# CLAUDIO PTOLOMEO

# *GEOGRAFÍA*
# (Capítulos teóricos)

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# Geografía
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La presente edición de la *Geografía* de Ptolomeo, fue realizada en el marco del proyecto PAPIIT IA400513: "La *Geografía* de Ptolomeo y la construcción de la idea renacentista de mundo: transmisión, traducción e interpretación en los siglos XV y XVI".

Primera edición: 2018
12 de febrero de 2018


Ciudad Universitaria, Delegación Coyoacán,
C. P. 04510, Ciudad de México.

ISBN **978-607-30-0005-5**



Impreso y hecho en México

# SOME NOTES ON THE TRADITION OF THE DIAGRAMS (AND THE MAPS) IN PTOLEMY'S *GEOGRAPHY*

Renate Burri

## 1. GRAPHICACY[1] AND REPRODUCTION

The careful study of diagrams[2] in illustrated manuscript texts can be extremely illuminating: it not only contributes, of course, to a better understanding of a certain text, but also sheds light on the history and the tradition of the text in question as well as on the history of the manuscripts containing and handing down this text, and hence on the stemmatology of these manuscripts. Never-

This article goes back to a paper given at the International Conference "Early Medieval Graphicacy in a Comparative Perspective" at the University of Oslo (June 2016). Some aspects of this essay were first presented at international conferences at the University of Haifa ("Cultural Exchanges between Byzantium, East and West in the Late Byzantine World", May 2012) and at the University of Hamburg (VIIIème Colloque International de Paléographie Grecque, September 2013). I wish to express my thanks to the organizers and participants of these conferences for their interest and for inspiring discussion. I am also very grateful to Stella Chrysochoou for her precious remarks and suggestions on this article. Alfred Stückelberger most generously allowed me to reuse two figures (fig. 1 and 3) that base on illustrations designed for the edition of Ptolemy's *Geography* co-edited by him (Klaudios Ptolemaios, *Handbuch der Geographie*, ed. by Alfred Stückelberger/Gerd Graßhoff [Basel 2006] vol. I, 122 [fig. 1a] and 134 [fig. 4a]; these illustrations were kindly edited by Peter Burri and printed for the first time in Renate Burri, *Die 'Geographie' des Ptolemaios im Spiegel der griechischen Handschriften* [Berlin/Boston 2013] 590 [fig. 3] and 593 [fig. 6]). Finally, my sincere thanks goes out to René Ceceña Álvarez for inviting me to contribute to this volume and to William Croall for revising my English.

1 Graphicacy designates the skill to 'read' and to understand or to draft a graphical representation of information. For a more detailed explanation of the term and an overview of its history see Ildar Garipzanov, "The Rise of Graphicacy in Late Antiquity and the Early Middle Ages", *Viator* 46,2 (2015) 1–21, at 1–3.

2 By the term 'diagram' it is to be understood as any kind of graphical representation, in accordance with its etymology (τὸ διάγραμμα = figure marked out by lines, geometrical figure; see Henry George Liddell/Robert Scott/Henry Stuart Jones, *A Greek-English Lexicon* [Oxford 1996] s.v.; see also Charles Mugler, *Dictionnaire historique de la terminologie géométrique des grecs*, vol. I [Paris 1958] s.v.). For more specific definitions see André Allard, *Maxime Planude, Le grand calcul selon les indiens. Histoire du texte, édition critique traduite et annotée* (Louvain-la-Neuve 1981) 244 (where the term figures within a "Lexique des termes grecs mathématiques"): "figure contenant des chiffres (synonyme de καταγραφή)"; Reviel Netz, *The Shaping of Deduction in Greek Mathematics. A Study in Cognitive History* (Cambridge 1999) 35–38.

theless, the *close reading* of diagrams in illustrated manuscript texts has long been neglected. This aspect of analyzing a text and its tradition has only recently become popular among scholars.[3]

Ptolemy's *Geography* is a productive study subject for this method.[4] The chapters on map projections in the theoretical parts of this work[5] are provided with a set of originally five diagrams: four diagrams in *Geogr.* I,24 and one diagram in *Geogr.* VII,6. They are meant to illustrate the complex instructions on how to draw the three projection methods suggested by Ptolemy for tracing a world map or, more precisely, a map of the *oikoumene*: of the inhabited parts of the world then-known.[6]

