by Muslim astronomers in al-Andalus and they were originally written in Arabic and set out for the Islamic calendar, although only Latin translations of the tables are preserved. The Toledan Tables were widely used throughout Europe, and derivatives of them were eventually translated into other languages, including Castilian, Greek, French, and even Arabic.

[1] See also the update to Kennedy's study in King, Samsó, and Goldstein 2001.

The construction of the Alfonsine tables marked a significant shift in European table making. These tables were commissioned by Alfonso X (1221–1284) of Castile and León and constructed by two Jewish scholars, Judah ben Moses ha-Cohen and Isaac ben Sid. Their tables are not preserved, but their "canons" (explanations of how to use the tables), which were written in Castilian, are. The Castilian Alfonsine tables reached Paris in the early 14th century, where they were translated into Latin. Several Parisian scholars wrote canons for the tables and adapted the format and content of the tables. Thus, as Chabás demonstrates, we cannot speak of "the Alfonsine tables" but instead of several sets of tables and canons in the Alfonsine tradition. Like the Toledan Tables, the Alfonsine tables quickly became popular throughout Europe and were translated into several languages, including English, and adapted to the local geographical meridian.

From the late 14th century to the end of the 15th century, further—and in some cases more radical—modifications to the Alfonsine tables were made by astronomers across Europe. These modifications included innovative layouts to simplify calculation or to make the process more efficient, as well as changes in the numerical parameters underlying the tables. Particularly significant are Giovanni Bianchini's *Tabulae astronomiae*, which are purely Alfonsine in their content but very original in their presentation, and Regiomontanus' *Tabulae directionum*, a set of tables on spherical trigonometry geared toward solving various problems in the calculation of astronomical data needed for casting a horoscope.

The book itself is handsomely produced, with several color photographs of manuscripts containing tables, nicely formatted and easily readable text, and even detailed indexes. In particular, the index of numerical parameters will be extremely useful for identifying newly discovered sets of tables. I noticed only a handful of trivial typographical errors, none of which affect the readability of the text. Furthermore, the book sells for a very reasonable price. All of this makes Chabás' book an essential reference for the history of astronomy in Europe from the 12th through the 15th centuries and for the history of astronomical tables (and, indeed, for the history of mathematical tables more generally).

BIBLIOGRAPHY

Kennedy, E. S. 1956. *A Survey of Islamic Astronomical Tables*. Philadelphia.

King, D. A.; J. Samsó; and B. R. Goldstein. 2001. "Astronomical Handbooks and Tables from the Islamic World (750–1900): An Interim Report". *Suhayl* 2: 9–105.

Montelle, C. and K. Plofker. 2018. *Sanskrit Astronomical Tables*. New York.