

Gerard Mercator, His Books and Instruments.

To day I would like to give you an overview of the library of GERARD MERCATOR or GERARD CREMER, born Rupelmonde 1515 and died in Duisburg 1694, one of the greatest surveyors of the 16th century, better known for his cartographic work.

You all have studied his cartographic projection (still in use to-day in navigation on seas and in the airs) from 1569 when he published his system of increasing latitudes and in which a loxodrome becomes a straight line and as you know the shortest distance between two points is the straight line. It is just a bit more complicated when your surface is the sea on a spheroid globe ...

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In 1604 10 years after Gerard Mercator died, his library was sold at Leiden (the Netherlands) and we are lucky to have a manuscript transcription of that catalogue from Dr. Van Raemdonck who copied the only surviving auction copy, the original was lost in World War II (1)

I will only concentrate on the books of geometry and surveying as his library was vast in history, geography, but also theology and different other fields : over a thousand books, prints and manuscripts.

Over the last years I've been fortunate and very lucky to have consulted many of them. An exhibition was organised in 1994 on the 400 anniversary of his death by the city of Sint-Niklaas (2), between Antwerp and Gent, where a beautiful collection of his atlases, books and globes is preserved.

Mr Penneman 12 years ago organised a special exhibition where he could find from Belgian public libraries 37 of the 195 scientific books.

POWER POINT PRESENTATION

A VERY BRIEF BIOGRAPHY.

He was born in Rupelmonde, between Antwerp and Gent, on 1512. He learned Latin at school and when 18 he entered the University of Louvain (created in 1425) as a student : « Pauperes en Castro » a poor student. He met Franciscus Monachus and Gemma Frisius (3). He learned geometry from the 6 first books of « Euclides Geometria, a Johannes Voegler » (4) Johan Vogelin. There have been 10 editions in 25 years starting in 1528. The greatest of chances are that it would be the 1529 edition, for at that time he was at Leuven University * (picture upper right). This was also the opinion of Antoine De Smet (+), Belgian historian specialised in cartography (5) and former head of the cartographic collection at our Royal Library Brussels.

One of the fundamental problems by reconstituting virtually his mathematical library comes from the transcription who does not mentions the editor, often not the year, nor the city where the book was printed and titles are most often abbreviations but, after some time and research I can present, with a number of question marks still, a summary of his geometry and surveying books.

P.30 of the transcript we read 1510 *Introductio in geometriam ...*, Paris (Anitius Manilius * Torquetus Severinus - +/- 470 – 526), this is Boetius together with other books published in 1510.

In David Eugene's Smith's *Rara Arithmetica* (p.80) we find « In hoc libro contenta Epitome, ... Introductio in libras Arithmeticus divi Severini Boetij ... Proxes Numerandi ... Introductio in geometriam ... first edited in Paris 1503, and it is the 3rd edition printed in Paris in 1510 together with works of Jodocus Clichtovens and Faber Stapulensis Geometry and a Treatise of perspective.

Another geometria just mentions « Euclides cum Commentaris Campani » edited in folio without date nor location. This is a « impossible » task as most Euclides versions are by Campani 1482, 1486, 1491 ... till Zamberti challenged the Campani version from 1505, 1510, 1513, 1517, etc. ... There are the Campani versions mixed of 1485, 1489, 1509 and the Campani – Zamberti versions by Faber Stapulensis of 1516, 1521, 1537, 1541, 1546, 1558 and 1576 ..

In the medical works I found : *Nicephorus (Blemmydes 1197-1272) : Euclided Quartus decimus liber Elementorum...* reprint in 1501 by Aldus in Venice. This is apparently an incunable edition of 1498 by Georg Valla, with other works of Hypsicles, Nicephorus, Prochus, Aristachus of Samas, Cleonides, ... (recently a copy was sold in the Macclesfield auction at 11.000 £ + costs).

Jacob Peletier : « Cenomani in Euclides Geometrica demonstrationum libro sex » Lyon, in 1557, folio edition (8) 166 + 14 ill. – Thomas Stanford 14 & Sterck III no 55. *
A second edition was published in Leiden in 1610 by Joannes Tornaesium.