3 See, e.g., Netz 1999, *The Shaping of Deduction*, 12–67 (= Chapter 1: "The lettered diagram"); Christina Prapa, "Diagramme in der Handschriftentradition. Ein methodologischer Beitrag anhand der Überlieferungsgeschichte von Aristoteles, *De Caelo*", *Codices Manuscripti* 82/83 (2012) 31–41; Nikos Agiotis, *Inventarisierung von Scholien, Glossen und Diagrammen der handschriftlichen Überlieferung zu Aristoteles'* De interpretatione (c. 1–4), Working Paper des SFB 980 *Episteme in Bewegung* No.5 (2015, Freie Universität Berlin).

4 Variously well managed first attempts on this issue were made by Alfred Stückelberger, "Das Ptolemaios-Diagramm des Planudes. Ein Nachtrag zum Problem der Kartenüberlieferung", *Museum Helveticum* 68,2 (2011) 141–147; Vladimiro Valerio, "Per una nuova ecdotica dei testi scientifici figurati. Tradizioni grafiche delle proiezioni tolemaiche dell'ecumene nel primo libro della *Geografia*", *Humanistica* 7,1–2 (2012) 61–80; Burri 2013, *Die 'Geographie'*, 124–132, see also the sections "Ausstattung, Buchschmuck, Illustrationen" in the catalogue part of the book (141–519).

5 The theoretical parts comprise of roughly speaking the whole book I and chapter 6 of book VII.

6 *Geogr.* I,24,1–9 refers to Ptolemy's first map projection, *Geogr.* I,24,10–27 to his second and *Geogr.* VII,6 to his third map projection. For a general introduction to the three Ptolemaic projections see Oswald A. W. Dilke, "The Culmination of Greek Cartography in Ptolemy", in: John B. Harley/David Woodward (eds.), *The History of Cartography*, vol. I: *Cartography in Prehistoric, Ancient, and Medieval Europe and the Mediterranean* (Chicago/London 1987) 177–200, at 185–189; J. Lennart Berggren/Alexander Jones, *Ptolemy's* Geography. *An Annotated Translation of the Theoretical Chapters* (Princeton/Oxford 2000) 35–40.

In the extant Greek manuscripts of Ptolemy's *Geography* these diagrams appear intercalated into the text and can be found in both textual recensions of the work, Ξ and Ω.[7] In some manuscripts, the diagrams –either all of them, some of them, or only one of them– were omitted. In this case the scribes often left a blank space (a so-called *fenestra*) between the two text portions where the diagram was supposed to have been placed. Thus the insertion of the diagrams was usually also planned in *Geography* codices which are completely or partially lacking the diagrams. All these circumstances suggest that the diagrams go back to an old tradition:[8] they were most probably an integral part of the work since its composition *ca.* 150 CE, although the oldest surviving witnesses of Ptolemy's *Geography* date from around the turn of the 13th to the 14th century and were therefore copied far more than one thousand years later.

The diagrams in the manuscripts of Ptolemy's *Geography* are generally corrupted and defective in various ways: they were obviously continually copied from their respective models. As my examinations showed, they were usually drawn by the scribes, who ordinarily were not trained in cartography, in technical drawing, or in fundamental science; they roughly reproduced what they found in their exemplar, without necessarily understanding it.[9]

We can therefore argue that the distortion of the diagrams in the manuscripts is on the one hand due to ***a)*** a lack of graphicacy of

7 These two textual recensions were determined for the first time by Paul Schnabel, *Text und Karten des Ptolemäus*, ed. by Albert Herrmann (Leipzig 1938) 55–77.

8 For an analogue situation in a group of manuscripts of Aristotle's *De caelo* see Prapa 2012, "Diagramme", especially 33–37.

9 See again Burri 2013, *Die 'Geographie'*, 124–132, as well as the sections "Ausstattung, Buchschmuck, Illustrationen" in the catalogue of the book (141–519). Similar conclusions were drawn by Prapa 2012, "Diagramme", 40 for a diagram in Aristotle's *De caelo*.

the persons who drafted the diagrams. Lack of graphicacy may have also been a reason for leaving them out.[10] On the other hand the deformation of the diagrams is as a result of ***b)*** continuous reproduction, i.e. copying.

