Mediterranean Archaeology and Archaeometry, Vol. 16, No 4,(2016), pp. 421-428

10.5281/zenodo.220966

ASTRONOMY IN THE MEDIEVAL *LIBER FLORIDUS*

S. Draxler and M.E. Lippitsch

Institute of Physics, Karl-Franzens-Universität Graz, Austria

Received: 16/02/2016
Accepted: 21/02/2016
Corresponding author: Sonja Draxler (sonja.draxler@uni-graz.at)

ABSTRACT

The *Liber floridus* is a medieval encyclopaedia, authored by a certain Lambert, Canon of Saint-Omer. The work was finished in 1121 and deals with a multitude of different topics, from religion and history to geography and astronomy. The Gent manuscript, which is the autograph, contains 287 folios of parchment. Detailed descriptions were given by Delisle (1906) and Derolez (1998).
The topics of Lambert's astronomy are divers. The movement of the sun and moon, the calendar, and the constellations are described. Several planetary diagrams are given, followed by astrological drawings as well as various geographical, meteorological, and astronomical remarks. These astronomical texts and figures so far have not been the object of detailed studies. In this paper an overview on the astronomical topics of the manuscript is given, several pages are described in more detail, and possible sources are discussed.

KEYWORDS: Liber Floridus, medieval astronomy, planetary astronomy

1. INTRODUCTION

Ego Lambertus … libellum istum … contexui, ut … fideles apiculae … saporis coelestis dulcedinem haurirent …Floridum intitulavi, quia … rerum mirandarum narratione praepollet (Lambertus a. S. Audomaro, 1121, f3v). "I, Lambert, have compiled this book, in order that faithful honeybees may suck the sweetness of the celestial juice. I called it 'flowering', because it is exquisite in the narration of admirable things." With these words the author of the book, Lambert of St. Omer, in the *prologus* of his *opus magnum,* the *Liber floridus*, strives to whet the potential reader's appetite.

It is really a grand endeavour the reader is invited to by the author, or, more correctly, the compiler of the *Liber floridus*. Already the sheer dimensions are awe-inspiring. The Gent manuscript that has been shown to be the autograph, contains 287 folios of parchment, 31 cm high and 21 cm wide, completely covered on recto as well as verso, by text and illustrations, 37 m^2 of information. And this is not the whole story, because the manuscript is not complete: The last part known from other manuscripts, *Apocalypsis depictus*, a story of the Apocalyps in comic book format, is missing.

The book was compiled around 1121 by Lambert, Canon of the Church of Our Lady in Saint-Omer, a small town in the north of France near the Belgian border. Very little is known about this man, in fact only what he tells us about himself in the book. In the *prologus* he introduces himself by providing his name, Lambert. He identifies himself as the author of the book and refers to his father Onulph, former canon of the same church. Furthermore, there is a portrait on f13r showing him writing the book. However, any information about his life is missing; even the dates of birth and death are unknown.

The table of content of the Gent manuscript lists 161 sections with cosmographical, biblical and historical topics. Lambert wanted, as he tells us, to select the best parts of his predecessor's works, for example from Isidore of Seville or the Venerable Bede, to preserve their work for future generations.

About 30 % of the content is devoted to religious topics. 25 % deal with historical matter. Geography makes up about 12 %, natural history 10 % and astronomy 8 %. Interestingly, only 4 % are related to *computus* and calendar. This proves that, contrary to a widespread believe, fixing the Easter date was not the dominant motive for astronomical studies in medieval times.

In the following centuries the *Liber Floridus* was copied several times. Table 1 shows a list with libraries containing copies of the book. The oldest one, written in the same century as the original, is housed in Wolfenbüttel, Germany; two copies are from the 13th century, five from the 15th century, and one from 1512. However, none of these copies is identical; sometimes parts of the text have been omitted, sometimes the order of the pages was changed. In addition, three partial copies exist in Belgium and England.

