



SCIENTIFIC IMPORTANCE OF AHMAD FARGHANI'S SCIENTIFIC HERITAGE IN MEDIEVAL EUROPE (ON THE EXAMPLE OF PUBLISHING HOUSES)

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Article history:	Abstract:
Received: 6 th October 2022 Accepted: 8 th November 2022 Published: 14 th December 2022	In the article studied the first editions of "Kitab fi usul ilm an-nujum" by prominent muslim astronomer Ahmad Farghani in publishing houses located in different cities of Europe. The article is aimed to analyze all editions, for example, translators who made the work possible to read for the European world, printers who published it in own publishing houses, different aspects of medieval printing methods in these editions and so on
Keywords: Ahmad Farghani, "Kitab fi usul ilm an-nujum", Toledo school, Johannes Guttenberg, book printing, publishing house, Andrea Belfortis, Johannes Petreius, Jacob Christmann, Jacob Golius.	

INTRODUCTION

In recent years, research conducted by historians of science confirms that the processes of scientific development that took place in the European region in the Middle Ages are closely related to the scientific heritage created in the Muslim East in the IX-XII centuries.

It should be noted that the interest in this rare scientific heritage in the Arabic language in Europe began in the 12th century in the central cities of the Iberian Peninsula, such as Toledo, Seville, Segovia and Barcelona, which were under the control of Muslims for a long time. One of the scholars whose works have been translated into Latin many times with great interest during this period is Ahmad Farghani.

METHODS AND MATERIALS

Methods such as study and systematization of the history, comparison, summarization of historical data, comparative analysis of scientific views and concepts, principles of impartiality were used.

Today it is well known to many that the book "Kitab fi usul ilm an-nujum" ("Elements of astronomy on the celestial motions") by the great astronomer and geographer, skilled engineer Ahmad Farghani served as one of the fundamental manuals for this science in Europe for a long time.

This work was created around 833 AD and it consists of 30 chapters. The work contains valuable information about the movement of the Sun, the Earth and the stars, the distances between the Earth and other planets, the phenomenon of day and night, the ecliptic, the Earth's meridian, and the phases of the Moon [16: 3-b]. Since the work is written in simple language, it made it much easier to learn basic information about astronomy. Perhaps, the famous Regiomontan realized this feature of the work and chose it as a guide for his university lectures [4: 50-b].

"Kitab fi usul ilm an-nujum" was translated into Latin and Hebrew several times between the 12th and 13th centuries. In particular, the work was translated into Latin for the first time in 1135 by Juan of Seville at the school of Toledo. Juan, who is considered a translator of works on astronomy and astrology, translates the treatise "Kitab fi usul ilm an-nujum" from Arabic into Latin with the title "Rudimentis astronomiae" ("Rudiments of Astronomy") [2: p. 174].

The second translation of the book "Kitab fi usul ilm an-nujum" created at the school of Toledo belongs to Gerard of Cremona. The translation was made in 1175 and was called "De rudimentis astronomiae", that is, "On the basics of astronomy" [2: 178-p].

In addition, in 1231-1235, Jacob Anatoly (1194-1256) translated the work into Jewish under the name "Qizzur Almagesti". This translation, in turn, served as the basis for the third Latin translation of the work by Jacob Christmann (1554-1613) [15: 252-b].

It should be noted that one of the important inventions of the European Renaissance was the creation of printing equipment. In the years 1445-1447, Johann Guttenberg, whose original name was Henne Gensfleisch von Zulgeloh, began regularly printing books in Mainz, Germany [1: p. 139]. As a result of Guttenberg's invention, publishing houses began to appear in many European cities. The above-mentioned translations of Ahmad Farghani's

works were also published several times in the form of books in European publishing houses in the 15th-17th centuries.

RESULTS OF RESEARCH

In this article, based on the results of the analysis of sources and scientific literature related to the history of European publishing houses, it is aimed to analyze the editions of the work "Kitab fi usul ilm an-nujum" written by Ahmed Farghani in the continent.

Ferrara is the European city where the first edition of the work in Latin was published, where the first publishing house started its activity in the 70s of the 15th century. A publishing house was first established in 1471 by Andrea Belfort (lat. Andrea Belfortis), a native of France, in this city located in the north-east of Italy [13: 21-b]. The work "Isagogicus libellus" by the Italian scientist Agostino Dati (1420-1478) is recognized as the first published work [11: 378-p.]. After that, more than 10 works were published here in the form of books, in particular, in 1493 Ahmad Fargani's "Kitab fi usul ilm an-nujum" under the title "Breuis ac peritulis compilatio Alfragani astronomorum pertissimi totum it continens quod ad rudimenta astronomica est opportunum" ("Controversies concerning the Doctrine of Alfraganus on Elements of Astronomy"). This edition was based on the Latin translation of the work by Juan of Seville.

