# THE RECEPTION OF NATURAL SCIENCE IN 13TH CENTURY ICELAND: A COMMENTARY ON GML. KGL. SML. 1812, 4TO. A REPORT ON WORK IN PROGRESS.

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## 1.

To talk of natural science in the Middle ages is somewhat anachronistic, as there was no such term before the 17th century.

However, this does not mean that Medieval scholars were not interested in natural science, but rather that they classified it somewhat differently. There were at least three philosophical categories into which the study of natural science was divided:

a) The *quadrivium*, i.e., those subjects of the Seven Liberal Arts (*septem artes liberales*) which dealt predominantly with numbers, and to a lesser extent with language. These were astronomy, arithmetics, geometry, and music. As far as any aspect of nature could be reduced to mathematical or geometrical problems, it would be included in the *quadrivium* and hence had a place in university curricula.

As the whole world was thought to be sphere-shaped, various monographs appeared under the title of *De sphaera*, all of them dealing with a variety of subjects ranging from basic geometry to astronomy, geography and optics, and most of these were text books for teaching at the basic level at universities.

b) The *artes mechanicae* or mechanical arts. These developed during the Middle ages as the practical counterpart to the theoretical subjects taught at the universities. They dealt with practical technical problems of everyday life and were normally neglected, if not despised, by scholars. Among the *artes mechanicae* medicine and veterinary medicine, horticulture, building techniques, mining and mineralology, map-making and navigation would be included among many others. These subjects only produced their own literature towards the later Middle ages, and these texts were normally written in the vernacular, as the knowledge contained in the texts was usually of a practical nature and had to be understood outside monasteries and universities.

c) Descriptive natural science contained in encyclopedic texts.

Most major Medieval encyclopedias, trying as they were to collect and organize the total knowledge of their times, contained not only sections on astronomy and geography, but also on mineralology, zoology, botany and what went for climatology,

normally included in the treatment of the four elements, earth, water, air and fire. The greater part of the encyclopedias of the 12th and 13th centuries relied heavily on the Etymologiae, compiled by Isidor of Seville early in the 7th century, although the allegorical "Marriage between Philology and Mercury" by Martianus Capella, dating from the 5th century, and Pliny's "Natural history" were also exploited regularly, as well as any suitable scholarly texts from antiquity or the early Middle ages.

2.

The textual tradition of Medieval scientific manuscripts does not always clearly reflect those different origins, as cross fertilization was common. Practical knowledge was occasionally included in scholarly texts, and practical handbooks tried to boost their prestige by including passages from, or at least authors and titles of, scholarly works. Encyclopedias increasingly tried to exploit every obtainable text, although practical knowledge did not normally play a significant part in them.

It is therefore extremely difficult to group or classify Medieval manuscripts containing texts from the natural sciences. Roughly, one may distinguish between:

*Florilegia* or *Collectanea*, which only contain extracts and short quotations from other texts, either collecting them under certain subject headings, or more normally simply in the order in which the author found them during his studies of manuscripts.

Miscellanies, which include either complete works or sections of such on a variety of (usually vaguely related) topics. If the subject is more closely limited, we may talk of *Compendia*, which sometimes contained just a few closely related and complete texts.

3.

Unlike the larger European libraries which usually house a vast number of manuscripts dealing with natural science, certainly more than those preserving literature, the collections of Medieval Icelandic manuscripts hardly contain any manuscripts whose material exclusively relates to natural science. What is preserved of this genre, amounts to a relatively small number of fragments and certain texts contained in other manuscripts.

Among the latter the most important is the Hauksbók, written between 1306 and 1308 by and for the Icelander Haukr Erlendsson, which may be classified as an encyclopedic codex, containing texts belonging to a range of different subjects, such as history, geography, theology, medicine, mathematics and natural science. Other than this, there are only some very late collections dating from the 15th to the 17th centuries (such as AM 281, 4to and the very fragmentary AM 208 IV, 8vo), reflecting lost Medieval manuscripts and these also contain some scientific material.

Some of the fragments consist of scientific texts only, but are rarely longer than a few leaves, and normally tell us little about their original context, whether they belonged to an encyclopedic collection or to a specialized compendium. Such fragments are AM 415, 4to (12 leaves dating from the early 14th century), AM 736 I, II, and III, 4to (altogether 10 leaves dating from various periods of the 13th century), AM 732 b, 4to (9 leaves from early 14th century).

