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The algebraic content of Bento Fernandes's Tratado da arte de arismetica (1555). (English)

Fernandes's Tratado from 1555 is the earliest printed arithmetic in Portuguese containing a treatment of algebra, appearing at a moment when rumours about Nuñez algebra were already circulating in Europe although this work (written in Castilian) was only to appear in print in 1567 in Antwerpen. Nuñez was explicitly familiar with Pacioli's Summa, and it has been claimed that even Fernandes's algebra built on Pacioli.

Maria do Céu Silva analyses Fernandes's treatise and shows that Pacioli plays no role at all (and, without saying so, that the scholar who claimed the connection cannot have opened both books). Her article contains a detailed analysis of the algebraic part (including a few problems solved by means of algebra before the systematic presentation of the technique), in particular of a group of false rules for the solution for higher-degree equations. Examination of the appearance of the same false rules in a number of Italian abbacus manuscripts from the 14th and 15th centuries (some published, some unpublished) allows her to demonstrate that Fernandes shares sources with these. On one point, however, Fernandes is shown to go beyond what is known from Italy: whereas Italian abbacus algebra always, when finding a solution containing radicals, leaves these as they are, Fernandes' finds an approximation. On another point, Fernandes appears to refer to an otherwise undocumented Iberian tradition: his name for the discipline is *zibra moqavel*, which cannot come from Italian but must reflect an Iberian pronunciation of *al-jabr [wa'l] muqabalah* (*b* becoming *v*).

An appendix contains the statements of all Fernandes's algebraic problems with English translations.

The reviewer has one objection to this very interesting and informative paper. In the likeness of a handful of Italian abbacus books, Fernandes first has a sequence of rules for the multiplication of algebraic powers ("multipricando huna cousa per houna cousa faz hun çenço"/"multiplying a thing by a thing makes a *censo* [*thing*^{2}]", etc.), followed immediately by strange rules "partindo numero per cousa vem numero"/"dividing a number by thing comes number", "partindo numero per çenso vem raiz"/"[by] dividing thing by *censo* comes root", etc.

Silva understands, for instance, the last statement as an expression of the rule $ax^2 = b \Rightarrow x = \sqrt{\frac{b}{a}}$, which certainly is mathematically correct but does not agree with Fernandes's words; Silva does not quote Fernandes's rule for this algebraic case, but it will have been something like "when the censi are equal to the number, you have to divide the number by the *censi* [NB, plural], and the root of that which results will be worth the thing" that is, quite different. Moreover, an Italian manuscript (Vatican, Vat. lat. 10488, fol. 30r) repairs one rule which had become corrupt in transmission (and is also

corrupt in Fernando's *Tratado*) in a way that shows its author to understand the strange rules straightforwardly as dealing with the quotient between algebraic powers (where resulting negative powers are then represented by roots, and $thing^{-1}$ by "number").

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