The Ferrara edition of Ahmed Farghani's work was not very large in size and quantity. The number of pages is 65, and the book cover is made of brown thick paper. In the center of the first page there is a picture of the emblem of the publishing house. Book pages are not clearly numbered. Important terms or phrases that the reader should pay attention to are underlined in red.

One of the unique features of this publication is that it not only contains complex astronomical and mathematical tables, but also comments on these tables in plain text, helping the reader to understand the difficult information in the book. Along with the comments written on the "Almagest" of the Greek scholar Claudius Ptolemy, the work also contains scientific news related to Farghani personally. On one of the first pages of the book, the portrait of Farghani, made by the famous artist of that time, Tura Cosimo (1430-1495), makes this publication even more unique.



Ahmad Farghani and European man. Ferrara, 1493

The digital copy of the Ferrara edition of "Kitab fi usul ilm an-nujum" can be found on the websites of the Bavarian State Library (Bayerische Staatsbibliothek)¹ and the Austrian National Library (Österreichische Nationalbibliothek)².

"Kitab fi usul ilm an-nujum" was republished for the second time in 1537 in Nuremberg, Germany, by the famous publisher Ioan Petraeus (lat. Johannes Petreius) under the name "Rudimenta astronomica Alfragani" ("Rudiments of Astronomy"). I. Petraeus, who lived in the years 1497-1550, studied in Basel, Switzerland, and started working as a publisher in Nuremberg from 1524. The first book published under his editorship was "Determinatio facultatis theologiae Parisiensis super alicjuibus propositionibus" by Guillaume Farel (1489-1565) [12: p. 12]. I. Petreus left an important mark in history as the publisher who first published the work of Nicolaus Copernicus "De revolutionibus orbium coelestium" ("On the Revolutions of the Heavenly Spheres") in 1543, which had an essential role in the development of science not only in Europe but also in the whole world [12: 96- b].

In addition to Farghani's work, this edition includes an unnamed work on the field by another great medieval Eastern astronomer, Abu Abdullah Muhammad ibn Jabir al-Battani (858–929), and the comment by the German astronomer Regiomontanus (1436–1478) on Euclid's "Elements".

As mentioned above, the number of pages in the book is more than the previous edition of Ferrara, i.e. 258, since this edition includes other works besides "Elements of Astronomy". In addition, for the first time, page numbers were written in the upper right corner of book pages. However, when paginating a book, publishers assign a single number to the two pages that are open to the reader without numbering each of them separately. For this reason, Farghani's work is included in the publication on pages 3-26.

Another aspect that distinguishes the Nuremberg edition from the Ferrara edition is that the name of the city, which the publishing house located, and the year of publication was given on the first page of the book. The words "Nuremberge anno MDXXXVII" written at the bottom of the page were the basis for reaching such a conclusion [6: 5-b]. Also, another important aspect of this publication is that on the page where Farghani's work ends, as on the first page, after the word "Nuremberg" below, the name of the publisher John Petraeus is written as "Ioh. Petreium», followed by the year of publication [6: 26-b]. The name of the publisher was recorded for the first time in the Nuremberg edition [16: 9-p].