10 Other reasons could include time pressure for the production of a manuscript or the use of a model manuscript that was lacking the diagrams.

## 2. THE MAPS IN PTOLEMY'S *GEOGRAPHY*

Ptolemy was well aware of the problems caused by continuous reproduction of graphical representations. In order to avoid distortion of the maps conceived in his *Geography*, he wanted to ensure that "without having a model already at hand, but merely by having the texts beside us, we can most conveniently make the map. After all, continually transferring [a map] from earlier exemplars to subsequent ones tends to bring about grave distortions in the transcriptions through gradual changes."[11] For this exact reason, Ptolemy did not spare the effort to give meticulous descriptions on how to construct the three map projections developed by him, instead of just delivering maps. It is indeed possible to draw the Ptolemaic set of maps[12] solely from the text of the *Geography*, an experiment which has been successfully conducted by several scholars in recent times.[13]

11 [...] πῶς ἂν καὶ μὴ προϋποκειμένης εἰκόνος ἀπὸ μόνης τῆς διὰ τῶν ὑπομνημάτων παραθέσεως εὐμεταχείριστον ὡς ἔνι μάλιστα ποιώμεθα τὴν καταγραφήν. τό τε γὰρ ἀεὶ μεταφέρειν ἀπὸ τῶν προτέρων παραδειγμάτων ἐπὶ τὰ ὕστερα διὰ τῆς κατὰ μικρὸν παραλλαγῆς εἰς ἀξιόλογον εἴωθεν ἐξάγειν ἀνομοιότητα τὰς μεταβολάς (Ptol., *Geogr.* I,18,2; translation by Berggren/Jones 2000, *Ptolemy's* Geography, 80).

12 The complete set of maps would include three maps of the *oikoumene*, each following one of Ptolemy's world map projections, and 26 regional maps. No Greek manuscript with maps has more than one world map. There is a group of manuscripts with maps that feature 64 regional maps. This non-Ptolemaic set of maps goes back to a Byzantine redaction of the maps in the early 14th century.

13 The whole set of maps was reconstructed by the collaborators on the latest edition of Ptolemy's *Geography*, see Ptolemaios 2006, *Handbuch der Geographie*, vol. II, 748–907. Vladimiro Valerio checked *Geogr.* I,24 for the feasibility of constructing Ptolemy's first and second projections: Valerio 2012, "Per una nuova ecdotica", 62–66. See also the experiments conducted by Stella Chrysochoou, "Ptolemy's *Geography* in Byzantium / Ἡ Πτολεμαϊκὴ Γεωγραφία στὸ Βυζάντιο"

The fact that the text in the *Geography* is an elaborate guide[14] on how to draw the set of maps, and that until today there is no definitive evidence whether the original work was provided with maps, led (and leads) various scholars to take the view that Ptolemy did not add any maps to his work.[15] This standpoint seems to be confirmed by a short non-Ptolemaic addition at the end of the *Geography* saying "I, the Alexandrian engineer Agathos Daimon, outlined the whole *oikoumene* from Klaudios Ptolemy's eight geographical books".[16] But there is neither anything known about Agathos Daimon (or Agathodaimon) until now,[17] nor does the note clarify exactly what Agathos Daimon's contribution was. He could well have been Ptolemy's assistant, entrusted with elaborating Ptolemy's sketches of the maps for the final version of the *Geography*.[18] At any rate, I propose that whoever engages

(in Greek), in: Georgia Xanthaki-Karamanou (ed.), *The Reception of Antiquity in Byzantium, with Emphasis on the Palaeologan Era* (Athens 2014) 247-271, at 259f. and 269–271 (plates 2–5).

14 This characteristic is also implied by the Greek title of the work γεωγραφικὴ ὑφήγησις which literally means 'geographical guidance', 'guidance for drawing the earth'.

15 On this issue see, e.g., Erich Polaschek, "Ptolemy's *Geography* in a New Light", *Imago Mundi* 14 (1959) 17–37, at 17f. There are also contemporary historians of cartography who hold this opinion, see, e.g., Duane W. Roller, *Ancient Geography: The Discovery of the World in Classical Greece and Rome* (London 2015) 197f. and 213.