From Sebastian Munster :

- *Rudimenti Mathematica* 1561, 1st edition, Basel (8)
- and *Cosmographia* in Basel (p.14) (9) *

From Orontius Fineus (1494-1555) :

- *Protomathesis opera varium*, Paris 1532, 1st edition in Latin, (10) I show you the first Italian edition of 1587 *
- and *De Rebus Mathematicis*, Paris – 1556 (11)

From Cardanus Hieronymus (1501-1576)

- *De Subtilitate*, Basel (sd) (1550, 1st edition in Nurnberg) (12), 1554 in folio, edition in Lyon and Basel (I show the 1554 edition) and 1560, folio, Basel *
- *De Rerum Varietate*, Basel (1557) in folio Henric Petrus, 4^e edition of 1557, Basel (13) *
- *Hieronymi Cardini ... Libelli Quique*, Nurnberg 1547 (14)

Further we find :

- Arnold de Lyon : *Eisagoge in Elementa Geometrica* (sd) (15)
- Paccioli's (1/2 15th-1509) *Summa de Arithmetica, geometria proportio & Proportionilita*, Venetia 1494 : 1st edition in Italian (16) *
- Archimedes : *Opera graeco & latino*, Basel – 1544 by J. Hervaginus (16)
- Nicolas Copernicus (1473-1543) : *De Revolutionibus*, Nurnberg 1543, with annotation of G. Mercator ; Owen Gingerich could recently find Gerard Mercator's copy in a English Public Library (17) *
- Vitellus : *Optica*, Nurnberg, 1535 – 1st edition (18) *
- Vegetius' *de Re Militari* (sd) edition 1554 (1st edition of Plantyn, Antwerp) (19) received from : Charles de Nielles – the Gerard Mercator copy. *

Among the classical works we found :

- Beda Venerabilis (+/- 672-735) : *De Natura rerum & temporarum ratione* (sd) (1537) (20) *
- Strabo : *Opera graecolat(ino)*, Bas(el) (1539) – 1st edition in Latin from and with the Greek text *
- Georg Reisch : *Margarita Philosophia*, 1512 (reprint 1517) *

We found other important works from his library we found :

- Johannes de Monte regio (1436-1476) better known as Regiomontanus : *De Triangulis*, Nurnberg 1533, f° = 1st edition (21) ; fundamental work in trigonometry and spherical trigonometry (2nd edition by Santbeck) *
 - *Fundamenta Operatorum ...*, Nurnberg 1557 *
 - (Galland) : *De Agrorum Conditionibus Varium autores*, Paris 1554 *
- This is a fundamental work translating the Roman knowledge and expertise for boundaries. An original manuscript (of end of the 5th early 6th century) is preserved in Wolfenbüttel in the Herzog August Bibliothek.
- This (very rare) book was printed from a manuscript of St-Omers Library in North of France, coming originally from the Abbey of Bobbio, where Gerbert better known on Pope Sylvester II, studied that book in the year onethousand AD (7)

With this book we really arrive in landsurveying :

- Carolus Bouelles (1470-1553) : *Geometria*, Pa(ris) (1555) already mentioned in the 1510 Boetius edition, many editions exists. *

In his correspondance with Wolfgang Haller Mercator writes that after learning geometry from Vogelin's *Geometrie*, (1529) he concentrated on :

- Oronce Fineus (1494-1555) : (Liber de) *Geometrica Practica* (sd) – 1544 Latin edition, Strasbourg *

The later edition : *De Re & Praxi Geometrica libri très ... ubi de Quadrato Geometrico ...* Paris, Gourbin 1556, is often cited but was not found in Gerard Mercator's library.

La Pratique de la Géométrie is a French translation by Forcadet in Paris, in 1586.