Table I. Libraries owning copies of the Liber Floridus

Libraries	Produced in
Wolfenbüttel, Herzog August Bibliothek	12th cent.
Paris, Bibliothèque Nationale, Ms. Lat. 8865,	13th cent.
Leiden, University Library, Ms. Voss. Lat.	13th cent.
Paris, Bibliothèque Nationale, Ms. Lat. 9675	1429
The Hague, Royal Library, Ms. 27A23	1460
Chantilly, Musée Condé, Ms. 724	15th cent.
Dounai, Municipal Library, Ms. 796	15th cent.
Genua, Bibliotheca Durazzo-Giustiniani, Ms. AIX9	15th cent.
The Hague, Royal Library, Ms. 128C4	1512

Source: http://www.liberfloridus.be/kopieen_eng.html (Retrieved Jan 8, 2016)

The astronomical content of the *Liber Floridus* is voluminous and covers all important parts of knowledge of that time: There are notes on the division of time, calculations of the Easter date and various calendars, as well as a description of stars and constellations. There are several explanations and planetary diagrams showing the movement of sun, moon and planets, sometimes mixed with astrological content, especially when describing characteristics of the planets. Other planetary diagrams give astronomical content in combination with geographical, meteorological or religious information. Furthermore, there is a copy of Cicero's *Somnium Scipionis* in the edition of Macrobius (Macrobius, 1994).

2. DESCRIPTION OF SELECTED PAGES

In this section some interesting pages with astronomical content will be described in detail. All the folio numbers refer to the Gent manuscript. The original Latin text is set in italic letters; English translations are given in quotation marks.

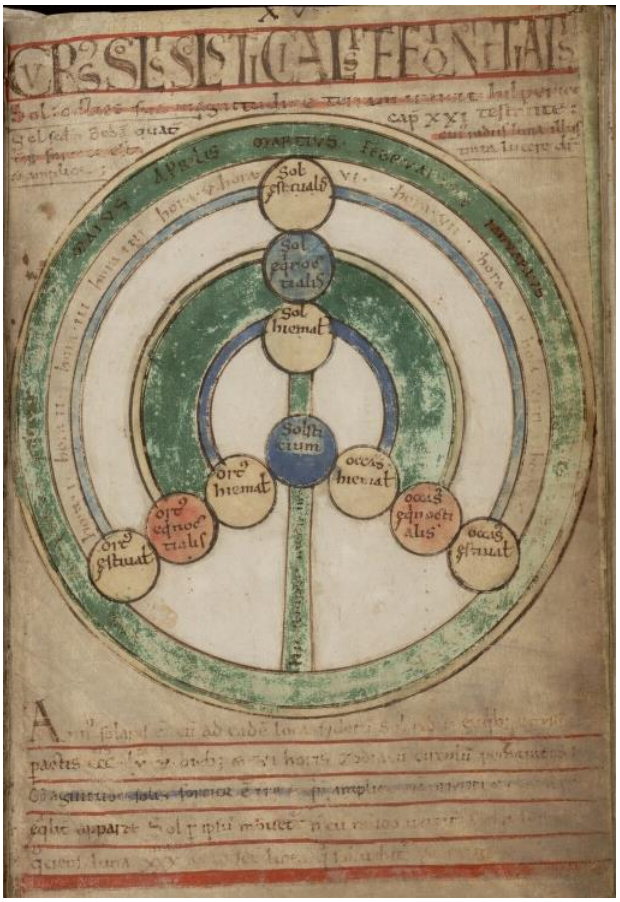

Figure 1. Cursus solaris solsticialis et equinoctialis

2.1. *f 25r: Cursus solis solsticialis et equinoctialis*

One of the first astronomical diagrams is found on f25r and named *Cursus solis solsticialis et equinoctialis (*Figure 1). It consists of a diagram with short texts above and below it. The text above the diagram says:

Sol octies sua magnitudine terram vincit Hilperico capitulo XXI testante, cuius radiis luna illustrate lucere dicitur. Sol secundam Bedam quater terrae fortior est et amplior. "The sun beats the earth in magnitude eight times, as attested by Helperic in chapter 21; by his rays illuminated, the moon is said to shine. According to Beda, the sun is four times stronger and wider than the earth."