16 Ἐκ τῶν Κλαυδίου Πτολεμαίου γεωγραφικῶν βιβλίων ὀκτὼ τὴν οἰκουμένην πᾶσαν Ἀγαθὸς Δαίμων Ἀλεξανδρεὺς μηχανικὸς ὑπετύπωσα. – In some manuscripts, the verb form is not in the first, but in the third person singular; on this variation and on Agathos Daimon (or Agathodaimon) see Burri 2013, *Die 'Geographie'*, 138f.

17 Agathodaimon is probably an ancient name. In the *Lexicon of Greek Personal Names* it is only recorded in vol. I (*Aegean Islands, Cyprus, Cyrenaica*, ed. by Peter M. Fraser [Oxford 1987] 3) and only attested for the first two centuries CE. Dating Agathodaimon to antiquity is also suggested by Berggren/Jones 2000, *Ptolemy's* Geography, 48; Alfred Stückelberger, "Klaudios Ptolemaios", in: Wolfgang Hübner (ed.), *Geographie und verwandte Wissenschaften* (Stuttgart 2000) 185–208, at 189, note 26; Patrick Gautier Dalché, *La Géographie en Occident (iv^e^–xvi^e^ siècle)* (Turnhout 2009) 18. On the name see also Burri 2013, *Die 'Geographie'*, 138, note 225.

18 I have made this suggestion for the first time in Burri 2013, *Die 'Geographie'*, 49 and 139.

with Ptolemy's *Geography* will understand and admit that creating three novel map projections and a coherent coordinate system for the whole *oikoumene* without at least sketching cartographical visual aids seems virtually inconceivable.

Howsoever, the extremely scarce surviving material evidence for ancient maps in general[19] and its total absence for Ptolemy's *Geography* must not exclude that this work also contained maps originally. There is definitely literary evidence for the existence of a map or maps in Ptolemy's *Geography* – and, as it seems, even for cartographical activity by Ptolemy himself – from as early as the first half of the 4th century, in the *Chorography* of the Alexandrian Pappos, a work now lost but extant in an Armenian translation.[20] However, the last undisputed literary testimony in the Greek world (and predating the extant manuscripts) for direct

19 On this issue see, e.g., Roller 2015, *Ancient Geography* 213–216.

20 The few fragments from Pappus' *Chorography* will soon be published by Klaus Geus in vol. V of *Die Fragmente der griechischen Historiker*. I am very grateful to Klaus Geus for making available to me in advance his edition of the texts, his German translations and his commentaries on the fragments.

Not personally knowing Armenian, I would like to thank Elena Grigoryeva who examined passages of fragments 2 and 3 for me. In Geus' new translation these fragments talk about an 'original map' in Ptolemy's *Geography* (frg. 2: "[...] Auf der Grundlage von dessen [*scil.*: Ptolemy's] *Originalkarte der Beschreibung der Oikumene* [...]", frg. 3: "[...] nach den in der *Originalkarte (in) der Weltbeschreibung* des Claudius Ptolemaios [...]", my italics), which would make this evidence even more spectacular (cf. previous translations of the fragments in modern languages). However, in Grigoryeva's opinion, the passages in italics above rather reflect what in Greek most probably would be αὐτόγραφος (περι) γραφὴ τῆς ἐν κύκλῳ (?) οἰκουμένης, an 'outline of the *oikoumene* in a circle (?), written/drawn by Ptolemy's own hand'.

On the other hand, it is uncontested that Pappus' work proves the use of Ptolemaic cartographical material, see, e.g., Maria G. Schmidt, *Die Nebenüberlieferung des 6. Buchs der* Geographie *des Ptolemaios: Griechische, lateinische, syrische, armenische und arabische Texte* (Wiesbaden 1999) 67-120; Klaus Geus, "Die 'Oikumene-Beschreibung' (Χωρογραφία οἰκουμενική) des Pappos von Alexandria und die armenische 'Welt-Schau' (*Ašxarhac'oyc'*) des Movses von Chorene. Zur Rezeption des Ptolemaios im Griechischen und Armenischen", in: Robert Rollinger (ed.), *World View and World Conception between East and West: Geburtstagscolloquium Reinhold Bichler* (Wiesbaden 2017) 81–91.

access to cartographic materials in Ptolemy's *Geography* seems to be an anonymous work most probably created in the 9th century, the so-called *Chrestomathy* of Strabo's *Geographika*.[21] We can thus record that ***c)*** we still have no historical proof that Ptolemy's *Geography* originally included maps, but that ***d)*** for a certain period preceding the surviving manuscripts the work circulated with maps.

