Las tablas alfonsíes de Toledo by José Chabás and Bernard R. Goldstein

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The first rigorous analysis of the origins and transmission of the Alfonsine astronomical corpus was published in English by José Chabás and Bernard R. Goldstein in 2003. The core of their book was the edition with commentary of the 'canons', or instructions for use, of a set of astronomical tables composed in Toledo during the mid 13th century by two Jewish astronomers, Isaac ben Sid and Juda ben Moshe ha-Cohen, working under the patronage of Alfonso X, king of Castile (1221–1284). These canons and tables came to be called (too simplistically as the authors prove) 'Alfonsine Tables'. For reasons well developed by Chabás and Goldstein, this work was fundamental for the history of Latin medieval astronomy in Western Europe. Together with other scientific works produced under Alfonso, it was also fundamental for the development of Spanish as a scientific language. As it happens though, the transmission of this work was precarious: the tables themselves are not preserved and the canons are extant in a single manuscript, nowadays kept in the Madrid National Library under number 3306. The manuscript is a 16th-century copy that gathers several astronomical treatises in Latin and Spanish, the Alfonsine canons among them.

There were very good reasons for publishing these canons. In the first place, the only previous edition was a very bad one, published in the 19th century by a Spanish doctor and professor of physics, Manuel Rico y Sinobas [see 1863–1867]. Rico, who was a cultivated man with a strong interest in archaeology and history of science, was nevertheless not instructed in the basic rules of paleographic transcription. His poor edition, fairly criticized by Chabás and Goldstein, is regrettable also because the manuscript, already badly preserved

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when he read it, suffered further damage afterwards. Had Rico been more accurate, he could have transmitted to posterity much more of the text than we possess today. Thus, Chabás and Goldstein aimed to improve on Rico's edition as much as possible, given the current state of the source materials. Next, another aim of their earlier edition was to place the Alfonsine canons into their proper scientific and historical framework. The editors traced the origins of the canons back to the Toledan and Andalusian context of early medieval astronomy written in Arabic and Hebrew; and their careful research follows the threads that link these tables to subsequent Latin astronomy as was practiced first in Paris and then in the rest of Europe from the beginning of the 14th century until the Copernican revolution.

Both of the editors' objectives were fully achieved, as one would expect considering the deep knowledge and abundant research already published by Chabás and Goldstein in the history of Hebrew, Arabic, Spanish, and Latin astronomy in medieval times. The edition of the Spanish canons is flanked by a glossary of the Spanish scientific terminology used in it, an astronomical comment to each canon, an investigation of the scientific and historical context of the Toledan Alfonsine Tables, and a study of their dissemination into Latin scientific production in Europe.

Several years later, the editors decided to re-publish their book, this time in its Spanish translation. I have no doubt that this decision is mainly due to the linguistic sensitivity of one of the editors, José Chabás, a Catalan native speaker who spent some years of his life as a professional Spanish translator for the European Union administration. This might seem a surprising decision against the background of the predominantly English-speaking environment of current research into the history of medieval science. But it is no less surprising than the decision of King Alfonso himself, who deliberately and for the first time promoted scientific production in Spanish within a then dominant context of either Arabic or Latin science.

The goal of disseminating the history of science in the original language is equally shared by the publisher of this book. The Diputación Provincial is a public authority administering the Province of Toledo. One of its aims is cultural promotion, including publication of studies and research on local literary works. In the case of Toledo, the Diputación has inevitably produced a huge number of historical publications, as befits the major role of Toledo in the history

of medieval Spain. The cultural life of the city in medieval centuries was unparalleled both under the culturally refined Muslim period and then under Christian times, when it became the main city of the Kingdom of Castile and León, and the only city to gather a sufficient number of scientific books and highly educated men of Muslim, Jewish, and Christian persuasion. Thus, it was only natural that the idea of publishing a Spanish translation of Chabás and Goldstein 2003 on the Toledan Alfonsine Tables immediately attracted the interest of the publishing services of the Toledan Diputación.

The Madrid manuscript was copied for a scholar of astronomy (perhaps Francisco de Morales himself, the clerk who signed the Spanish translation of John of Saxony's canons in the same book?) no earlier than the 16th century—Chabás and Goldstein rightly correct the date of catalogs in the 15th century. The date of the canons in the text is 'in the first decade of the fourth centennial of the second millennium of the Era of Caesar', i.e., between 1301 and 1310. This means that the drafting of the canons is to be dated between AD 1263 and 1272, as the Era of Caesar, which was predominantly used in medieval Spain, started 38 years before Christ. They were composed for tables starting 10 years earlier, in 1252, the year of Alfonso's coronation. The copyist was a professional scribe and clearly not an astronomer, as he makes mistakes in the transcription of technical terms that no astronomer would make, such as writing 'opinion' instead of 'oposicion'. The transcription of the Spanish text by Chabás and Goldstein, without being purely philological, is nevertheless a very accurate work. It is especially praiseworthy not only because it has been done not only from a badly preserved manuscript, but also because, since this manuscript is a *unicum*, it is not possible to collate it against copies in other manuscripts, which is always a useful tool for an editor.