Lambert here cites Helperic of Auxerre and his statement in the *Liber de Computo* (Helperic, 1844) correctly, with only a small error in the number of the chapter: the text (*Sol autem, quia octies sua magnitudine terram vincit*) is in chapter 20 instead of 21.

The diagram shows the path of the sun at different times in the year. In the outmost green circle there are the months of the year, followed by hours, starting with *hora prima* on the left hand side to *hora decima* on the right. At summer solstice in June the sun rises early in the morning, called *ortus aestivalis*. In December at winter solstice the sun rises latest. The highest point of its path the sun reaches always in hour VI, named *sol aestivalis*, *sol aequinoctialis* and *sol hiemalis*. The diagram shows that the path of the sun is shorter in winter than in summer.

Below the diagram there is a description of the sidereal year with 365 days and six hours:

Annus solaris est cum ad eadem loca syderum sol redit ex quibus egressus est, peractis CCC^{tis}LX^{ta}V^{que} diebus et VI horis zodiacum circulum peragratis. A solar year is, when the sun returns to the same place of stars from where it had started, after 365 days and six hours and after the zodiac is walked through".

2.2. *f 25v: Cursus lunaris et anni descriptio*

The next page, f25v, bears the title *Cursus lunaris et anni descriptio* (Figure 2). The outer circles show the path of the moon during one year, the phases of the moon, and the c. 30 days of a lunar month.

The inner circles provide geographical and meteorological information. In the red circle there are the terms *Oriens, Auster brumalis, Occidens solsticialis* and *Solsticium*, which stand for descriptions of the cardinal directions. The next, uncoloured circle gives the names of winds as described by Seneca (1998) and Isidore of Seville (2008), with *Subsolanus, Favonius, Nothus* and *Septentrio.* The following circle shows pictures of the winds alternating with the description *Dies, Solis occidens, Nox, Solis ortus.* The next circle gives the names of the four qualities *calidus*

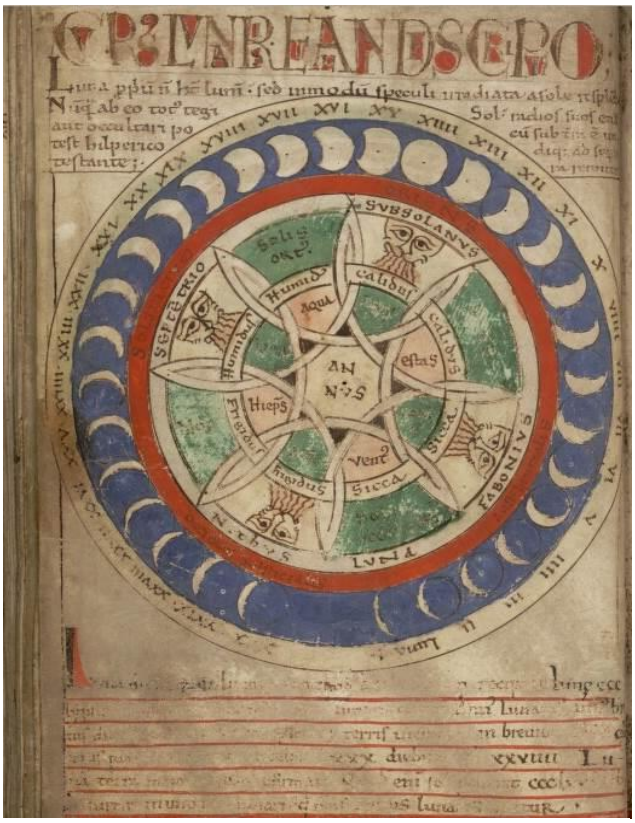

Figure 2. Cursus lunaris et anni descriptio

warm, *sicca* dry, *frigidus* cold and *humidus* wet, followed alternatingly by the names of three of the elements, *ignis* fire, *aer* air and *aqua* water, but with *ventus* wind instead of *terra* earth. There follow the names of the seasons *Estas, Autumnus, Hiemps* and *Ver*. In the center there is the term *Annus*.