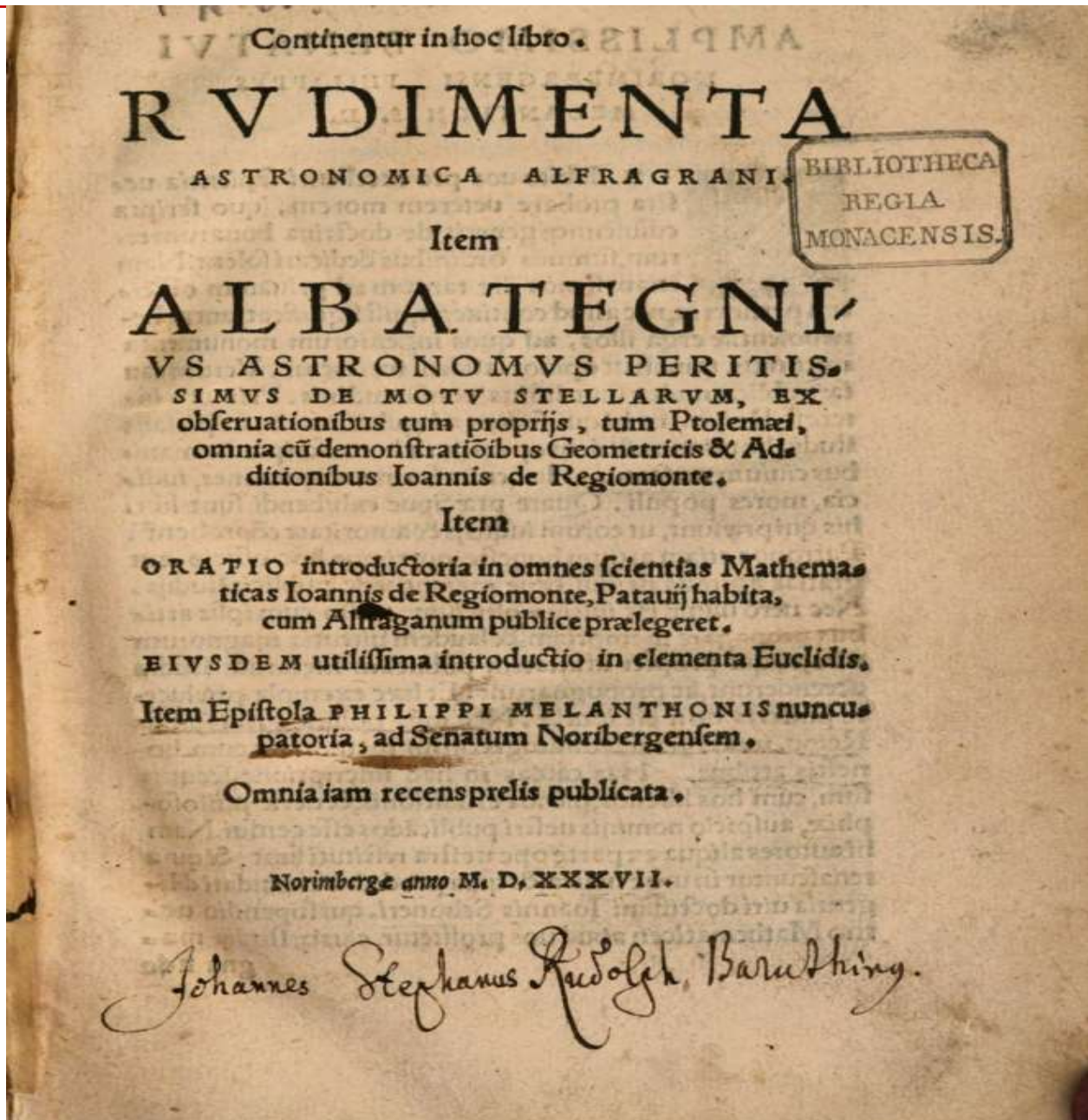
A digital copy of the Nuremberg edition is available on the websites of the Bavarian State Library³ and the Austrian National Library⁴.

¹<https://daten.digitalesammlungen.de/0006/bsb00065201/images/index.html?id=00065201&groesser=&fip=eayaqrsweayaewqyzts eayaewqxseayaeyaw&no=1&seite=3>

² https://digital.onb.ac.at/RepViewer/viewer.faces?doc=DTL_6822289&order=1&view=SINGLE