The only sizable manuscripts containing predominantly scientific texts in Old Norse are AM 194, 8vo, written 1387, and the manuscript fragments bound together in Gml. kgl. Sml 1812, 4to.

There are no corresponding Latin manuscripts preserved, which could with any certainty be connected with Medieval Icelandic libraries.

## 4.

AM 194, 8vo is a small compendium, consisting of 52 leaves, whose scribe or owner was mainly interested in natural science, and was written in Western Iceland in 1387. It begins with a longish computistical text, followed by a cosmography, which probably was meant as an introduction to Abbot Nikulás's itinerary to the Holy Land. Shorter texts on Noah's sons, marvels of the East, ages of the world and the main church councils close the more cosmographic section. The rest of the manuscript deals mainly with natural science in the narrower sense of the term, as it contains sections on medicine, hydrology, mineralology, snakes, prognostics and miscellaneous information (the number of verses in the psalter, the number of bones in the human body, the formation of the foetus, the days of fast).

Some of the texts represent better versions of texts than those in slightly older fragments, therefore it is not unlikely that the greater part of the texts contained in AM 194 goes back to the late 12th century. Of Abbot Nikulás's itinerary we know that it was written between 1154 and 1159, and some of the cosmographical texts may well also be old.

K. Kaalund edited AM 194, with the nearly inexplicable exception of the introductory *computus*, as early as 1908, including a rather short but helpful commentary. He called AM 194 a "lille encyklopædi"[1], which is slightly misleading only insofar as AM 194 is only a very slim codex by encyclopedical standards.

## 5.

The other manuscript mentioned is Gml. kgl. Sml. 1812, 4to, now in the Arnastofnun in Reykjavík, a codex consisting of the fragments of four older manuscripts which were already bound together in the late Middle ages.

In his catalogue of manuscripts from the Royal Library in Copenhagen, Kaalund

numbered the four sections and dated the pieces to around 1200 (Nr. IV), the thirteenth century (III) and the 14th century (I and II) respectively. It is clear that sections I and II originally belonged together (the Algorismus in part II begins on the last leaf of part I), and the date in the 14th century when parts I and II were copied may well have been the time when the whole codex was bound together as we have it now.

The older parts are somewhat different in size and layout and were probably cut to size at the time of their inclusion in the present codex, which now measures 21 x 14 cm. The two parts from the 14th century now form the first two thirds of the manu script (f. 1v - 24v, with the exception of the double leaf 5r - 6v), followed by the so-called oldest part ("äldsta delen"[2]), 24r - 34v) from the end of the 12th century; the two remaining double leaves from the 13th century, which originally belonged to the same manuscript, are now bound as 5r - 6v and 35r - 36v. The "oldest part" also once contained another few leaves, 4 of which are still preserved in the fragment AM 249 1, 4to, which seems to have belonged between the present f. 25 und 26 of the "oldest part". The leaves of the "oldest part" in AM 249 1 are bigger (24 x 16 cm) then the remnants in Gml. kgl Sml. 1812, and were in all likelihood separated from these before Gml. kgl. Sml. 1812 was bound together to form the codex as it came down to us.

## 6.

Gml. kgl. Sml. 1812, 4to has never been edited in its entirety, although the "oldest part" was published by Larsson as early as 1883 and substantial parts, although not always identified as deriving from Gml. kgl. sml. 1812, were used by Kaalund und Beckman in their collection in Alfrædi Íslenzk[3]). Cosmographical texts from the manuscript have been edited with facsimiles by R. Simek[4]). We are presently working on a one-manuscript edition, together with a facsimile and a commentary, which is paid for by the Austrian research fund. Our aim is to provide a far more detailed commentary than the one given by Kaalund for his texts in Alfrædi Íslenzk, in order to establish a record of continental works on natural science known in Iceland in the Middle Ages, therefore widening the scope of the source material to be looked at in the future when dealing with scholarship in Medieval Iceland.

## 7.

Gml. kgl. Sml. 1812, 4to is richly illustrated. It contains illustrations of cosmographical, astronomical, geometrical and geographical nature, which is in keeping with similar continental illustrated miscellanies.