The text above the diagram is a mixture of information from Helperic of Auxerre and Venerable Bede (Beda, 1844). It says, for example, *Lunam terra maiorem Beda affirmat.* "The moon is larger than the earth, Bede confirms". In fact, we can find this text in Venerable Bede's *De natura rerum*, chapter 19, where he writes *lunam vero terra esse maiorem*. This is interesting as Isidore of Seville about 100 years earlier wrote in his Etymologia, XX: 48 *Sicut autem sol fortior est terrae, ita terra fortior [est] lunae per aliquam quantitatem*, "As the sun is stronger than the earth, so the earth is stronger than the moon in a certain quantity."

2.3. *f 26v - 46r: Various calendars*

The following pages, from 26v to 46r, contain different calendars. One of them, for example, counts all days from year 1 till year 1291. In addition it gives information on the Easter date and the phases of the moon as well as historical records. The description of historical events ends in 1119, probably the date of production of this part of the book.

2.4. *f 89r - 91v: De ordine et positione signorum*

These folios give short descriptions of more than 40 constellations, with nice illustrations. Lambert is rather consistent in his text and drawings. His numbers are realistic, as can be seen from comparisons between his data and modern ones. For example he reports 22 in *Ursa maior*, and there are 22 brighter than magnitude 5, indeed. Nevertheless, in the drawings the stars' position within a constellation is governed more by the intent to achieve a good agreement with the mythological figure. However, with this procedure Lambert is in good company, because it is true for most medieval writers, including even Apian in the 16th century. A change comes about only with Bayer's *Uranometria* in 1603. Anyway, we can admire the pretty style of Lambert's drawings.

2.5. *f 92r: Calculations on the spheres*

This folio deals with cosmic distances. There is the size of the sun (diameter 140.000 stadia), the earth (half the sun), or the circumference of the sun's orbital sphere (30,170.000 stadia). Lambert's bias to mathematics becomes apparent, for example, in his explanation of the relation circumference/diameter in a circle (triplicationem cum parte VII^{ma} triplicated, with a 7th part), what we now know call the constant π. It is obvious also from the following calculation:

Constat universe terre ambitum habere stadiorum $CC^{ta}L$ *milia. Horum* $XX^{a}II^{a}$, *id est* $\overline{XI}CCCCLIIII$ *remanentibus XII, si auferantur, remanebunt* $\overline{CCXXXX}DXXXXIII$. „It is sure that the circumference of the earth is 250.000 stadia. The 22th part thereof is 11.454, remaining 12. If removed 11.454, remain 240.543." Repeating Lamberts calculation shows that he is approximately correct except of a permutation of the last two digits. The correct value should be 240.534. But anyway, the purpose of this exercise and the relevance of the result remain unclear.

2.6. *f 93v: De anno mundano Macrobius a Romulo post multa secula annis finitis* $\overline{XV}$

This folio (Figure 3) deals with the "mundane year", a concept already vaguely discribed by Platon (Timaios, 39d), again by Cicero in his *Somnium*

Figure 3. De anno mundano

Scipionis (Dream of Scipio, 6,24) as *annus vertens* and eventually adopted by Macrobius for the time needed for all heavenly bodies to revert to a certain initial position. Cicero (2009) believes this position to be present at the death of Romulus. Since Scipio asserts *Cuius quidem anni nondum vicesimam partem scito esse conversam,* "of this year not yet the twentieth part has

elapsed, you should know", the duration of the *annus vertens* has to be more than 11.460 normal years. This number is found accepting the difference of dates between Romulus and Scipio to be 573 years, following Macrobius (1994, 2.11.16). It may be by accident, but an interesting one, that 11.460 is nearly identical with 11.454 given above on f 92r. Lambert, however, gives *quindecim milia … a discessu Romuli,* "fifteen thousand years from the passing of Romulus", again using Macrobius (1994, 2.11.11) as his source. So he does, continuing with *Ille ergo vere annus vertens vocandus est,* "this therefore in verity has to be called a turnaround year", because it is not only the recurrence of the sun, but of every luminary in the sky. And he repeats Macrobius' unchallengeable argument, *Sicut asserunt physici,* "so assure the physicists". Maybe he regarded a physicist himself?

