Menso Folkerts, ***Die älteste lateinische Schrift über das indische Rechnen nach al-Ḫwārizmī. Ed., Übersetzung und Kommentar, unter Mitarbeit von Paul Kunitsch.*** **München (Verlag d. bayerischen Akademie der Wissenschaften) 1997. pp. 213 + 16 Tafeln mit Facsimilen. (Bayer. Akad. d. Wiss. Phil.-hist. Kl. Abh. NF, 113).**

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Until recently, al-Khwārizmī's treatise on "Hindu reckoning" was only known through one incomplete manuscript ("**C**") of the Latin translation *Dixit Algorismus* (henceforth **DA**), published and translated repeatedly since 1857 – most recently, together with the relevant parts of some other twelfth-century treatises that are derived from it, by André Allard (Muḥammad ibn Mūsā al-Khwārizmī, *"Le Calcul indien"* (*Algorismus*). Histoire des textes, édition critique, traduction et commentaire des plus anciennes versions latines remaniées du XII^e siècle. Paris / Namur, 1992). The Arabic original has not yet been locateed, but a few years ago Menso Folkerts found another, complete manuscript of the Latin translation ("**N**").

Chapters 4–5 of the volume under review contains an edition and German translation of this new manuscript, in parallel with a corrected edition of **C** (the manuscripts turn out to represent differently altered versions, for which reason a unified critical text cannot be established). Chapter 1 discusses early Indian and Arabic texts on the topic, while Chapter 2 describes early Latin "algorisms", and Chapter 3 al-Khwārizmī's other works. Chapter 6 is a thorough critical commentary to the text, comparing also constantly to the other texts published by Allard (and to the early Arabic texts, 1–2 centuries younger than al-Khwārizmī's work). Chapter 7 contains the author's conclusions from the analysis. Beyond this, the volume contains *inter alia* an extensive English summary; a Latin glossary of all mathematical terms together with the fixed German translation that is used for each, and in as far as possible with the corresponding Arabic term as known from the other treatises; a reverse Arabic glossary; and a photographic reproduction of **N**. Everything is done with great care. Not only making obsolete everything that was said until now about **DA**, Folkerts' volume will also be a compulsory companion to Allard's edition of the derived texts.

Among the convincing conclusions that are drawn, three may be emphasized:

(i) **N** is, in general but not always, more faithful to the original translation than **C**. This original will have been fairly literal; although its vocabulary is Latin, many of its phrase structures are recognizably Arabic.

(ii) The texts – both the Latin translation and the Arabic original – are witnesses of phases where the topic was not yet fully digested; at times the explanations are so concise that they become opaque, at times they are unnecessary long and repetitive; examples, when present, are not always worked out in adequate detail; terminology is still descriptive, not technical. Slightly later texts in both Arabic and Latin are much more pedagogical. Folkerts is probably right in ascribing the virtual disappearance of **DA** to this fact – as it is also likely to explain the disappearance of the Arabic original.

(iii) Sexagesimal fractions are much more important that ordinary fractions; this confirms that astronomical rather than everyday computation was the reason for the introduction of the new numerals in ninth-century Baghdād (as also in the Latin university environment).

As observed by Folkerts, the character of the translation excludes that Hermann of Carinthia could be translator. Though with some apparent reluctance he accepts the assertion of Juškevič that a quotation from a-Khwārizmī's *Algebra* be so similar to Gerard of Cremona's translation that Gerard or somebody close to him could be the translator; in the reviewer's opinion the similarities do not exceed what could be expected from two independent literal translations of the same Arabic phrase; since the well-informed list of Gerard's translations does not include anything like DA, this hypothesis is probably to be rejected (DA also conserves the religious introduction, which Gerard eliminates from the *Algebra*). This, however, only strengthens Folkerts conclusion on this question: apart from fair certainty that the translation belongs to the twelfth century and high probability that it was made in Spain we know nothing.

One point in al-Khwārizmī's text which was lacking in **C** and hence not known before the publication of **N** is an explanation that al-Khwārizmī himself has devised the method to increase the precision of square-root calculations by adding zeroes. This is important for two reasons: (i) it demonstrates that Jordanus of Nemore (who ascribes this particular trick to al-Khwārizmī) knew DA and not only the derived treatises; (ii) it is very similar to the explanation given by al-Khwārizmī in the algebra that he had tried to make graphic proofs for the addition of trinomials (but failed), and hence allows us to assume that passages where such declarations are absent explain borrowed (but digested) material – things which he "has found", in another phrase that recurs in both works.

All in all, Folkerts has produced a fine edition of a text of no slight importance for our understanding of Medieval Latin and Arabic mathematics.

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