³<https://reader.digitale-sammlungen.de/resolve/display/bsb10151849.html>

⁴http://digital.onb.ac.at/OnbViewer/viewer.faces?doc=ABO_%2BZ179828707



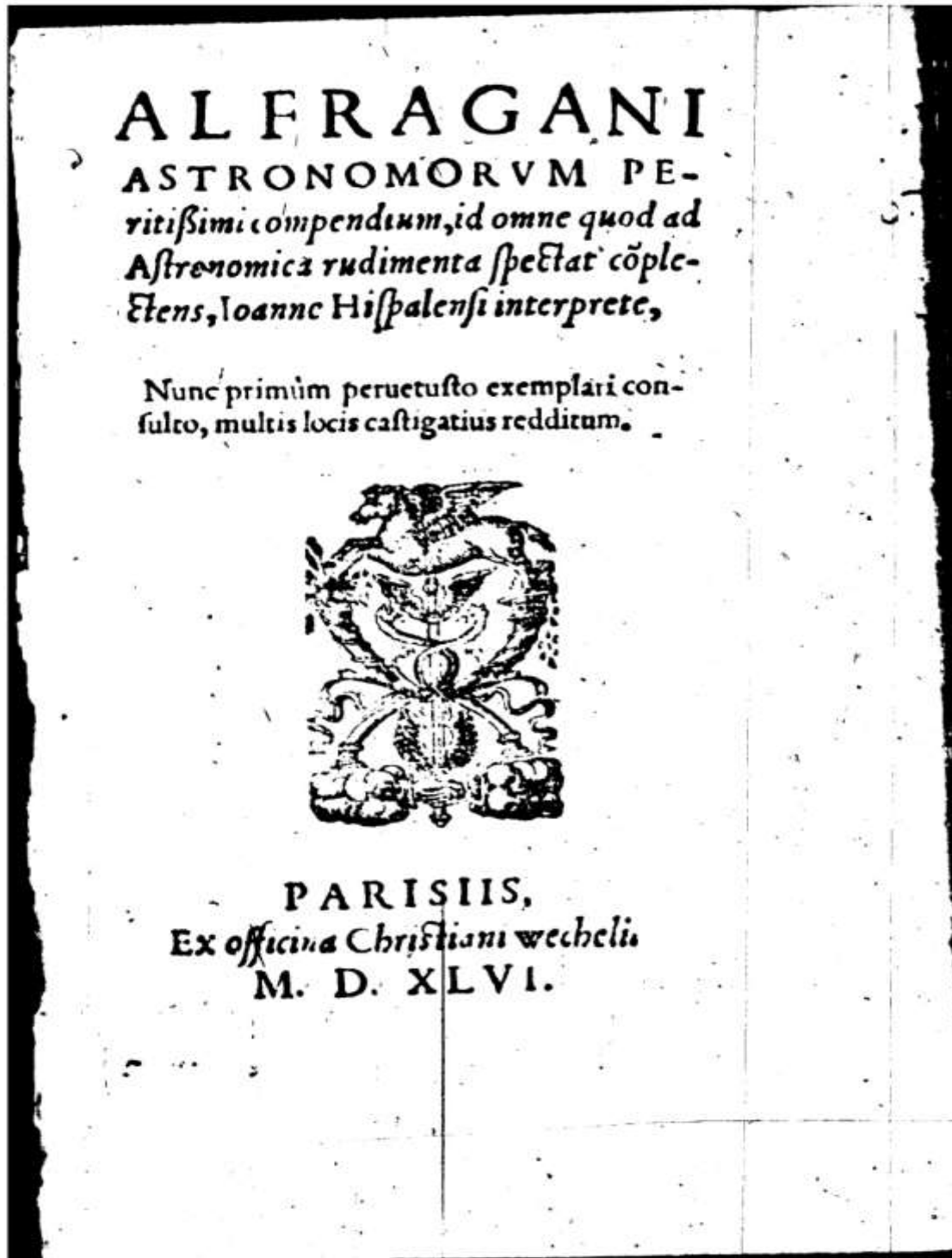
The title page of Nuremberg edition, 1537.

After Nuremberg, "Kitab fi usul ilm an-nujum" was published for the third time in Paris, the capital of France, in 1546, under the title "Alfragani astronomorum pertissimi compendium, id omne quod ad Astronomica rudimenta spectat complectens, Ioannis Hispalensi interprete, nunc primum peruetusto exemplari consulto, multis locis castigatus redditum". The Paris edition was printed by the publishing house of Christiani Wecheli, but information about the publisher(s) who made this edition is not recorded in the book itself, nor in historical sources and literature. The book consists of 111 pages, and for the first time in this edition, all pages are numbered individually and are located in the upper left corner of the pages.

Another important aspect of the Paris edition is that the name of Juan from Seville, the translator who translated Ahmad Farghani's work into Latin for the first time, is mentioned in the title page of the book in the form of "Ioannis Hispalensi" [16: 9-b]. The word "Hispalensi" that appears here was originally interpreted as "Hispanic". However, as a result of the scientific research conducted by Doctor of Philosophy (Ph.D.), Associate Professor O. V. Mahmudov on the topic of "Study of the Scientific Heritage of Oriental Scholars in Medieval European Translation Centers", it was determined that the phrase "Hispalensi" means Sevillian. According to him, many historians of the East and the West have made the above confusion due to the later shortened variants of the names of the two translators, i.e. Hispalensis / Hyspalensis / Yispalensis (Sevillian) and Hispanus / Hyspanus / Yispanus (Hispanic) as "Hisp", "Hysp" or "Yisp" style and the name Johannes / Hohannes (Juan) as "H". It was not easy to determine who the name "H.Hisp", "H.Hysp" or "H.Yisp" or "H" belongs to (Juan from Seville or Spain) [2: p. 175].