The text is written in a circular diagram, showing the spheres of the universe. In the centre we read *terrae globus*, in the volume of the first sphere (uncoloured) *radiis in luna* (with the complementary word *solis* over the next sphere. Following is the lunar sphere (green), carrying the moon in five (!) phases, namely (counter-clockwise from bottom right) new light with the text *prima*, waxing crescent with *VII prima,* full moon with *luna XIIII anno I*, third quarter with *XXIII*, and waxing crescent (?) with *XXX*. There is a fairly unreadable text between new light and waxing crescent. Then follows the sphere of Mercury (blue) with *Mercurius annis XX* on top. The next is the sphere of Venus (red). At the lower right, already in the sphere of the sun, there is a star and the words *Venus Vesper*.

The following, very broad, uncoloured sphere is that of the sun. It is filled with the text on the mundane year discussed above. On top, there is a 16-fold rosette with the inscription *sol ortus* inside and *sol XVIIII* above, the latter referring to the Metonic cycle. On bottom there is another rosette, with sol occasus inscribed. From this rosette to the upper left and upper right each the word *solis* is written, extending over the spheres of Venus and Mercury. Then follows (in green) the sphere of Mars, with *Mars annis XV* (?), that of Jupiter (uncoloured) with *Jupiter annis XII* on top and *Jupiter* on bottom, and finally the sphere of Saturnus (red) with *Saturnus annis XXX cursum explet* on top and the interesting statement *A terra usque ad Saturnum sunt stadia DCLXXXVIII, miliaria* $\overline{LXXX}$ *DCCCCXXXVII* , "from earth to Saturn there are 688 (should read 688.000) stadia, 80.937 miles".

This gives 8.5 stadia per mile. The conversion factor between stadia and miles, the use of these two units and the origin of the given planetary distances will occupy our interest again when dealing with f 94v. The least common multiple of the years given for the turnaround of each planet in the diagram, should give the duration of the mundane year. And, luckily, the result is 16.416, fitting rather well to the "fifteen thousand years" given by Lambert.

The page closes with the somewhat out-of-place sentence *Exemplar lunam lumen habere a sole,* "Example: that the moon has her light from the sun".

2.7. *f 94r De Astrologia secundum Bedam*

f94r is entitled *De Astrologia secundum Bedam.* The introductory text in the upper left corner of the drawing says *Stelle a sole illuminantur et sunt immobiles et cum celo fixe perpetuo motu feruntur. Stelle autem magnitudinem terre uincunt Tullio testante, que globose et rotunde circulos suos conficiunt celeritate mirabili.* "The stars are illuminated by the sun and are immobile and fixed with the sky they are carried in perpetual motion. The stars, however, surpass the size of the earth, as Tullius [Cicero] testifies, and globosely and round they perform their circles with admirable swiftness."

The dominant subject of the drawing is a representation of the night sky with a number of constellations. On this "star map" are superimposed three excentric circles inscribed Sol, Venus and Mars, representing the orbits of these luminaries. The text below the diagram reads: *Duo sunt extremi uertices mundi, quos appellamus pilos Sepemtrionis et Austri, quorum alter a nobis semper videtur, alter uero numquam. In eo qui a nobis cernitur, tria sunt signa constituta, duo scilicet Arcturi, hoc est Maior Ursa et Minor Ursa, et Serpens et cetere stele et signa XII, ut superius notatum est.* "Two are the extreme vertices of the world, that we call Pillars [*recte* Poles] of North and South, of those the first is always visible for us, the second, however, never. In the one we can discerne three signs are arranged, namely two of Arcturus, that is the taler and the smaller she-bear, and the dragon and other stars and 12 signs, as was annotated above." This is the adaptation of a text (uncertainly) ascribed to the 2nd century Roman author Hyginus (Hasper, 1861). The text is found in a number of medieval manuscripts.

