



Summary :

Astronomical work of George Chrysokokkes, written in 1347. It is the book that made Persian astronomy popular in the Byzantine Empire and then in the West. It became quite popular both in the period it was written and later, as indicated by its numerous manuscript copies preserved so far.

Date

1347

1. Historical Background and Editions

One of the most important and most well-known astronomical works of the 14th century was written by the physician and scholar [George Chrysokokkes](#). It was the *Introduction to the Syntaxis of the Persians*, as it is known. The full title is usually referred to as "George Chrysokokkes physician's introduction to the Syntaxis of the Persians, to his brother Ioannes Charsianites". Ioannes Charsianites was the founder of the monastery of Charsianites in Constantinople and must have had a close relationship with Chrysokokkes.

The *Introduction to the Syntaxis of the Persians*, written in 1347, became extremely popular in the Byzantine Empire, mainly in Constantinople, as well as in the West, while it continued to be copied for a long time after the Ottoman occupation (in the Greek world, in particular, it was still being copied during the 19th century). Its numerous copies, dozens of which have survived in manuscript, are a strong evidence of its popularity. However, few copies have preserved the full text. One of them is the Parisian Codex 2461 of Bibliothèque Nationale, which includes the full text and the astronomical tables of Chrysokokkes, and was copied in the 15th century, as well as two Codexes of the Old Library in Venice, one of them (cod.marc.gr 327) including a note of its proprietor, Cardinal [Bessarion](#).¹ Other known manuscripts, lacking the prologue and thus considered unfinished, are at the Metochion of the Holy Sepulchre (Cod. 700 of the 15th century), at the Old Library of Venice (Cod.marc.gr VI.9)² and at the monastery of Dionysios on Mt. Athos (Cod.324).³

The work has not been fully published yet. In 1645 the French mathematician and astronomer Ismael Boulliau 1605-1694)⁴ published for the first time the prologue in Paris, while the prologue was published for a second time, along with the first chapters, by H. Usener in 1912-1913.⁵ The prologue was also published by Spyridon Lambrou in 1921,⁶ while the tables have been published separately by P. Kunitzsch.⁷ Some other chapters have been annotated by Philippe Dachy, who was based on Code Vat.gr. 210.⁸

The publication of the *Introduction* was delayed in comparison with other works of the same period and it seems to be a rather arduous task; the reason is the great number of manuscripts preserved. There are at least thirty of them, according to the last count, and even more may be found. Because several manuscripts are attributed to Isaac Argyros, the identification of the full text becomes even more difficult. In recent years there has been an attempt at publishing the work as part of the series "Corpus des Astronomes Byzantins".

2. Content

With his *Introduction to the Syntaxis of the Persians*, George Chrysokokkes actually introduced Persian astronomy to the 14th-century Byzantine Empire and the West. It was a period when Byzantium bitterly criticised the work of Ptolemy, which seemed to fall short of astronomical calculations. As a result, the circumstances were suitable for turning to other astronomical traditions and methods of calculation. One of them was the Persian method, which George Chrysokokkes was going to spread through his work.

The work consists of the prologue, 51 chapters and the astronomical tables. The astronomical tables of the *Introduction* are based



on Zij-I Ilkhani,⁹ the work of Nassir al-Din Al-Tousi, the most important astronomer from the observatory of Maraga, written circa 1270. The tables of Al-Tousi had recently been taken to Trebizond by Gregory Chioniades, who had also translated them. Chrysokokkes actually adapted the tables of Zij-I Ilkhani to the standards of Constantinople and explained their use by means of his *Introduction*.

The pattern of the content is as follows: the introduction recites the headings of the following chapters, according to the pattern of scientific works of Late Antiquity. The first chapters are dedicated to calendar questions, while the subsequent chapters study the motions of the Sun, the Moon and the five then known planets (Saturn, Mars, Venus, Jupiter, Mercury). Some chapters are dedicated to the eclipses of the Sun and the Moon, a subject that preoccupied particularly those who studied astronomy in the 14th century.¹⁰ The last part includes chapters dealing with astrological matters, such as drawing astrological charts and finding the horoscope. The way the position of celestial bodies are calculated facilitates both the drawing of astrological charts and calendar calculations, such as finding the exact date of Easter. Some characteristic headings are: 'Finding a bissextile year', 'The passage of the Moon from sign to sign', 'Culminating signs'.

In terms of methodology, the work follows the principles of the astronomical texts written after Claudius Ptolemy: it starts with definitions, then the elaboration on the subject follows and, at the end of each chapter, there is an example for better understanding. The examples used by Chrysokokkes mainly refer to the year 1346, a proof that the text was written in 1347.

However, the *Introduction* includes some methodological mistakes resulting in considerable variances in calculations. Based on the tables of Al-Tousi and without having the relative text, Chrysokokkes made some mistakes. For example, he wrongly supposed that the first meridian (72° east) passed by a non-existent city he called Tybene, while he implemented Ptolemaic and Persian formulas at the same time, etc.

