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The Arabic tradition of Euclid's *Elements* preserved in the Latin translation by Adelard of Bath and the Hebrew translation by Rabbi Jacob

Ofer Elior

The Program for History and Philosophy of Science, The Hebrew University of Jerusalem, Mount Scopus, Jerusalem 91905, Israel

Abstract

The present paper offers a detailed study of the textual differences between two medieval traditions of Euclid's *Elements*: the tradition transmitted in most of the extant Arabic manuscripts of the work, and the tradition preserved in the Latin translation commonly ascribed to Adelard of Bath and a Hebrew translation ascribed to "Rabbi Jacob". The principal aim is to identify types of differences in the structure and the formulation of Book I. In conclusion, the question is raised whether this typology reflects the procedures employed by al-Ḥajjāj ibn Yūsuf ibn Maṭar in revising his translation.

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1. Introduction

More than twenty Arabic manuscripts of Euclid's *Elements* are extant.¹ Unfortunately, the information they convey about the Arabic transmission of this work leaves much to be desired. First and foremost, the manuscripts allow but a glimpse into the history of the two main branches of the primary Arabic transmission, namely the so-called Ishāq/Thābit-tradition and the Ḥajjāj-tradition.² Indeed, most of these manuscripts transmit a single version of the *Elements* that is currently believed to be a revision made by

E-mail address: ofer.elior@gmail.com.

¹ For a list of Arabic manuscripts of the *Elements*, see [Lo Bello \(2003b, xii–xxix\)](#). This list should be complemented with two manuscripts discovered recently by De Young. On the latter, see [De Young \(2015\)](#).

² For a detailed summary of modern research on the medieval, mainly Arabic transmission of the *Elements* see [Brentjes \(2001\)](#).

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Thābit ibn Qurra (d. 901) of a translation from the Greek produced during the last third of the ninth century by Ishāq ibn Hunayn (d. 910/1). However, no manuscript exemplar of Ishāq’s original translation is extant. Of the texts constituting the Ḥajjāj-tradition, the Greek–Arabic translation of the *Elements* (completed before 805), made by al-Ḥajjāj ibn Yūsuf ibn Maṭar (fl. 786–833), is also thought to be lost; and of the revision made by al-Ḥajjāj of his translation (about 833?) only fragments are extant.³ In addition, although scholars found hints that Arabic traditions of the *Elements* other than these might have existed,⁴ it is impossible to rely exclusively on the extant Arabic manuscripts as a source in learning about such traditions. In this state of affairs other sources such as bio-bibliographic texts,⁵ the secondary Arabic transmission (epitomes, commentaries, and so forth) as well as non-Arabic versions of the *Elements* based on Arabic versions assume a crucial relevance in uncovering the Arabic textual tradition of Euclid’s *magnum opus*.⁶

With the purpose of contributing to the understanding of the medieval transmission of the *Elements*, I offer here a detailed study of the textual differences between the tradition of the *Elements* transmitted in the majority of Arabic manuscripts and the Arabic tradition preserved in two medieval translations of the work – one Latin and one Hebrew – and based to some extent on the Ḥajjāj-tradition. My study focuses on differences in the structure and the formulation of Book I. I have examined whether these differences are arbitrary or whether it is possible to trace systematization in them. The research confirmed the latter alternative. The principal aim of this paper is to identify the types of differences. In conclusion the question is raised whether the identified typology may reflect the procedures employed by al-Ḥajjāj in revising his translation.

2. The examined traditions, the scope of the research, and primary sources used

The research whose results are the focus of this paper systematically examined the differences between two Arabic traditions of the *Elements*, and checked whether it is possible to identify in them types of differences. One tradition is transmitted in most of the extant Arabic manuscripts of the work, namely Thābit’s revision of Ishāq’s translation – I will henceforth refer to this version as **IT**. The other tradition is preserved in two medieval translations of the *Elements*. One translation, ascribed to Adelard of Bath (fl. 1116–1142), was made from an Arabic translation, and henceforth referred to as **A**.⁷ It has long been observed that **A** is based on a tradition different from **IT**, and that it shows similarities to extant Euclidean texts considered to belong to the Ḥajjāj-tradition.⁸ The same was found concerning the other translation, an Arabic–Hebrew translation preserved in several manuscripts, ascribed in some of them to a scholar by the

³ The primary “reference texts for the Ḥajjāj tradition” are listed in Brentjes (1996, 206), and in De Young (2016, 3–5). See also Brentjes (2006). For many years, scholars assumed that a great part of al-Ḥajjāj’s revision (Books I–VI and the definitions of Book VII) is identical to or at least can be reliably reconstructed on the basis of the *lemmata* included in the commentary on the *Elements* by Abū’l-‘Abbās al-Faḍl ibn Ḥātim al-Nairīzī (d. ca. 922). However, in 1980 John Engroff showed that this assumption is untenable and, by the beginning of the 1990s his conclusion was endorsed. See Engroff (1980, 13–20). And cf. Brentjes (1996, 42); De Young (2003, 127). For al-Nairīzī’s commentary see Besthorn and Heiberg (1897). For an English translation see Lo Bello (2003a).

⁴ See e.g. Rashed (1993, 52–53).

⁵ Many sources of this kind pertaining to the medieval transmission of the *Elements* in Arabic are presented and discussed in Djebbar (1996, 92–98).

⁶ See Brentjes (1996). See also Brentjes (2001).

⁷ A critical edition of this translation was produced by Busard (1983).

⁸ See Brentjes (2006, 188–189; 2001, 42) and the studies listed there as well as Lo Bello (2003a, 34–38). Examining recent evidence concerning the Ḥajjāj-tradition, De Young (2016, 12) concluded that this evidence “frequently” confirms that **A** “was based on one or more manuscripts containing the version of al-Ḥajjāj.”

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