In the upper right corner there is a text that could be an introduction to the following f94v. It reads *E quibus unum globum possidet Saturnus, alterum vero Iovis tertiumque Mars, quartum quoque Sol, quintum Venus, sextum uero Mercurious septimumque Luna radiis solis accensa. Supra lunam eterna sunt omnia, et infra nihil nisi mortale.* "From these Saturn possesses one globe, the second, however, Jupiter and the third Mars, also the forth the Sun, fifth Venus, but the sixth Mercury and the seventh the Moon, kindled by the rays of the Sun."

2.8. *f 94v Circuli VII^em^ cursusque VII^em^ planetarum*

This page is the most complex regarding astronomy. It can, therefore, be presented here only without going into depth: This will be done in another publication. Here the mere description must be sufficient.

The page starts with a description of the heavenly spheres, which together form the cosmos. The text above the diagram again is taken from Macrobius (1994 Vol. II.17.2 f).

Novem ordinibus uel globis conexa sunt omnia, quorum unus est celestis extimus, qui reliquos omnes complectitur, summus ipse Deus arcens et continens ceteros, in quo sunt infixi illi qui uuoluuntur stellarum cursus sempiterni. Cui subiecti sunt septem qui uersantur retro contrario motu atque celum. Summus ille celi stellifer cursus, cuius conuersio est concitatior, acuto et excitato mouetur sono, grauissimo autem lunaris infimus.

"In nine ranks or globes all are connected, from which one is the outermost heaven, that comprises all the remaining, the highest God fencing and containing the others, in which are fixed those performing the eternal movements of the stars. Beneath of it are seven, turning backward against the motion and the sky. That highest course of the sky is the star carrier, whose revolution is more rapid, moved with a sharp and thrilling sound, but with the gravest the lowermost of the moon."

Then there is a planetary diagram with seven concentric circles for the planetary spheres including sun and moon. The planets are ordered following the Chaldean or Plinian order (Eastwood, 1997): Moon, Mercury, Venus, Sun, Mars, Jupiter and Saturn. In the centre there is the earth. Here it is shown as a TO-type world map first designed by Isidore of Seville (Etymologiae XIV, 2). In this map Asia takes up one half of the whole, while Europe and Africa share the other half. The combination of a TO-map with a planetary diagram is rare.

Each planet is characterized by a symbol and a description giving the orbital period, and in addition two numbers for the distances between the planetary spheres in stadia and miles. The text says:

Saturnus XXX annis cursum explet. A Terra ad Saturnum stadia DCLXXXVIII, miliaria uero $\overline{LXXX}DCCCXXXVII\varsigma$. "Saturn in 30 years passes the course. From Earth to Saturn are 688 stadia, but 80,937.5 miles."

Iovis XII annis cursum explet. Ab eo usque ad Saturnum stadia LXII ς, miliaria uero $\overline{VII}\ DCCCXII\varsigma$. "Jupiter in 12 years passes the course. From him to Saturn are 62.5 stadia, but 7,812.5 miles."

Mars XV annis cursum explet, a quo usque ad Iouem stadia LXIIς, miliaria uero $\overline{VII}\ DCCCXII\varsigma$. "Mars in 15 years passes his course, from there to Jupiter are 62.5 stadia, but 7,812.5 miles."

Figure 4. Circuli VII^em^ cursusque VII^em^ planetarum

Sol XVIIII annis cursum explet, a quo ad Martem stadia CXXV, miliaria uero $\overline{XV}\ DCXXV$. "The sun in 19 years passes its course; from there to Mars are 125 stadia, but 15,625 miles."