A digital copy of the Paris edition is available on the official website of the National Library of France (Bibliothèque Nationale De France)⁵.

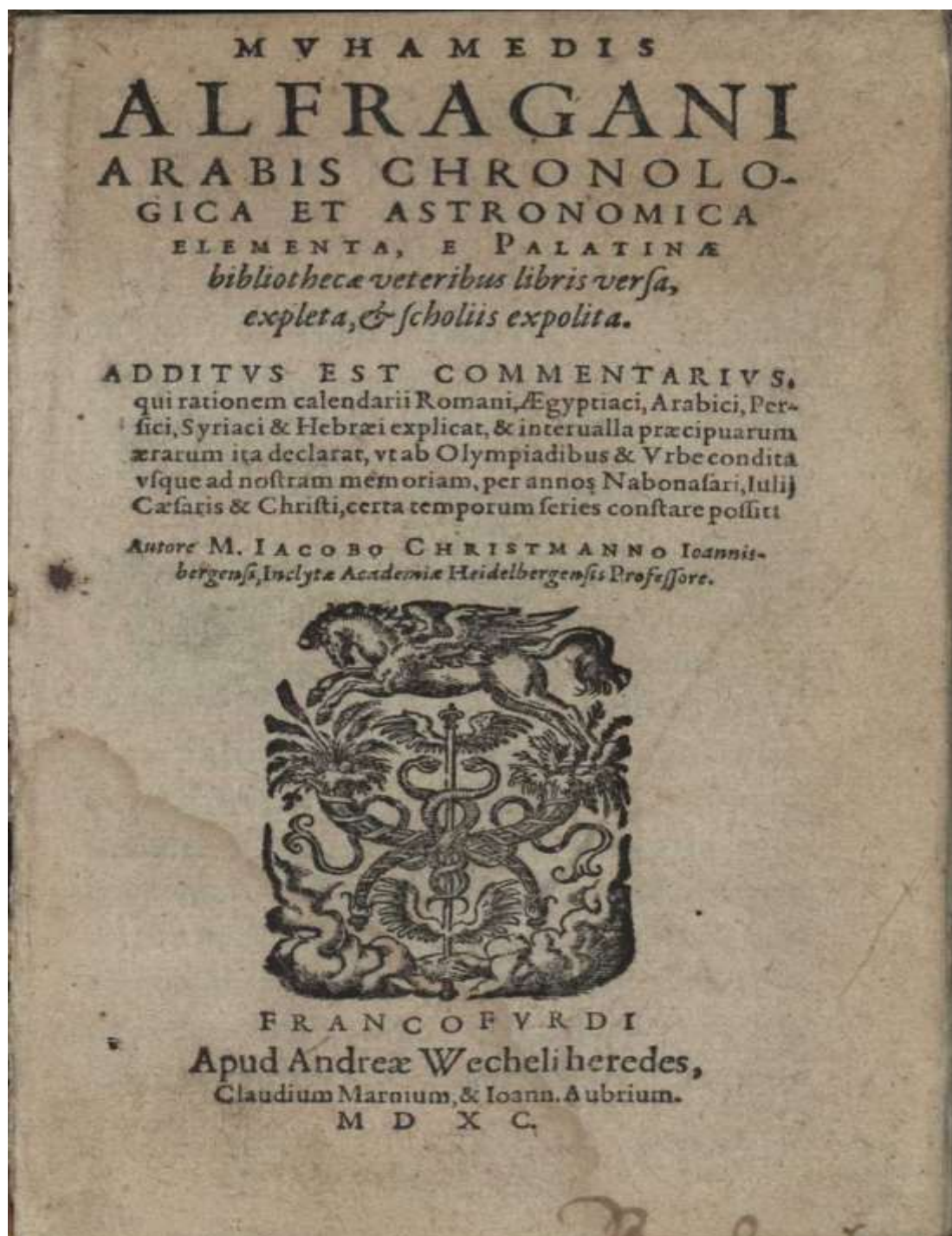
The next fourth edition of "Kitab fi usul ilm an-nujum" was published in Frankfurt (Germany) in 1590 by the publishers Claudius Marnium and Ioann Aubrium in the publishing house of Andrea Vecheli. Published under the title "Muhammedis Alfragani Arabis Chronologia et astronomica elemental" ("Elements of Astronomy and Arabic Chronology by Muhammad Alfragani"). This publication was based not on the Latin translation of Juan of Seville, but on the Hebrew translation made by Jacob Anatoly in 1231-1235, as it was mentioned above. That is, based on this Jewish translation, the German Heidelberg University professor Jacob Christmann translated the work into Latin and it was published in 1590.