The glossary is exhaustive and especially useful for those of us used to the astronomical Latin terminology but not to these then-newly created Spanish terms. However, it lacks an explanation for some of the terms included such as 'arco de la vista', 'arco del ponimiento', and 'echamiento de los rayos', whose meaning in explained only in the astronomical commentary in chapter 4. Some others might have been added as well, e.g., 'padron' (the starting value in a calculation [canon 51]) and 'planetas de suso' meaning 'superior

planets' [canon 27:19]. An explanatory note for some terms incomprehensible nowadays to Spanish speakers such as 'sobrehas/sobrehaz' ('surface') might have been added too. But these are petty details when confronted with an impressive number of more than 300 terms.

The glossary also has an important bonus: it has been compared with four other astronomical texts written in Spanish in the Alfonsine *milieu*, two of them by Isaac ben Sid himself: the *Tratado del quadrante sennero*, Azarquiel's *Almanac*, the translation of al-Battani's *zīj* (attributed to Isaac ben Sid without further explanation [245]); and the *Lapidario*.[1] In this way, the lexical coherence of the Alfonsine canons *vis-à-vis* contemporary works, and thus the pertinence of their attribution to that same *milieu*, is demonstrated. The rigorous approach of the authors in entering the territory of comparative lexicography is again to be praised.

This book is not just a translation of the first English version. It adds some information here and there that reflects the continued work of the authors on the history of Alfonsine astronomy. Thus, we find in the Spanish version that the chapter on John of Vimond's tables is more detailed than in the English version, and that further information on the tables for the mean movements of the inferior planets has been added. The research on Vimond's work is a fascinating one, as the book illustrates. His tables have 10 March 1320 as starting date (which means that the composition of the tables themselves was probably done later, as was usually the case). He seems to have worked in parallel with the well known Parisian astronomers who disseminated their own versions of the Alfonsine Tables (the so-called Parisian Alfonsine Tables): John of Lignères, John of Murs, and John of Saxony. The relation between the astronomical productions of these men is far from clear. Vimond seems to take in an intermediate position between Azarquiel, Castilian Alfonsine astronomy, and the Parisian version: his model for precession and trepidation is close to the Parisian Tables but, like the Castilian ones, his mean motions are sidereal; his table for planetary equations adds a column for planetary velocities that seems to match the description of the Castilian canons; his tables for planetary latitudes of inferior

[1] The first three works are kept in a single manuscript, Paris, Bibl. de l'Arsenal 8322. The fourth one is preserved in El Escorial, Bibl. del Monasterio, h–I–15.

planets add a third column that has its only precedent in canon 22 of the Toledan Alfonsine Tables; and, as in the Toledan Tables based on Azarquiel, he accepts the existence of proper movements for the apogees of the Sun and the planets. On the other side, his list of stars shows a precession of 17;52°, which does not match the Parisian catalog. Chabás and Goldstein clearly reject the total precession of 17;8° as the standard value for the Alfonsine star list and affirm that, contrary to what has always been said, there is no homogeneity in the star catalogs that can be found in the Alfonsine corpus.

The Parisian tables present mean movements in sexagesimal days, signs of 60°, a new model for trepidation, and tropical mean motions. By contrast, the Toledan Alfonsine tables use sidereal mean motions presented in *anni collecti* at 20-year intervals, and signs of 30°. It is not easy to understand how the Parisian tables could have been influenced by the Toledan ones; but the authors prove that an undeniable link exists, based on some shared characteristics: 1252, the year of Alfonso's coronation, as starting era; Toledo as meridian of reference; the presence of several calendar tables for the calculation of different eras; a value of 2;10° as maximum solar correction; and no proper movements for the apogees of the Sun and the planets.

To demarcate the exact perimeter of a set of medieval astronomical tables is usually a frustrating exercise, and the Alfonsine Tables are no exception. The complexity of manuscript traditions and permanent 'contamination' of sources is a reality that all scholars dealing with medieval astronomy have to accept. Being well aware of this, Chabás and Goldstein have already introduced in the English version of this book a terminological and conceptual distinction between 'Toledan (or Castilian) Alfonsine Tables' and 'Parisian (or Latin) Alfonsine Tables' that tries to identify general trends or groups within a specific kind of astronomical practice. The basis for this distinction relies on issues such as the tables' layout, their underlying parameters and models, and the internal coherence between tables and canons. On a higher level, they speak of an 'Alfonsine corpus' that comprises 'the totality of the astronomical works that ultimately derive from Alfonso's court' [2003, 6]. In this way they put forward a different and certainly more honest approach to the question, and issue a general warning against any attempt to identify tables and authors through categorical affiliations.

Introducing such conceptual distinction is one of the major aims of this book, and we think that it is a successful one. But beyond that, the work of Chabás and Goldstein provides excellent scientific value, especially in two remarkable chapters: the astronomical commentary in chapter 4 and the chapter dealing with the legacy of Alfonsine astronomy. They are a fine example of scholarly work both on the mathematical and the historical side. The history of astronomy has gained a contribution that will be difficult to surpass.

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