3. Evaluation

As mentioned above, the *Introduction to the Syntaxis of the Persians* became very popular. Despite the methodological mistakes of Chrysokokkes, the use of the Persian rules was easier than the use of the respective Ptolemaic ones, since the work aimed at practical use. This is indicated by the lack of elements considered unclear, such as trigonometric functions. One of the reasons why the work became so important is the fact that it was written in a period when the observatory of Maraga was closed. Therefore, the *Introduction* acted as the European prolongation of the astronomical tradition of Maraga.

In addition, in the next years the *Introduction* was followed by a series of books on Persian astronomy, directly influenced by the particular work. One of them was the third volume of the [Three Books on Astronomy](#) by [Theodore Meliteniotes](#), which was released as an independent text titled *Paradosis eis tous persikous proxeirous kanonas (Tradition in the Persian Rough Tables)* and was attributed to Chrysokokkes until recently. Another work directly connected with the *Introduction*, which seems to simplify its tables, was found in Cyprus and must have been written shortly after Chrysokokkes' work.¹¹

The work of Chrysokokkes holds an important place among the Byzantine astronomical books that became popular in the West. It is worth mentioning that two of its copies are among the Codices that Cardinal Bessarion possessed and bequeathed to Venice so that they would become the core of the Old Library in Venice (also called the Library of St. Mark's or the National Marcian Library).

1. Λούκου, Δ., 'Δύο χειρόγραφα περσικής αστρονομίας της συλλογής του Βησσαρίωνα', in Βλαχάκης, Γ.Ν. – Νικολαΐδης, Θ. (edit.), *Βυζάντιο-Βενετία-Νεώτερος Ελληνισμός. Μια περιπλάνηση στον κόσμο της επιστημονικής σκέψης* (Athens 2004), pp. 159-167.

2. Papathanassiou, M., 'An anonymous astronomical treatise in Cod. Marc. Gr. VI.9 identified', *Θησαυρίσματα* 22 (Venice 1992), pp. 372-379.



3. Καρράς, Γ., *Οι επιστήμες στην Τουρκοκρατία Β'* (Athens 1993).
4. Bullialdus, I., *Astronomia Philolaica* (Paris 1645).
5. Usener, H., 'Ad historiam astronomiae symbola', *Kleine Schriften* 3 (Lipsiae 1912-1913, republ. Osnabruck 1965).
6. Λάμπρου, Σ., 'Τα υπ' αριθμόν Α και Β κατάλοιπα', *Νέος Ελληνομνήμων* 15 (Athens 1921), pp. 332-336.
7. Kunitzsch, P., 'Das Fixsternverzeichnis in der Persischen Syntaxis des Georgios Chrysokokkes', *Byzantinische Zeitschrift* 57 (1964), pp. 382-411.
8. Dachy, Ph., *La Syntaxe Perse de Georges Chrysococcès (Chapitres 14, 15, 16, 31, 32, 33, 34, 35, 43, 48)*, (Mémoire (inédit), Faculté de Philosophie et Lettres, Université Catholique de Louvain 1968).
9. Mercier, R., 'The Greek *Persian Syntaxis* and the Zij-I Ilkhani', *Archives Internationales d'Histoire des Sciences* 34 (1984), pp. 34-60. D. Pingree expresses reservations in 'Gregory Choniades and Palaeologian astronomy', *Dumbarton Oaks Papers* 18 (1964), pp. 144-145, supporting that the work is based on *Zij al-Alai* written in 1176.
10. As for the eclipses, see Κατσιαμπούρα, Γ., 'Νικηφόρος Γρηγοράς εναντίον Βαρλαάμ Καλαβρού: Διαμάχη με ένδυμα την πρόβλεψη εκλείψεων στο Βυζάντιο του 14ου αιώνα', *Νέσις* 13 (2004), pp. 138-148.
11. Tihon, A., 'Un traité astronomique chypriote du XI^e siècle I', *Janus* 64 (Amsterdam 1977), pp. 279-308; Tihon, A., 'Un traité astronomique chypriote du XI^e siècle II', *Janus* 66 (Amsterdam 1979), pp. 49-81; Tihon, A., 'Un traité astronomique chypriote du XI^e siècle III', *Janus* 68 (Amsterdam 1981), pp. 65-127.

Bibliography :

