A dialogue on the use of arithmetic in geometry: Van Ceulen's and Snellius's *Fundamenta Arithmetica et Geometrica*

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Abstract

Snellius's *Fundamenta Arithmetica et Geometrica* (1615) is much more than a Latin translation of Ludolph van Ceulen's *Arithmetische en Geometrische Fondamenten*. Willebrord Snellius both adapted and commented on the Dutch original in his *Fundamenta*, and thus his Latin version can be read as a dialogue between representatives of two different approaches to mathematics in the early modern period: Snellius's humanist approach and Van Ceulen's practitioner's approach. This article considers the relationship between the Dutch and Latin versions of the text and, in particular, puts some of their statements on the use of numbers in geometry under the microscope. In addition, Snellius's use of the *Fundamenta* as an instrument to further his career is explained.
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Uittreksel

Snellius' *Fundamenta Arithmetica et Geometrica* (1615) is veel meer dan de Latijnse vertaling van Ludolph van Ceulens *Arithmetische en Geometrische Fondamenten*. Omdat Willebrord Snellius de Nederlandse versie aanpaste en becommentarieerde in de *Fundamenta*, kan deze Latijnse editie gelezen worden als een dialoog tussen twee verschillende benaderingen van wiskunde in de vroeg-moderne tijd: Snellius' humanistische aanpak en Van Ceulens rekenmeestersaanpak. In het bijzonder legt dit artikel sommige van hun uitspraken over het gebruik van getallen in de meetkunde onder de loep. Bovendien wordt Snellius' gebruik van de *Fundamenta* als een instrument om zijn carrière te bevorderen uitgelegd.
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1. Introduction

1.1. A dialogue

The *Fundamenta Arithmetica et Geometrica* ("Arithmetical and Geometrical Foundations"), Willebrord Snellius's translation and adaptation of a vernacular text by Ludolph van Ceulen, is a fundamental work for better understanding several problems in early modern mathematics. It acquaints us with some of the obstacles that mathematicians at the time experienced in the application of arithmetical concepts in geometry, tells us how some of them tried to reconcile different mathematical traditions in a fruitful way, and shows how difficult it was to obtain a position in which a mathematician could actually do mathematics.

Neither the *Fundamenta* nor its Dutch counterpart, the *Arithmetische en Geometrische Fondamenten*, has received much attention in scholarship. In this article, I will present them as stores of rich material that deserve more attention. The *Fundamenta* is not just a translation; it is a reworking of the Dutch original with many additions by Snellius. The differences between the two books make them function as a dialogue between Snellius and the by then dead Van Ceulen about several fundamental issues in mathematics at the time.

The organization of this article is as follows: first the principal persons involved in the rest of the story will be briefly introduced; then the publication process of the *Fundamenta* will be sketched. In Section 3 the Dutch and Latin versions will be compared. The next two sections focus on two programmatic parts of the *Fundamenta*: Section 4 analyses in detail Snellius's dedication letter, a rich rhetorical piece containing, in a nutshell, his philosophy of mathematics, and Section 5 discusses Van Ceulen's introduction of the four elementary operations to line segment–number pairs and Snellius's reaction to it.

The present article is an abridged and somewhat modified version of a part of my Ph.D. thesis [de Wreede, 2007], to which I refer for the discussion of more examples of the dialogue Van Ceulen–Snellius.

1.2. The actors

Both the *Fundamenta* and the *Fondamenten* appeared in 1615. By that time Willebrord Snellius (1580–1626) was an extraordinary professor (*extraordinarius*) of the mathematical sciences at Leiden University, the bulwark of late humanist scholarship. After an extensive *peregrinatio academica*, he stayed in Leiden to assist his father, Rudolph Snellius, in his teaching activities. Rudolph Snellius (1546–1613) had been the first professor of the mathematical sciences at Leiden University. He was the most fervent Dutch adherent of the contested work of Petrus Ramus, the 16th-century reformer of the school curriculum. Unlike Willebrord, Rudolph was no specialist in mathematics, which is clearly shown in his works, mainly adaptations of and commentaries on the work of Ramus and his circle. By 1615, Willebrord had already shown some achievements in mathematics: among other things, he had reconstructed two lost works of Apollonius of Perga, translated Simon Stevin's voluminous *Wisconstige Gedachtenissen* into Latin, and written a commentary on Ramus's *Arithmetica*. His more original works would appear in the next decade.

As well as from his father, Willebrord received his scientific and scholarly education from two other key figures from the Leiden scene: Ludolph van Ceulen and Josephus Justus Scaliger. Van Ceulen (1540–1610) was a professor at the Leiden engineering school, where mathematics for practical purposes was taught in the vernacular. However, his mathe-