It is uncontested that after the Fourth Crusade and the Latin dominion over Constantinople Ptolemy's *Geography* was almost forgotten and nearly nowhere to be found in the capital of the Byzantine Empire. But it experienced a revival in the early Palaeologan Renaissance thanks to the efforts of the most important scholar of this period, the monk and polymath Maximos Planudes (*ca.* 1255 – *ca.* 1305).[22] He is considered the re-discoverer and re-editor of the work.[23] Even if it remains to this day obscure ***e)*** what kind of *Geography* manuscript(s) he rediscovered and ***f)*** what exactly he contributed to the new edition of the work, the

21 On this text see Aubrey Diller, *The Textual Tradition of Strabo's Geography, with Appendix: The Manuscripts of Eustathius' Commentary on Dionysius Periegetes* (Amsterdam 1975) 38–41. Even later evidence for a direct consultation of maps in Ptolemy's *Geography* survived from the Arab world (where Ptolemy's work had a strong impact especially in the 9th century) in passages of the work *Muruj adh-Dhahab* (*The Meadows of Gold*) of the 10th century scholar Al-Mas'udi, see Florian Mittenhuber, *Text- und Kartentradition in der* Geographie *des Klaudios Ptolemaios. Eine Geschichte der Kartenüberlieferung vom ptolemäischen Original bis in die Renaissance* (Berne 2009) 345 (repeated in *id.*, "Karten und Kartenüberlieferung", in: Klaudios Ptolemaios, *Handbuch der Geographie, Ergänzungsband, mit einer Edition des* Kanons bedeutender Städte, ed. by Alfred Stückelberger/Florian Mittenhuber [Basel 2009], 34–108, at 90).

22 On his life and career see Edmund Fryde, *The Early Palaeologan Renaissance (1261–c. 1360)* (Leiden/Boston/Köln 2000) 226–267, especially at 253–257 (Planudes' credits for Ptolemy's *Geography*); Filippomaria Pontani, "Scholarship in the Byzantine Empire (529–1453)", in: Franco Montanari/Stephanos Matthaios/Antonios Rengakos, *Brill's Companion to Ancient Greek Scholarship* (Leiden/Boston 2015) vol. I, 297–455, at 409–415.

23 For the reconstructed story of Planudes' rediscovery of Ptolemy's *Geography* see the overview in Renate Burri, "Die Wiederentdeckung der *Geographie* des Ptolemaios durch Planudes", in: Jochen Althoff/Bernhard Herzhoff/Georg Wöhrle (eds.), *Antike Naturwissenschaft und ihre Rezeption*, vol. 13 (Trier 2003) 127–136, at 131–133; see also Gautier Dalché 2009, *La Géographie en Occident*, 82–84.

seven most ancient manuscripts handed down to us, all copied closely around 1300, are all linked to him, among them the three opulent large format parchment codices Urbinas graecus 82 (Vatican City, Vatican Library), Seragliensis G. İ. 57 (Istanbul, Library of the Topkapı Palace), and Fabricius 23,2° (Copenhagen, University Library).[24] These three codices were produced under Planudes' guidance and feature(d) a map of the *oikoumene* and 26 regional maps.[25] They are the oldest surviving witnesses of Ptolemy's *Geography* with maps and at the same time belong to the key witnesses of the textual recension Ω.