Nine very decorative illustrations show nine of the twelve signs of the Zodiac, another page shows four of the stellar constellations (Sirius, Centaurus, Orion and Canes). The manuscript contains three different maps of the world, among which is the

largest existing Medieval Scandianvian world map, which spreads over two pages and contains over 120 entries. Three purely astronomical illustrations show the excentric movements of planets, the movements of Mercury and Venus around the sun, already known in thirteenth century Iceland, and the lunar movements in connection with the tides.

Two other detailed circular illustrations may be classified as belonging to the popular Medieval macrocosmos-pictures, giving the connections between the ages of man, seasons, zodiacs, directions, winds etc.

A Latin table showing the division of philosophy takes up a whole page, giving a structure of Medieval sciences.

## 8.

Gml. kgl. Sml. 1812 contains a wide variety of individual texts. The following list is only a tentative table of contents, as some of the longer texts may still turn out to be compilations of a number of shorter texts:

<1> *Cisio Janus*

<2> Various verses

<3> Stjörnu-Odda-Tali

<4> Concerning the movement of the planets

<5> Concerning the movement of the moon

<6> Nine pictures of the signs of the Zodiac

<7> Concerning the solar and the lunar years

<8> The division of philosophy

<9> List of Icelandic priests

<10> Double paged *Mappa mundi*

<11> Illustration of macrocosm with small *Mappa mundi*

<12> Illustrations of the astronomical constellations Orion, Canes, Hydra, Centaurus

<13> Extract from Macrobius: *Commentarius in Somnium Scipionis*

<14> On the periods of planetary revolutions

<15> Concerning the star of Bethlehem, supposedly by "Ion gullmudr i glosan yfir Matheo"

<16> Concerning the length of months

<17> Concerning the moon and the tides (Latin)

<18> Concerning leap years

<19> Concerning celestial movements

<20> *Descriptio poli*

<21> Extract from Hyginus: *Poeticon Astronomicon*

<22> On the seven spheres

<23> Illustrations of exccentric planetary movements

<24> Extract from John of Sacrobosco: *Computus*

<25> Concerning planetary movements

<26> Illustration of planetary movements

<27> Commentary on the size of the earth

<28> Commentary on the size of planets

<29> Extract from Helpericus: *Liber de computo*

<30> Illustration of lunar movement with *Mappa mundi*

<31> On tidal movements, supposedly by Bede

<32> On tidal movements

<33> Text and illustration on geometry

<34> Algorismus

<35> Extract from Gerlandus: Abacus

<36> Extract from John of Sacrobosco: *Liber de sphera*, on the shape of the earth

<37> On the seven climatic zones

<38> Extract from Isidor: *Etymologiae* XV, 16, on linear measurements

<39> On the solar year, supposedly by Macrobius

<40> Calendar

<41> Calendar verses (Latin)

<42> Concerning biblical chronology

<43> Computistical notes (Latin)

<44> Astronomical notes (Latin)

<45> On solar and lunar movements

<46> On the lunar year

<47> *Computus*, probably by Hrabanus Maurus

<48> On the leap year

<49> Latin-Icelandic glossary

<50> On the seven day creation, possibly from Honorius Augustodunensis: *Elucidarius*

<51> On chronology, possibly from Bede: *De temporum ratione*

## 9.

As can be seen from the above table, more than 50 different texts are to be found in this manuscript of 72 pages, most of them very short ones which are minor excerpts or brief quotations from Medieval Latin authors, translated into Old Norse.

A number of these quotations actually give their source. Apart from the reference to Stjörnu-Oddi there are other Icelanders mentioned as well, Sæmundr the Priest and Bjarni in tölvisi, but all the other sources given are from Latin authors. A short passage on comets refers the reader to certain glosses about the Gospel according to Matthew by Jón Gullmundr, who can only be Johannes Chrysostomos. On the movements of the planets, Meistari Johannes i Paris af Sacrobosco and his *Computus* are quoted, obviously a reference to John of Sacrobosco. Macrobius is mentioned repeatedly, Bede is named as well as Helpericus, Josephus and a certain nameless *Geometricus*, whose work we have not been able to identify yet. Ptolemy is called Tomemu and made a king of Egypt, whilst the Arabian Almanon (Son of Harun al Rashid) obviously got mixed up with the English monk Alkuin and is here called Alkim.

Apart from authors, titles are also mentioned. The *Glosae super Matheum* by Jón Gullmundr have already been mentioned, as has the Computus by John of Sacrobosco. A certain *Tractatus philosophie de spherae* is mentioned twice, the second time it seems to be attributed to Macrobius. In addition to these, we find the popular Medieval mnemonic calendar verses known as *Cisio Janus* also called by this name.