From Apianus (Peter Bienewitz, 1495-1552) and Gemma Frisius, his professor at Louvain, we find :

- Petrus Apianus (1508-1555 ? ?) : *Instrumentum Sinuum*, Nurnberg 1541 – 1st edition 1534 *

Gemma Frisius :

- *De Astrolabo Catholico liber*, 1556, Antwerp – J.Steels, 1st edition
- I can show the 1584 – 2nd edition, Antwerp by Verwithagen that was published with *

The Cosmographie of Apianus (Van Ortroy no130)

- *De Principiis Astronomiae* (sd) ; the 1st dition dates of 1530
- There are 12 editions, 9 in Latin and 3 in French ; here the 1548 edition – *
- Antwerp by Steelsius (Van Ortroy no 40)
- *Arithmetica* (sd)
- from 1540 till 1611 there were 64 editions of this very popular work
- Note : We found no copy of *The Cosmography*, nor of 1529, not the 1533 copy where Gemma Frisius introduced : *De Locorum Describendorum Ratione nunque hunc visum* of 1533, to my great surprise *

It seems to me to be « impossible » that Mercator would not have learned this technics while he studied with Gemma Frisius, when he was at the University, the fundamental work for the cartography.

Probably the work went just missing as Gerard Mercator's « Map of Flanders » - 1540, is based on a surveying using Gemma Frisius trigonometrical application.

From Beausard (.....-1577), the professor to succeed Gemma Frisius in Louvain, we find :

- *Annuli astronomici Instrumenti...* (1533 – 1st edition, 1558 – 2nd edition)
- « *Gerardus Mercator Rupelmondanus vir, quo fabricare instrumentorum, ut cum omnium pace diveiim, hoc tempestate nullem preritiorem noverum* »

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His studies helped him to practise Cosmography « *ita in mathematicis omnia id cosmographica tantum direxi* ».

From the 1604 auction catalogue I will mention the works concerning mathematical and surveying instruments that have inspired him in his further cartographic work

- (Georg Reisch) : *Margarita Philosophia* (1512) *
- Jacques Besson : *Le Cosmographe*, 1557 Paris *
- and *Theatrum Instrumentorum*, Lyons (1578) – 1st edition Paris, 1571
- first sector 30 years before Galilei Galileo
- Petrus Apianus : *Folium Populi* (1533) where he describes his quadrant *
- Gemma Frisius : *Astrolabo Catholico liber* – 1556 (2nd edition 1584) *
- Regiomontanus : *De Astrolabio et Baculo Jacobi*, 1544 Nurnberg *
- A manuscript of *The Quadranti Novi* ... *

These surveying instruments are found in many books of surveying in the 16th century : the Astrolabe, the Jacobstaf and the Quadrant, etc. ...

Note :

- The (*altazimuthal*) *Theodolite*, attributed to Thomas Digges (...-1595) is his *
 « instrumentum topographicum » first published in *The Pantometrium* – 1576, *
 and what Digges called his theodolitus is a full circle divided in 360° but only for
 horizontal readings.
 The oldest altazimuthal theodolite, as we understand, it is preserved in Oxford (UK)
 in the Museum of the History of Science by Humphrey Cole.
 Another 16th century theodolite is preserved in Firenze by Augustinus Ryther
 of 1598, offered to the Medici family.

I have prepared a paper on the Gerard Mercator instruments, but that could be presented at another occasion.

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LIST OF PRESENTATIONS

- (1) Theo Penneman, Catalogue Vande Boucken des Gheleerden ende Wytberoemden Wereld-beschrijver Gerardi Mercators Lugduni Batavorum ex Officina Thomas Basson, published by Mercatorfonds Parisbas, 1994
- (2) Mercator en Zijn Boeken, Mercatormuseum st-Niklaas, 1994
ISBN D 1994/3026/3 – Koninklijke Oudheidkundige Kring van het Land van Waas
- (3) See the correspondence of G. Mercator with Wolfgang Haller p. 116
- (4) Mentions Max Steck : Bibliographie Euclideana + Mauro Folkerts, Hildesheim 1981 editions of Voeglens'Euclid - 10 editions in 25 years :
 1. in 1528 – Wien : Ekementale Geomericum ex Euclidis Geometria Vindolomae
 2. in 1529 – Strasburg : Elementale Geometricum ex Euclidis Geometria
 3. in 1530 – Paris : Elementale Geometricum, together with Thomas Bradwardine
 4. in 1533 – Paris : by the printer Christian Wechel
 5. in 1534 – Paris : by the printer Christian Wechel
 6. in 1534 – Frankfurt : together with J. Wolphius : Rudimentorum Arithmetices
 7. in 1536 – Wittenberg : together with Puerbach's Arithmetica, and preface by Melanchton
 8. in 1539 – Venice : a reprint of the 1536 edition by Nicolini de Sabio
 9. in 1548 – Frankfurt : a new edition
 10. in 1554 – Paris : a new edition
- (5) See Averdunck and Muller Reinhard
- (6) David Eugene Smith : Rara Arithmetia : a catalogue of the Arithmetics written before the year 1601 ..., New York 1970, 4th edition – p. 62
The 1st edition : 1503 in Paris
The 2nd edition : 1507 in Paris
The 3rd edition : 1510 in Paris : G. Mercator – copy
1515 in Köln
1509 + 1510 : edition together with Cr. De Bouelles
- (7) This book was exhibited in the Royal Library in Brussels (2001) p. 136 – 138