At present, we know of at least 66 Greek manuscripts that contain Ptolemy's *Geography* either completely or in part.[26] However, about only a fourth of the *Geography* manuscripts are provided with maps. This could be mainly due to the enormous effort necessary to include them: drawing the maps – usually a world map and 26 regional maps – was much more laborious, complex, time-consuming and expensive, than simply reproducing the text of the work. For instance, more writing material, and preferably large format writing material, mostly of good quality parchment, was needed for the maps, as well as pigments for the colors;

24 The other four *Codices Planudei* are ms. grec 2423 (Paris, National Library), ms. Arch. Selden B. 46 (Oxford, Bodleian Library), Vaticanus graecus 177 and 191 (both Vatican City, Vatican Library; more about the latter below on p. 232-235). I expressed doubts in previous publications as to whether there is really a link between Planudes and Vat. gr. 177, see Burri 2003, "Die Wiederentdeckung", 135f.; *ead.* 2013, *Die 'Geographie'*, 524f.

25 Only a single bifolium survived from Fabr. 23,2°. It is accessible online at www.kb.dk/permalink/2006/manus/31/dan/.

26 The most recent and most complete list of Greek *Geography* manuscripts is compiled by Burri 2013, *Die 'Geographie'*, 97–112. To the 64 manuscripts listed there we can now add ms. Laud. misc. 531 (Oxford, Bodleian Library), a parchment codex of the 15th century that exhibits *Geogr.* III,4 (description of Sicily) on its fols. 83r–84v, and Vaticanus graecus 1411 (Vatican City, Vatican Library) of the 15th century with the theoretical parts of Ptolemy's *Geography* (according to note 5 above, but the manuscript has also *Geogr.* II,1; VII,5; VIII,1–2, while VII,6 is missing, except for its title) on fols. 128r–150v.

specialists who were able to draft the maps were required, be it on the basis of Ptolemy's instructions in the theoretical parts of his work, or from a model.

And now we have arrived at presumably the most disputed and still unresolved issue considering Ptolemy's *Geography* (already implied above under *e*) and *f)*): ***g)*** are the maps in the most ancient extant manuscripts copies of a model, did Planudes and his circle have an exemplar manuscript with maps at their disposal, or ***h)*** are the maps in the manuscripts handed down to us as "simple" reconstructions, due to Planudes' initiative, designed according to Ptolemy's meticulous instructions given in his geographical work?

We should be aware that neither of the facts recorded under *c)* (no historical proof for maps in the original work) and *d)* (the work once circulated with maps) impacts on the two possible scenarios just expressed under *g)* and *h)*, nor on the questions formulated under *e)* and *f)* (what manuscript[s] did Planudes discover and what did he contribute to the edition?).[27] I argue that certain observations on the diagrams schematizing the first and the second Ptolemaic projections can shed new light on these questions.

27 Supporters of the theory that Ptolemy's *Geography* was originally provided with maps, and opponents of the thesis that the maps are late Byzantine reconstructions, either deny or do not consider or are not aware of the independence of these problems. On the long list of proof for the existence of Ptolemaic maps in the ancient world, supposed by Mittenhuber 2009, *Text- und Kartentradition*, 321-352 and 362f. (repeated in *id.*, "Karten und Kartenüberlieferung", 76-91, and again in *id.*, "The Tradition of Texts and Maps in Ptolemy's *Geography*", in: Alexander Jones [ed.], *Ptolemy in Perspective. Use and Criticism of his Work from Antiquity to the Nineteenth Century* [Dordrecht 2010] 95-119, at 107-114), see the reassessment by Burri 2013, *Die 'Geographie'*, 49-55.

## 3. THE DIAGRAMS IN THE MANUSCRIPTS

### *The Diagram of Ptolemy's First Map Projection*

The diagram of Ptolemy's first map projection (fig. 1) appears between paragraphs 7 and 8 of *Geogr.* I,24. Strangely, the drawing illustrating Ptolemy's first projection usually occurs twice in the manuscripts, as two identical sketches, mostly placed next to each other or sometimes one below the other. One can presume that the reason for this double occurrence of the diagram is to create more space for placing all the labeling. In the manuscripts that exhibit the drawing twice, the labeling is always shared out in the very same way between the two diagrams: aside from the indication of the points, the first drawing generally exhibits the labeling for the intervals along the central meridian for placing the parallels, whereas the second drawing usually features the names of the parallels.[28]