This is not the place to list all the sources already identified by Kaalund and Beckman in their footnotes in Alfrædi Islenzk or which we have found so far. Also, since this is a report on work in progress, we have not nearly identified the sources of all the texts yet. What we are able to do now, though, is to classify the source material found so far. As is to be expected, this falls for the greatest part into four major categories: firstly original Icelandic texts (especially the astronomical work of Stjörnu-Oddr; secondly encyclopedic works of late classical and early Medieval authorities (Isidor, Macrobius, Hrabanus Maurus, Venerable Bede, Hieronymus); thirdly Medieval popular texts (*Elucidarius, Cisio Janus*) and finally, late Medieval astronomers (John of Sacrobosco, Gerlandus, Helpericus).

The most surprising result of our investigation so far is the wide range of astronomical and mathematical texts obviously availabale in Iceland before the end of the 13th century. Despite the highly compilatory nature of most of the texts included in the manuscript, the information is not only extracted from popular astronomical handbooks like John of Sacrobosco's *Liber de Sphaera* and his *Computus*, but from quite a number of different sources. This shows the very high standard of Icelandic natural science by the end of the twelfth and the first half of the thirteenth century, which knew nearly all the continental scholars of any stature. By the evidence we have in Gml. kgl. Sml. 1812, Icelandic monastic and episcopal libraries at the time were very much up

to date in matters of natural science, and probably in other subjects as well, even if the few library catalogues preserved from the 13th and 14th centuries hardly reflect this.

Despite the relatively copious source references given in the manuscripts, it is not always easy to trace the original Latin texts referred to, as most of the sources identified in the above table of contents are not actually given in the manuscript. Most of the references which are given in the texts, are in fact wrong. Examples for this somewhat disconcerting practice is the double reference to a certain *Tractatus philosophie de spera* ascribed to Macrobius (Nrs. 13 and 39 above), whose *Commentarium in Somnium Scipionis* is quoted in the first instance, but not in the second. The text on comets (Nr. 15) is not only by John Chrysostomos, despite the detailed reference to author and work. A third example is the reference given in Nr. 31 of the above list, which is to Bede, but the text comes from William of Conches' *Philosophia mundi*, an author extensively used by the Icelandic compilators, but never mentioned anywhere in an Icelandic manuscript.

The reasons for these and many other wrong citations are to be found in the codicological transmission of the Latin texts described at the beginning of these papers. Texts were, of course, ascribed to wrong authors even originally (as in the case of William of Conches, whose works are more often to be found under the name of Bede or Honorius than his own, and which were edited under those wrong names as late as the 19th century) or the translator looked up the wrong *explicit* in his codex. The transmission of the texts in collections or miscellanies made it difficult for the user of a specific text to ascribe it to a longer work, let alone its author. Medieval scholars also were not as one-track minded about authorship as we are, even if the compilators of Gml. kgl. Sml. 1812 seem to be fairly modern in this respect.

To trace sources despite the shortcomings of the Medieval citation systems, which certainly cannot be blamed on the Icelanders alone, is one of the objects of our commentary, thereby facilitating future investigations into Medieval Icelandic natural science and its manuscript tradition.

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1) Kr. Kaalund: Alfrædi Íslenzk. Islandsk encyclopædisk litteratur. I. Cod. mbr. AM 194, 8vo. København 1908, xviii.
2) L. Larsson: Äldsta Delen af Cod. 1812, 4to Gml. Kgl. Samling. København 1883 (= SUGNL 9).
3) N. Beckman og Kr. Kaalund: Alfrædi Íslenzk. Islandsk encyclopædisk litteratur. II. Rímtǫl. København 1914-16, 23 - 64, 65 - 66, 72, 76 - 80, 83 -116, 124 - 126, 246 - 261; Kr. Kaalund: Alfrædi Íslenzk. Islandsk encyclopædisk litteratur. III. Landalýsingar m. fl. Kobenhavn 1917, 71 - 73.
4) R. Simek: Altnordische Kosmographie. Studien und Quellen zu Weltbild und Weltbeschreibung in Norwegen und Island vom 12. bis zum 14. Jahrhundert. Berlin - New York 1990 (= Ergänzungsbände zum Reallexikon der Germanischen Altertumskunde 4), 419-424, 502-504, 508-510, 590-592.