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Πτολεμαίου Πρόχειροι Κανόνες. *Les «Tables Faciles» de Ptolémée: 1a. Tables A1–A2. Introduction, édition critique* by Anne Tihon

Πτολεμαίου Πρόχειροι Κανόνες. *Ptolemy's Handy Tables: 1b. Tables A1–A2. Transcription and Commentary* by Raymond Mercier

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Ptolemy's *Handy Tables* contain a set of astronomical tables intended to provide numerical solutions to the astronomy-related problems known at his time (second century AD) and a text explaining their use. In fact, it is the first known set of tables for this purpose ever compiled, inaugurating a genre that was mostly followed by Arabic astronomers in the handbooks called *zijes*. Ptolemy composed the *Handy Tables* after the completion of his *Almagest*, a major mathematical text also including tables which was the culmination of the astronomy developed by his predecessors. The *Handy Tables*, which are largely based on the models and tables in the *Almagest*, can be considered an updated version of it. In general terms, the driving force in the transition from the *Almagest* to the *Handy Tables* seems to have been that of providing tools to facilitate computation by offering new tables on certain topics (e.g., the equation of time) and newly presented tables on others (e.g., right ascension), by reducing an unnecessarily high number of sexagesimal digits in other tables (e.g., mean motions), by enlarging the number of entries in still others to simplify interpolation (e.g., planetary equations), and by defining a new epoch for timekeeping. Ptolemy succeeded in making the *Handy Tables* more user-friendly than the tables in the *Almagest* and they became a model for medieval astronomers to imitate.

The *Handy Tables* circulated extensively in Antiquity and the Middle Ages, directly or through commentaries, according to the number of fragments in papyri and manuscripts preserved (more than 45). The most widely diffused commentaries were those by Theon of Alexandria (fourth century), who

commented on the *Handy Tables* twice, producing a *Great Commentary* [see Mogenet and Tihon 1985, Tihon 1991, and Tihon 1999] and a *Little Commentary* [see Tihon 1978]. The tables themselves were first edited in 1822 by N.-B. Halma, and then transcribed and analyzed by W. D. Stahlman in 1960.

As indicated by Anne Tihon and Raymond Mercier, the critical edition of Ptolemy's *Handy Tables* and the mathematical analysis of their contents is a large, and long awaited, project for which six volumes are planned. The first volume is presented here in two parts (called volumes 1a and 1b). This is not a jointly authored work, for Tihon takes care of the philological part [vol. 1a] and Mercier is responsible for the mathematical part [vol. 1b]. As a result, we are given two lists of references, two indexes, two lists of manuscripts and papyri, and two tables of contents. Two authors and four languages, as Tihon points out in the general preface: Greek (Ptolemy's), Latin (critical apparatus), French (Tihon's text), and English (Mercier's text). But there is more to it because in volume 1b we also find here and there pieces in Assyrian script [1b.55], Ethiopic [1b.75], Hebrew [1b.77], Syriac [1b.180], and Arabic [1b.192–194]. This has certainly required a complex process of typesetting and a considerable editorial effort, resulting in a superb edition; and thus it is only regrettable that some of the mathematical data and formulae are not properly presented [see, e.g., appendix G in vol. 1b].

In addition, Paolo La Spisa is responsible for a short paleographic note on an Arabic palimpsest in annex V of vol. 1a.

The scope of Ptolemy's *Handy Tables* is defined in volume 1a. It consists of 22 tables, of which 20 are astronomical, one geographical, and one chronological. That is, only the tables explicitly given in Ptolemy's text are considered to be authentic [1a.11–12], although other tables associated with the *Handy Tables* are presented in this volume. Volumes 1a and 1b deal with two astronomical tables for right and oblique ascension for the seven climates (Meroe, Syene, Lower Egypt, Rhodes, Hellespont, Mid Pontus, and Borysthenes). They also include the edition of a table for the oblique ascension of Byzantium, not belonging to the original *Handy Tables* but usually found among them and probably compiled in the seventh century [1a.9]. The other volumes planned in this project, numbered from 2 to 6, will be devoted to the tables for the two luminaries, planetary tables, star catalogues, a translation of Ptolemy's text, and an account of the manuscript tradition, respectively.

An accurate edition of the tables for right and oblique ascensions fill in most of volume 1a and exhibits the highest level of scholarship. The principle used for the edition consists in reproducing faithfully the tables found in one carefully chosen manuscript (Florence, Biblioteca Medicea Laurenziana, MS 28/26), and presenting all variants found in other manuscripts and papyri [1a.55]. This principle definitely seems the most reasonable and respectful option for transcribing astronomical tables.

Volume 1b gives a transcription of the three tables considered here, that is, right ascension, oblique ascension for the seven climates, and oblique ascension for Byzantium. In a few cases, we are also given additional data 'whenever any entry [in the table] departs from the correct calculated value' [1b.9], where 'correct calculated value' probably refers to values recomputed with modern means. Then follows an in-depth commentary in six chapters. Most interesting is the chapter devoted to chronology, where we find among other topics a large amount of information on the eras of Nabonassar and Philip, the death of Alexander, the regnal years of Alexander the Great and his successors, and the Seleucid era. The crucial point is the fact that in the *Handy Tables* Ptolemy uses as epoch the era of Philip (noon, –323 November 12) and not the era of Nabonassar (noon, –746 February 26), as he did in the *Almagest*.

Even more remarkable is the reconstruction of the working methods used by the 'calculator of column 3', as Mercier calls the author, to compute the entries of the equation of time. This is done by means of a very detailed analysis consisting in making various assumptions for the quantities and computing methods involved, up to 180 different combinations. Mercier argues convincingly that, in order to produce the entries displayed for the equation of time (not tabulated in the *Almagest*), the value for the tropically fixed solar apogee was taken to be  $66^\circ$  rather than  $65;30^\circ$ , which is the explicit value in the *Almagest* [see, e.g., 3.7]; and that the underlying values for the right ascension were derived by ordinary linear interpolation from those already found in the *Almagest*.

The other chapters and appendices contain insightful comments on oblique ascensions, the calculation of horoscopes, the textual tradition of the *Almagest* and the *Handy Tables*, and the derivation of modern formulas in relation to the tables analyzed in this volume.

As mentioned above, volumes 1a and 1b are the first installment of the complete edition of Ptolemy's *Handy Tables*. The two volumes presented by Tihon and Mercier set a very demanding standard for the rest of the work: a most respectful principle for editing astronomical tables, an insightful method of analysis of their contents, and an outstanding level of scholarship. When finished, this long-range project is certainly going to become a major contribution to the history of ancient astronomy.

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