Lucifer VIII annis cursum explet, a quo ad Solem stadia CLXXXVIII, miliaria uero $\overline{XXIII}\ CCCCXXXVII\varsigma$. "Lucifer in 8 years passes the course; from it to the Sun are 188 stadia, but 23,437.5 miles."

Mercurius XX annis cursum explet. Inde stadia LXIIς, miliaria $\overline{VII}\ DCCCXX$. "Mercury in 20 years passes the course. From here are 62.5 stadia, 7.820 miles.

Luna per annum cursum explet. Ad Mercurium stadia LXII ς, miliaria $\overline{VII}\ DCCCXII\varsigma$. The Moon passes the course in one year. To Mercury are 62.5 stadia, 7.812.5 miles.

A Terra ad Lunam stadia CXXV, miliaria $\overline{XV}\ DCCC\ et\ XXII\varsigma$. From the Earth to the Moon are 125 stadia, 15,822.5 miles.

The information regarding the orbital periods is taken from Isidore of Seville; he describes the time a planet needs to reach the same position on heaven regarding longitude and latitude.

Table 2 summarizes all the numbers which can be found in the diagram. If we assume that Lambert

neglected the sign for 1000 in the stadia, all the values are multiples of 62.500 stadia or 7.812,5 miles. This gives a factor of 8 between stadia and miles, a correct conversion factor between these ancient Roman measures of length. It is not clear why for the distance between Earth and Saturn Lambert uses a conversion factor of 8.5 here and on f 93v.

The numbers given for the distances do not have a real astronomical background but follow a scale first known from Alexandros Lychnos (Alexander of Ephesos) in the 1st century BC. He wrote a hexameter poem describing the harmony of the spheres (Irby-Massie et al., 2013). Alexandros' scale relates planetary distances with musical intervals. The basic distance was 63.000 (or 62.500) stadia, a number which fits well with Eratosthenes' value for a quarter of the earth's circumference. This unit is set equal to the interval of a half tone in music. The distance between earth and moon corresponds to two times the basic unit, the distance between moon and mercury is one time the basic unit, and so on. Thus the distances between the planetary spheres form a musical gamut; details cannot be given here for lack of space. Combining astronomy and music has a long tradition in Greek sciences dating back to Pythagoras, of whom is said that he believed in the planets and stars moving according to mathematical terms corresponding to musical notes (Riedweg, 2005). Later this was called the harmony of the spheres.

The text below the diagram gives properties supposed to be characteristic for the various planets: *Inter celum terramque hec VII sidera pendent: Saturnus candidus natura gelidum. Iouis clarus et temperatus. Mars feruidus et sanguineus. Sol ardens clarus. Lucifer refulgens est iocundus. Mercurius radians resplendet. Luna blanda terra est maior. Sol uero quater terra amplior est Beda testante et octies maior Macrobio et Hilperico affirmantibus.* "Between heaven and earth these seven planets are pending: Saturn, white and of cold nature. Jupiter bright and temperate. Mars flamy and sanguine. The sun burning bright. Lucifer reflective is pleasant. Mercury shines radiant. The friendly moon is greater than the earth. But the sun is four times larger than the earth according to Beda and eight times larger as affirmed by Macrobius and Helperic."

Table 2: Planetary distances given in folio 94v

planet	years	distance (stadia)	distance (miles)	factor stadia/mile
Saturn	30			
↑		62.500	7.812,50	8,0
Jupiter	12			
↑		62.500	7.812,50	8,0
Mars	15			
↑		125.000	15.625,0	8,0
Sun	19			
↑		187.500	23.437,50	8,0
Venus	8			
↑		62.500	7.820,00	7,9923
Mercury	20			
↑		62.500	7.812,50	8,0
Moon	1			
↑		125.000	15.822,5	7,9
Earth				
↓		688.000	80.937,5	8,5
Saturn				

2.9. Further astronomical content

Only a selection of interesting astronomic material could be given here. There is more in the book, e. g. on f88v (distribution of the year over the zodiacal signs, seasonal day-lengths), 91v (time spent by sun and moon in each zodiacal sign), 95r-95v (constellatons), 135v (time reckoning), 222v-224v (Scipio's dream, by Cicero), and 225v-228r (planets, eclipses etc.). Each of these folios would deserve becoming subject of a special investigation.