The title page of Paris edition, 1546.

⁵<https://gallica.bnf.fr/ark:/12148/bpt6k53531c?rk=21459;2>

The book consists of 587 pages, in which, in addition to "Elements of Astronomy", Jacob Christman's commentary on Farghani's work is included. In the Frankfurt edition, after Ferrara, we can see the emblem of the publishing house reflected in the title of the publication for the first time.



The title page of Frankfurt edition, 1590

The name of the translator and publishers, the name of the publishing house, and the year of publication are also mentioned on this page. In addition, it should be noted that at the end of this publication there are alphabetical explanations of important terms and phrases. The digital copy of the Frankfurt edition is available on the official websites of the World Digital Library⁶, the Austrian National Library⁷, and the Bavarian State Library⁸.

The translation and commentary of Ahmad Farghani's work by Jacob Christmann was published again in 1618 in Frankfurt under the same title by the publishing house of Andrea Cambieri (lat. Andrea Cambieri). Although this edition does not differ from the one of 1590 in any way, but the emblem of the publishing house of Andrea Camberis

⁶<https://www.wdl.org/ru/item/10669/#q=alfragani&q1a=ru>

⁷http://digital.onb.ac.at/OnbViewer/viewer.faces?doc=ABO_%2BZ179885806

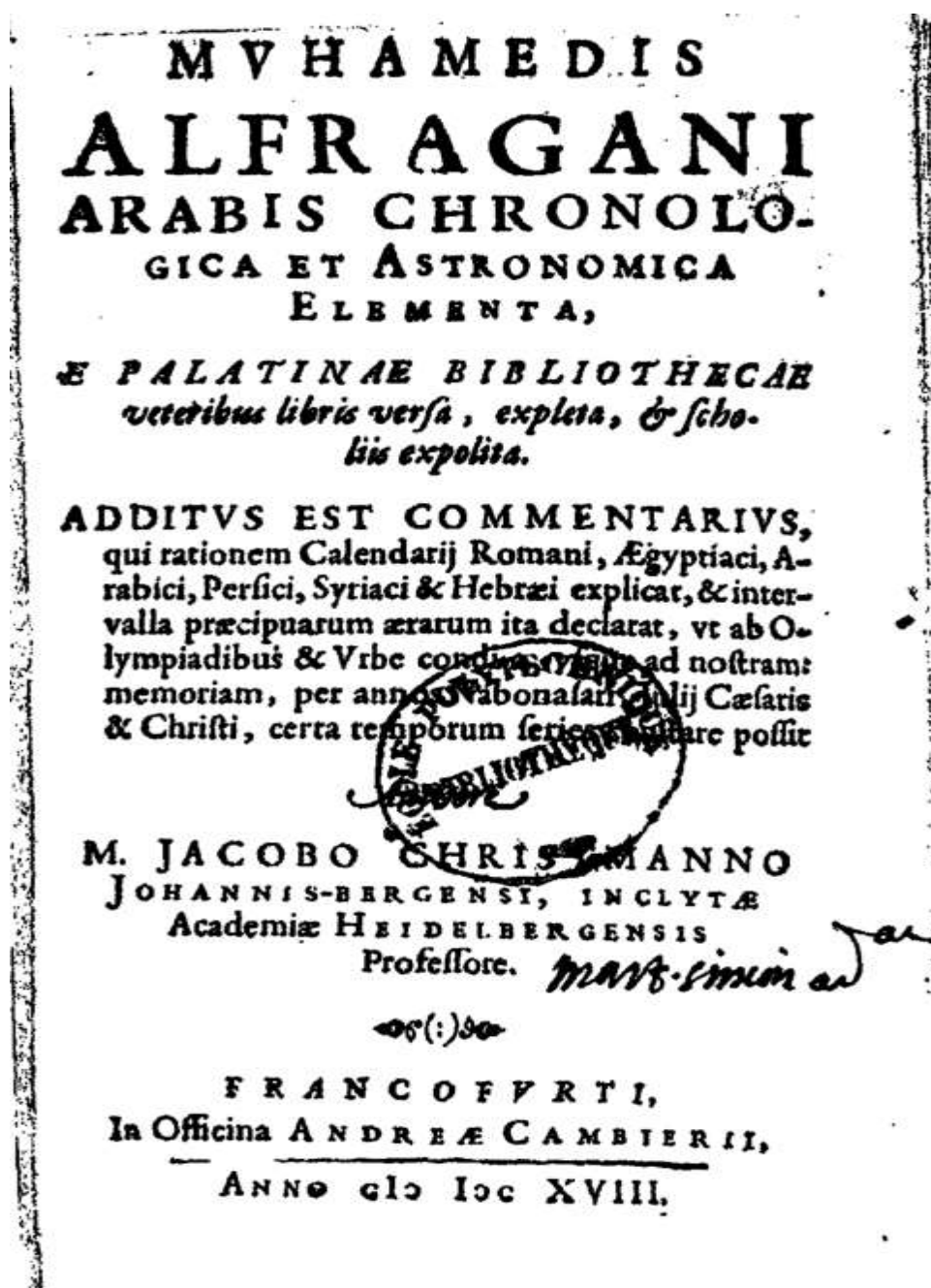
⁸<https://www.digitale-sammlungen.de/en/view/bsb10172710?page=6,7>