In the above mentioned codex Urb. gr. 82 (see p. 229) there are two diagrams placed next to each other for the first Ptolemaic projection (see fol. 10r, col. 2).[29] When comparing a reconstructed diagram of Ptolemy's first map projection (fig. 1) with the

28 For these observations see also Burri 2013, *Die 'Geographie'*, 126f.

29 All my folio references for Urb. gr. 82 refer to the printed foliation in the lower outer corner of the rectos (and not to the handwritten foliation in the upper outer corner of the rectos). The manuscript is available as facsimile edition (Josephus Fischer [ed.], *Claudii Ptolemaei Geographiae Codex Urbinas graecus 82*, Codices e Vaticanis selecti quam simillime expressi 19 [Leiden 1932]) and now accessible online at http://digi.vatlib.it/view/MSS_Urb.gr.82?ling=en.
We had to forbear from adding plates regarding manuscripts that can be viewed online.

corresponding drawings in Urb. gr. 82, we notice that the diagrams in the manuscript do not strictly reflect the instructions given by Ptolemy: according to Ptolemy, the long sides of the parallelogram αβγδ should measure as closely as possible to twice the length of its broad sides.[30] The parallelogram would then ideally consist of two squares (αεγζ and εβυδ), joined together side by side.[31] In Seragl. G. İ. 57, which is very closely related to Urb. gr. 82, the situation of the two diagrams showing Ptolemy's first projection is completely analogous to Urb gr. 82. Nevertheless and despite the mentioned flaw in proportions we can state that ***i)*** the diagrams in Urb. gr. 82 and Seragl. G. İ. 57 are capable of giving a schematically coherent idea of the first Ptolemaic projection.[32]

Let us now review Vaticanus graecus 191 (Vatican City, Vatican Library),[33] a miscellaneous codex containing astronomical, mathematical, and geographical texts, copied in Constantinople in the years around 1300. Palaeographical evidence links the production of this codex with Maximos Planudes' entourage. In the textual tradition of Ptolemy's *Geography* Vat. gr. 191 is the only pure representative of recension Ξ. The manuscript has no maps. However, its model – or the model of its model or even a prior model – obviously had 27 regional maps, according to a

30 *Geogr.* I,24,1: Κατασκευάσομεν πίνακα παραλληλόγραμμον ὀρθογώνιον, οἷός ἐστιν ὁ αβγδ, διπλασίαν ἔχοντα ἔγγιστα τὴν αβ πλευρὰν τῆς αγ. – The peculiarity of this passage as well as various translations of it were pointed out by Valerio 2012, "Per una nuova ecdotica", 62 with notes 5f.

31 Namely if the ratio "long side : broad side" was exactly 2:1, as in fig. 1.

32 For another very frequent error, pertaining though to the labeling of the diagram for Ptolemy's first projection, see Burri 2013, *Die 'Geographie'*, 126.

33 The manuscript is fully digitized and accessible at http://digi.vatlib.it/view/MSS_Vat.gr.191?ling=en. The text of Ptolemy's *Geography* is on its fols. 128v-169v.

note that appears at the very end of the *Geography* (fol. 169v, col. 4).[34]

In Vat. gr. 191 there is only one diagram representing Ptolemy's first map projection (see fol. 137r, col. 1). The labeling only indicates the points of the diagram and the names of the parallels – as, in the case of manuscripts having two drawings, usually the second drawing does (see above p. 231). But again, the width of the parallelogram is too short in proportion to its height, contrary to Ptolemy's requirements. Interestingly, the width of the space used for the diagram exactly coincides with the width of the text column. The same phenomenon can be observed in many *Geography* manuscripts: the straight lines ruled vertically for defining the width of the column additionally served the scribe as a welcome reference when positioning the drawings. Let us remember that the diagrams were usually drawn by the copyists who were normally not specifically trained in sciences and simply copied what they saw in their exemplar (see above points *a)* and *b)*).

The famous Byzantine diplomat and humanist Manuel Chrysoloras (*ca.* 1350–1415) was also obviously unsatisfied with the diagram in Vat. gr. 191 just described: in a brief note that I can attribute to Chrysoloras' hand, and that he added to the top right of the drawing (see fol. 137r, col. 1), he comments: "This is in no way designed closely to the proportions indicated."[35]

34 According to the note the tenth regional map of Europe was split into two maps (most probably for the high amount of toponyms to be collocated on this map). For this reason the model manuscript featured 27 (instead of the 26 Ptolemaic) regional maps. For a transcription and a translation of the note see Burri 2013, *Die 'Geographie'*, 133. The note does not appear in any other *Geography* manuscript.