	Pingree D. , "Gregory Choniades and Paleologan Astronomy", <i>Dumbarton Oaks Papers</i> , 18, 1964, 133-160
	Νικολαΐδης Θ. , "Η έκδοση της 'Συντάξεως περσικής Αστρονομίας' του Γεωργίου Χρυσοκόκκη", <i>KNE/EIE, Οι επιστήμες στον ελληνικό χώρο</i> , Αθήνα 1997, 135-141
	Νικολαΐδης Θ. , "Οι επιστήμες στο Βυζάντιο. Η ιστορική παράδοση του νεότερου ελληνοισμού", Καράς, Γ. (επιμ.), <i>Ιστορία και φιλοσοφία των επιστημών στον ελληνικό χώρο</i> , Αθήνα 2003, 26-44
	Λούκου Λ. , "Δύο χειρόγραφα περσικής αστρονομίας της συλλογής του Βησσαρίωνα", Βλαχάκης Γ.Ν., Νικολαΐδης Θ. (επιμ.), <i>Βυζάντιο-Βενετία-Νεώτερος Ελληνοισμός. Μια περιπλάνηση στον κόσμο της επιστημονικής σκέψης</i> , Αθήνα 2004, 159-167
	Mercier R. , "The Greek 'Persian Syntaxis' and the Zij-I Ilkhani", <i>Archives Internationales d'Histoire des Sciences</i> , 34, 1984, 34-60
	Papathanassiou M. , "An anonymous astronomical treatise in Cod. Marc. Gr.VI.9 identified", <i>Θησαυρίσματα</i> , 22, 1992, 372-379
	Καρράς Γ. , <i>Οι επιστήμες στην Τουρκοκρατία Β'</i> , Αθήνα 1993
	Γεώργιος Χρυσοκόκκης , <i>Synopsis tabularum persicarum ex syntaxi Persarum Georgii medici Chrysococcae</i> , Ismael Bullialdus (ed.), <i>Astronomia Philolaica</i> , Paris 1645



	Usener H. , "Ad historiam astronomiae symbola", Usener H. (επιμ.), <i>Kleine Schriften 3</i> , Osnabruck 1965
	Kunitzsch P. , "Das Fixsternverzeichnis in der 'Persischen Syntaxis' des Georgios Chrysokokkes", <i>BZ</i> , 57, 1964, 382-411
	Λάμπρος Σ. , "Τα υπ' αριθμόν Α και Β κατάλοιπα", <i>Νέος Ελληνομνήμων</i> , 15, 1921, 332-336
	Κατσιαμπούρα Γ. , "Νικηφόρος Γρηγοράς εναντίον Βαρλαάμ Καλαβρού: Διαμάχη με ένδυμα την πρόβλεψη εκλείψεων στο Βυζάντιο του 14ου αιώνα", <i>Νεύσις</i> , 13, 2004, 138-148
	Tihon A. , "Un traité astronomique chypriote du XI ^e siècle I", <i>Janus</i> , 64, 1977, 279-308
	Tihon A. , "Un traité astronomique chypriote du XI ^e siècle II", <i>Janus</i> , 66, 1979, 49-81
	Tihon A. , "Un traité astronomique chypriote du XI ^e siècle III", <i>Janus</i> , 68, 1981, 65-127
	Dachy P. , <i>La Syntaxe Perse de Georges Chrysococcès (Chapitres 14, 15, 16, 31, 32, 33, 34, 35, 43, 48)</i> , Faculté de Philosophie & Lettres, Univ. Cathol. de Louvain, Louvain 1968

Webliography :

Τραπεζούντα, Ανάπτυξη θετικών επιστημών
<http://www.fhw.gr/choros/trapezounda/gr/webpages/501.html>

Quotations

Chrysokokkes referring to his teacher Manuel:

Ἐπειδὴ κατὰ τιν' ἀγαθὴν τύχην καὶ αὐτὸς τὰ τῆς ἰατρικῆς παιδεύομενος, τοῖς τούτων συγγράμμασιν ἐντυχόν, καὶ ἰδὼν ὅσον εἰς ἰατρικὴν τὸ χρήσιμον ἐκ τῆς καταλήψεως τῶν πλανωμένων κινήσεως, παρὰ μὲν τῷ Τραπεζουντίῳ ἐκείνῳ ἱερεὶ τῶ ἡμῶν διδασκάλῳ, σπεύσας, ὥσπερ οἶσθα, μεμάθηκα.

Dachy, Ph., *La Syntaxe Perse de Georges Chrysococcès (Chapitres 14, 15, 16, 31, 32, 33, 34, 35, 43, 48)*, (Mémoire (inédit), Faculté de Philosophie et Lettres, Université Catholique de Louvain 1968), p. 64

Auxiliary Catalogues

Partial publications of the work *Introduction to the Syntaxis of the Persians*

Bullialdus, I., *Astronomia Philolaica* (Paris 1645)

Usener, H., 'Ad historiam astronomiae symbola', *Kleine Schriften 3* (Lipsiae 1912-1913, republ. Osnabruck 1965).

Kunitzsch, P., 'Das Fixsternverzeichnis in der Persischen Syntaxis des Georgios Chrysokokkes', *Byzantinische Zeitschrift* 57 (1964), pp. 382-411.

Λάμπρου, Σ., 'Τα υπ' αριθμόν Α και Β κατάλοιπα', *Νέος Ελληνομνήμων* 15 (Athens 1921), pp. 332-336.

Philippe, D., *La Syntaxe Perse de Georges Chrysococcès (Chapitres 14, 15, 16, 31, 32, 33, 34, 35, 43, 48)*, (Mémoire (inédit), Faculté de Philosophie et Lettres, Université Catholique de Louvain 1968), p. 64.