Available online at www.sciencedirect.com
ScienceDirect
Historia Mathematica 37 (2010) 345–375
HISTORIA MATHEMATICA
www.elsevier.com/locate/yhmat

The scholar and the fencing master: The exchanges between Joseph Justus Scaliger and Ludolph van Ceulen on the circle quadrature (1594–1596)

Jan P. Hogendijk

Department of Mathematics, University of Utrecht, P.O. Box 80.010, 3508 TA Utrecht, Netherlands

Abstract

In Chapter 21 of Vanden Circkel (On the Circle) [Van Ceulen, 1596], the arithmetic teacher and fencing master Ludolph van Ceulen published his analysis of 16 propositions which had been submitted to him by an anonymous "highly learned man". In this paper, the author of the propositions will be identified as the classicist and humanist Joseph Justus Scaliger (1540–1609), who lived in the city of Leiden, just like Van Ceulen. The whole Chapter 21 of Van Ceulen's Vanden Circkel turns out to be a criticism of Scaliger's Cyclometrica (1594), a work which includes a false circle quadrature and many other incorrect theorems. The exchanges between Van Ceulen and Scaliger are analyzed in this paper and related to difference in social status and to different approaches to mathematics.

Samenvatting

In Hoofdstuk 21 van *Vanden Circkel* publiceerde de reken- en schermmeester Ludolph van Ceulen zijn analyses van 16 proposities die aan hem waren gestuurd door een anonieme "hooggeleerde." In dit artikel wordt de auteur ervan geïdentificeerd als de classicus en humanist Joseph Justus Scaliger (1540–1609), die net als Van Ceulen in Leiden woonde. Het blijkt dat het hele hoofdstuk 21 van *Vanden Circkel* een systematische kritiek is op de *Cyclometrica* van Scaliger van 1594, een werk waarin een foute cirkelkwadratuur en andere onjuiste meetkundige stellingen voorkomen. De uitwisseling tussen Van Ceulen en Scaliger worden in dit artikel geanalyseerd en in verband gebracht met verschil in maatschappelijke status en verschillende opvattingen over wiskunde.

MSC: 01A40

Keywords: Scaliger; Ludolph Van Ceulen; circle quadrature; Adriaan Van Roomen; Andreas Helmreich

E-mail address: J.P.Hogendijk@uu.nl

0315-0860/$ - see front matter © 2010 Elsevier Inc. All rights reserved.
doi:10.1016/j.hm.2010.03.004

1. Introduction

Joseph Justus Scaliger (1540–1609) was a famous classicist and humanist. Although mathematics was not his main area of expertise, he announced around 1590 that he had solved the three famous problems of ancient Greek mathematics, namely the circle quadrature, the trisection of the angle, and the construction of two mean proportionals [Grafton, 1993, 380–384]. In the summer of 1593 he was hired by the University of Leiden, where his *Cyclometrica Elementa* [Elements of Circle Measurement] appeared in June 1594. The work was lavishly produced. The definitions and theorems are in ancient Greek with Latin translation, and the proofs are in Latin. The chapter titles, page headers, and geometrical figures are printed in red, as well as all letters in the Latin text indicating points in the figures. The *Cyclometrica Elementa* consists of two books, and will henceforth be abbreviated as *Cyclometrica*. In Book 1, Scaliger "shows" that the square of the circumference of the circle is ten times the square of the diameter (i.e., $\pi = \sqrt{10}$). In Book 2, he "proves" that the area of a circle is $1\frac{1}{5}$ times the area of the inscribed regular hexagon (i.e., $\pi = \frac{9}{5}\sqrt{3}$). Scaliger does not accept the relationship between the circumference and area of a circle, which had been proved by Archimedes, and which can be expressed in modern terms as follows: surface area (πr^2) is radius times half circumference $(r \cdot \pi r)$. Archimedes proved this relationship by reductio ad absurdum, but Scaliger warns against the corrupting influence of this method of reasoning on young people [Scaliger, 1594b, 11; Grafton, 1993, 382]. It was not a problem for Scaliger that his circle rectification was inconsistent with the Archimedean limits $3\frac{10}{71} < \pi < 3\frac{1}{7}$. Scaliger states that his own quadrature of the circle is done in a geometrical way and according to scientific method, and not done in a tyrannical way as was that by Archimedes [Scaliger, 1594b, 15; Goulding, 2005, 251].

Scaliger's pompous *Cyclometrica* did not fail to make a big impression on many scholars, as appears from his extant correspondence between 1594 and 1596.[1] Only a few experts in mathematics realized that Scaliger's work was mathematically very incorrect. Three such experts were Francois Viète (1540–1603), Adriaan van Roomen (1561–1615), and Ludolph van Ceulen (1540–1610). At the time when Scaliger published his *Cyclometrica*, Viète worked as a diplomat at the court of King Henri IV in Tours [Hofmann, 1970, xvii–xiv], and Van Roomen was professor of medicine in Würzburg [Busard, 1975]. Van Ceulen, who did not have academic training, worked as an arithmetic teacher and fencing master in the city of Leiden since 1593 [Katscher, 1971]. All three of them had determined π to many decimal places: Viète printed 10 decimals in 1593 [Viète, 1646, 392]; Van Roomen gave 14 decimals, also in 1593 [Busard, 1975]; and Van Ceulen published 20 decimals in his work *Vanden Circkel* [Van Ceulen, 1596]. Van Roomen and Van Ceulen were close friends and maintained an intensive correspondence.

Later in 1594, Viète printed his *Defense against the New Cyclometrica, or Anti-axe* [Viète, 1594]. Viète did not mention Scaliger explicitly but the *Defense* was full of humoristic insults. The title is a pun on Scaliger's newly introduced technical term *axe*, that is, the area contained inside the concave arcs *GC* and *GD* and the convex arc *CD* in Fig. 1. Van Roomen corresponded with Scaliger about the errors in the *Cyclometrica*, but when Scaliger remained unconvinced, Van Roomen printed a refutation in the form of dialogues [Van Roomen, 1597]. Hitherto, historians have assumed that Van Ceulen could not afford to

[1] I thank Dr. Dirk van Miert for showing me his edition of the Scaliger correspondence, which he and Dr Paul Botley prepared at the Warburg Institute, London, and which will appear in 2011 as *The Correspondence of Joseph Justus Scaliger*, 7 vols., Droz, Geneva.