not shown in the title page, instead the symbol of the publishing house of Andrea Vecelli is depicted on the last page. So, it can be concluded that there was a close cooperative relationship between the two publishing houses.

The digital copy of this publication is posted on the official website of the National Library of France⁹ and can be viewed by those interested.

In 1669, Ahmed Farghani's work "Kitab fi usul ilm an-nujum" was published in Europe for the sixth time after Guttenberg's invention. The translation of the work into Latin by the Dutch orientalist Jacob Golius (lat. Jacobus Golius or Jacobi Golii) became the basis for the Amsterdam edition.

But for many years Jacob Golius was interpreted as the publisher who made this publication, and a partial mistake was made. In particular, in the 2nd volume of the 11-volume Encyclopedia of Islam published in 1986-2002 under the auspices of the International Union of Academies, it is erroneously stated that a Dutch scientist edited the Arabic text and published under the title "Muhammedisfit. Ketiri Ferganensis, qui vulgo Alfraganus dicitur, Elementa astronomica, Arabice & Latine" ("Fergani's Elements of Astronomy") [14: p. 793]. Historian scientist O. V. Mahmudov also studied the issue in his scientific research.



The title of Frankfurt edition, 1618.

⁹<https://gallica.bnf.fr/ark:/12148/bpt6k961027.r=Muhammedis%20Alfragani%20Arabis%20Chronologia?rk=257512;0>

According to him, the reason for this misunderstanding is the phrase "Opera Jacobi Golii" in the title of the publication. Based on this sentence, the researcher introducing the above information for the first time into scientific discourse, without being personally familiar with the information about Jacob Golius (or Jacob van Gaul) who lived in 1596-1667, wrote "Kitab fi usul ilm an-nujum" by Ahmad Farghani, Jacob Golius in 1669 published in Amsterdam" [3: 220-b]. However, Johannes Janson van Wesberg and Eliza Weirstret were the publishers who published the Amsterdam edition of "Kitab fi usul ilm an-nujum". This is indicated in the lower part of the title page as "Amstelodami, Apud Johannem Jansonivm á Waasberge & Viduam Elizei Weyerstraet, 1669." [3: 220-b].

So, how is this edition different from the previous ones? First of all, in this edition, for the first time, along with the Latin translation of Ahmad Farghani's work, his Arabic text also appeared on the pages of the book. Of the total 565 pages, 109 pages were in Arabic, and 306 pages were in Latin. Secondly, in the 1669 edition, a situation that was not observed in the previous five editions is noticeable, that is, the contents of the work were included in the book by the publishers for the first time. Thirdly, some changes were made to the cover of the book. As in previous editions, the cover was not just a blank piece of paper. Maybe now it is filled with various patterns and decorations made of different colors. Fourthly, it is noteworthy that the publication year was expressed in Arabic numerals, not in Roman numerals, for the first time in the Amsterdam edition.