« Des Agrimensores Romains aux Arpenteurs du XVIe siècle » Jan De Graeve & Jean Mosselman together with several others also described in my catalogue (2001)

- (8) Sebastian Munster : Rudimenta Mathematica, 1551 Basel by Henricus Petri, March 1551, f° (Zinner 2022) Grewe :
- (9) Sebastian Munster : Cosmographie oder Beschreibung aller Landen ... 1567 Basel, Officina Cenricpedina
Cosmographia Universali – 1st edition in 1544 in Basel by Heinrich Petri (without instruments). There have been many editions but the auction catalogue doesn't mention any date nor location.
- (10) Oronce Fineus : ... Protomathesis opus varium ... (de arithmetica practica – libri 3, de geometria – libri 2, de cosmographia – libri 5, de soloribus horologis et quadrantis – libri 4 ..., Paris 1532, f° - 1st edition
- (11) Oronce Fineus : De Rebus Mathematicis hactenus desideratis libri 4, 1556
- (12) Hieronymo or Girolamo Cardano : De Subtilitate Rerum, 1554 – folio, in Basel by L. Lucius
was first published in 1550, edition of Nürnberg – folio, 390 p.
was published Basel in 1554, 591 p.
later in 1560, in Basel, i 8°
and in 1582, in Basel in folio.
For further reading on Girolamo Cardano, we suggest Markus Fienz, Boston (USA) – ISBN 3-7643-3057-0, 1983
- (13) De Rerum Varietate, is to be considered as the supplement to the previous book, published in Basel in 1557, 8°, 707 p. ; Basel, Henric Petrus
- (14) De Supplemento in Almanach + De Indiciis Genitorarum + De Revolutionibus + De Exemplis Cenerum geriturarum + Aphorismorum astronomicorum liber, 4°, 310 p., Nürnberg, 1547
- (15) Luca Paccioli : Somma de Arithmetica Geometria proporzioni e proporzionalita, 1st published in Venetia by Pagani..... De Paganissis, 10 – 20 November 1494, f°
Another edition appeared in 1523 by the same printer

- (16) Archimedes : ... opera ... omnia primum & Graece & Latine in lucem edita. Adjecta quoque sunt Eutocii ... Commentaria item Graece & Latine, Basel, J. Hervagius, 1544, f°
- (17) Nicolaus Copernicus : De Revolutionibus Orbium Caelestium, libri VI ..., Nürnberg, J. Petreius, 1543, f°
- (18) (V) Vitello : Colocum atque formarum id est naturo, ratione et projectione radiorum visus luninem..... perspectivam vacant, libri X, Nürnberg, 1st edition – 1533, Johannes Petreis, f°
- (19) After long research we are sure it is the 1554 edition as we have recently seen the book offered for auction. We are proud to show you the dedicatium to Gerard Mercator.
Note :unfortunately we could not join this book to our library ...
- (20) First edition of « The Opera » in Paris 1531, and a folio edition in Basel, 1537, mentioned in J. De Lalande « Bibliography Astronomique ».
- (21) Johannes Regiomontanus : De Triangulis omnimundi libri quoque ... Nürnberg, Johannes Petreis, 1533, f°
Has been reprinted by Sandbeck in 1561, 2nd edition

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