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The Norse Treatise Algorismus preserved in manuscript GKS 1812 4to

Abstract

The thirteenth century treatise *Algorismus* is preserved in four manuscripts, written in the Norse language, spoken in Iceland and Norway in the Middle Ages. The four manuscripts are AM 544 4to, AM 685 4to, and AM 736 III 4to (a fragment), all three preserved in Copenhagen, and GKS 1812 4to, preserved in Reykjavík. *Algorismus* was first published in a scientific edition 1892–1896 by Finnur Jónsson. Otto B. Bekken and Marit Christoffersen (1985) translated *Algorismus* into modern Norwegian in 1985 and explained its text. Kristín Bjarnadóttir (2004; 2007, pp. 43–47) has explained the content of *Algorismus* in English and in modern Icelandic.

Algorismus is a complete prose translation of the Latin hexameter *Carmen de Algorismo* (Steele, 1988) by the French canon Alexander de Villa-Dei, on Hindu-Arabic numeration and calculation methods, dated in 1202. The poem and the treatise introduce the Hindu-Arabic number notation to Europeans and the treatise to Icelanders and Norwegians in particular. Finnur Jónsson (1892–1896) suggested that the translation of *Carmen de Algorismo* may have been made before 1270, and Helgi Guðmundsson (1967) has suggested that *Algorismus* existed in the Viðey monastery off Reykjavík at the proposed writing time 1306–1308 of the version of *Algorismus* in AM 544 4to, *Hauksbók*.

In this presentation, the focus will be on the version of *Algorismus,* presented in the manuscript GKS 1812 4to on sheets 13 verto to 16 verto. We shall explore incidences where *Algorismus* deviates from *Carmen de Algorismo*, and compare the four extant manuscripts of *Algorismus* numerically. The *Carmen de Algorismo* is a hexameter, a poem, to be recited verbally. There are no numerical symbols in the text except in its beginning where the ten digits are presented. Zero is mentioned for the first time in European text in *Carmen*. In the continuation, *Carmen* only uses words to signify numbers. The same is mainly done in the manuscript GKS 1812 4to, while the manuscript AM 544 4to, which is closest to it in age, switches often to Roman numeration, possibly to save space on the precious vellum. The younger manuscript, AM 685 4to, uses more often Hindu Arabic numeration. In this respect, the version of *Algorismus* in GKS 1812 is closest to *Carmen*.

The texts of *Algorismus* are differently long in the four manuscripts, longest in GKS 1812 4to but the AM 544 4to is close to it. The GKS 1812, 4to has 2986 words and 15174 characters while the AM 544 4to, a fragment, has 2960 words and 15110 characters. A numerical method was used to compare the four manuscripts, comparable to methods that have been used extensively in comparative linguistics and in gene and protein comparison. *Mismatches* between the manuscripts were counted and classified into three distinct classes; *Single character mismatches*, *word reorders* and *word mismatches*. A phylogenetic tree with distances similar to the distances in the distance matrix was constructed (Zmasek & Eddy, 2001). The phylogeny may be interpreted such that the manuscript AM 544, 4to, contains the most original copy of the treatise, and that the copy in GKS 1812 4to is closest to it. The copies in the manuscripts AM 736 III 4to, and

AM 685 4to, are partly drawn from the same stem, but are further from the origin.

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