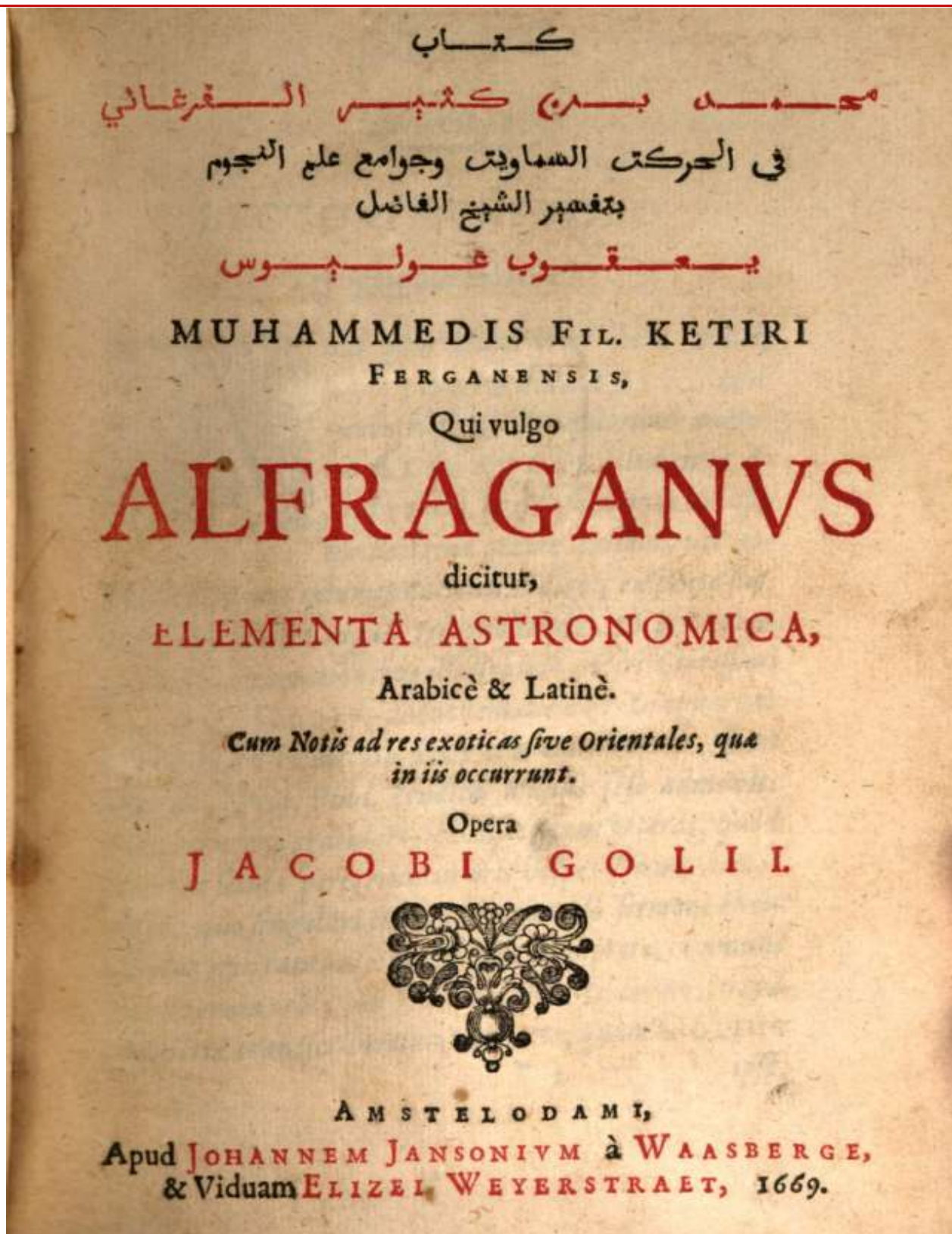
A digital copy of the Amsterdam edition can be found on the official websites of the World Digital Library¹⁰ and The Internet Archive¹¹.

CONCLUSION

In conclusion, Ahmad Farghani's work served as an important fundamental source for the study of astronomy in Europe during the Middle Ages. For this reason, it was translated several times into European languages, and it was published six times in different cities of Europe during a little more than 200 years after the advent of printing on the continent. Professors of European universities directly addressed him in lectures to students. European astronomers studied this work in depth and developed their new scientific ideas and teachings based on it. These aspects mean that the development of astronomy in the region during the European renaissance was in many ways closely related to the scientific legacy of Ahmad Farghani.

¹⁰<https://www.wdl.org/ru/item/10687/>

¹¹https://archive.org/details/bub_gb_OvWTSYvB0TYC



The title page of Amsterdam edition, 1669.

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