3. CONCLUSION

The astronomical content in the *Liber Floridus* is distributed over the whole book, shows no systematic order, is redundant, often mixes astronomy with geography or meteorology, sometimes astrology and religion. Most of the content is not genuine but taken from the literature.

For us the book may look a little bit confusing. It seems, however, that in medieval times it was rather popular, as it was copied several times. Anyway nearly every part of the text is a challenge for the student of the history of astronomy.

ACKNOWLEDGEMENTS

We thank the Universiteitsbibliotheek Gent for generously making available the original manuscript MS 92 of the *Liber Floridus* in high resolution in the internet.

REFERENCES

Apian, P. (1540) *Astronomicum Caesareum*. Peter Apian Ingolstadt
Bayer, J. (1603) *Uranometria*. Christoph Mang Augsburg

Beda Venerabilis, *De Natura Rerum Liber*. Chap. 19. Migne, J. P. (1844) Patrologia Latina. Vol. 90: Col 0187-0278A

Cicero, Marcus Tullius, *De re publica liber sextus*. BiblioBazaar Charleston South Carolina (2009)

Delisle, L. (1906) Notices sur les manuscrits du Liber Floridus de Lambert, chanoine de Saint-Omer. In: *Notices et extraits des manuscrits de la Bibliothéque National et autres bibliothèques* **38**, 577-791

Derolez, A. (1968) *Liber floridus; Lamberti S. Audomari canonici Liber floridus : codex autographus Bibliothecae Universitatis Gandavensis*. Story-Scientia Gent

Derolez, A. (1998) *The autograph manuscript of the Liber Floridus. A key to the encyclopedia of Lambert of Saint-Omer.* Corpus Christianorum, Autographa Medii Aevi 4. Brepols Publishers Turnhout

Eastwood, B.S. (1997) Astronomy in Christian Latin Europe c.500–c.1150. *Journal for the History of Astronomy* **28**, 235-258

Helperic of Auxerre. *Liber de Computo*. Migne, J. P. (1844) Patrologia Latina Vol. 137, Col: 0017-048D. http://www.documentacatholicaomnia.eu/04z/z_0980-0980__Helpericus_Monachus_S_Galli_Liber_ De_Computo__MLT.pdf.html (Retrieved January 7, 2016)

Hasper, L.W. (1861) *Hyginus, Philosophus*. Dyk'sche Buchhandlung Leipzig

Irby-Massie, G. L., Keyser, P.T. (2013) *Greek Science of the Hellenistic Era: A Sourcebook*. Routledge London

Isidore of Seville, *Etymologiae libri*. Translated an annotated by Lenelotte Möller. Marixverlag Wiesbaden (2008)

Lambertus a S. Audomaro (1121) *Liber Floridus*. Universiteitsbibliotheek Gent, MS 92; http://adore.ugent.be/OpenURL/app?id=archive.ugent.be:018970A2-B1E8-11DF-A2E0-A70579F64438&type=carousel&scrollto=0 (Retrieved Jan 8, 2016)

Macrobius, Ambrosius Theodosius, *Commentarii in somnium Scipionis.* James Willis (ed.) Teubner, Stuttgart/Leipzig (1994)

Platon, *Timaios*. Platon Werke Band 7, 4. Aufl. Wissenschaftliche Buchgesellschaft Darmstadt (2005)

Riedweg, C. (2005) *Pythagoras: His Life, Teaching and Influence*. Cornell University Press

Seneca, Lucius Annaeus, *Naturales quaestiones* /Naturwissenschaftliche Untersuchungen: Lat. /Dt. (Reclams Universal-Bibliothek). Otto Schönberger, Eva Schönberger (eds.) (1998)