35 Οὐδαμῶς οὐδὲ σύνεγγυς κατὰ τὴν εἰρημένην ἀναλογίαν γέγραπται. – This remark could of course also refer to the parallels in the diagram since they are not drawn at correct intervals.

Vat. gr. 191 belonged to Chrysoloras' library.[36] Chrysoloras most probably brought this codex from Constantinople to Italy when he took up his appointment as the first professor for Greek in the Western world in Florence in 1397 (or he had it brought to Italy at a later date). It is in fact well known that Chrysoloras played a decisive role in introducing Ptolemy's *Geography* to the West: he also brought or had brought to Italy codex Urb. gr. 82 that would become the chief model for *Geography* manuscripts in Greek and Latin produced in the European west.[37] Moreover, he started to translate the work into Latin, an undertaking accomplished by Jacopo Angeli da Scarperia.[38] In Vat. gr. 191 he not only added the note just mentioned, but also marginal and interlinear glosses, primarily commenting on the theoretical parts of the *Geography*, and even two small additional drawings that illustrate two constellations explained in the text.[39] Hence, these two additional drawings are not to be regarded as a peculiarity of the textual recension Ξ, best represented in Vat. gr. 191, but they are in fact an effort to make

36 On this attribution see Sebastiano Gentile, "Umanesimo e cartografia: Tolomeo nel secolo XV", in: Diego Ramada Curto/Angelo Cattaneo/André Ferrand Almeida (eds.), *La cartografia europea tra primo rinascimento e fine dell'illuminismo* (Firenze 2003) 3–18, at 12f. with note 26; Lydia Thorn-Wickert, *Manuel Chrysoloras (ca. 1350–1415)* (Frankfurt a.M. 2006) 150–157; Sebastiano Gentile/Davide Speranzi, "Coluccio Salutati e Manuele Crisolora", in: Concetta Bianca (ed.), *Coluccio Salutati e l'invenzione dell'Umanesimo*, Atti del Convegno (Firenze, 8–10 ottobre 2008) (Roma 2010) 3–48, at 9.

37 See Gentile/Speranzi 2010, "Coluccio Salutati", 11–14; Burri 2013, *Die 'Geographie'*, 485f.

38 On this translation see Patrick Gautier Dalché, "The Reception of Ptolemy's *Geography* (End of the Fourteenth to Beginning of the Sixteenth Century)", in: David Woodward (ed.), *The History of Cartography*, vol. III.1: *Cartography in the European Renaissance* (Chicago/London 2007) 285–364, at 287–292; *id.* 2009, *La Géographie en Occident*, 146–154.

39 These drawings are on fol. 129r and 129v respectively. Reconstructions can be found in Ptolemaios 2006, *Handbuch der Geographie*, vol. I, 60 and 62, as well as in Burri 2013, *Die 'Geographie'*, 589 (plates 1–2).

the text better understandable, due to humanist interest and to the use of graphicacy.

Returning to the diagram of Ptolemy's first projection in Vat. gr. 191, it is peculiar that the scribe left quite a large *fenestra* for the drawing, but positioned it only in its lower half, leaving the upper part of the *fenestra* blank. However, as a look into the original manuscript revealed, there were originally two drawings, one placed below the other, but the diagram in the upper half of the *fenestra* was erased and is now only visible like a watermark (see fig. 2).[40] The parallelogram of this erased diagram measures 53×54 mm and is roughly a square (whose width though is shorter than the width of the text column). The distances between the parallels coincide with the distances between the horizontal ruling lines for the text, a phenomenon that can be found in other *Geography* manuscripts, too, although this way of proceeding makes the distances between the parallels inconsistent with Ptolemy's guidelines. We can only speculate about the reason for the erasure of the diagram in Vat. gr. 191. Maybe the drawing was simply considered to be too inadequate and too poor.

### *The Diagram of Ptolemy's Second Map Projection*

The diagram of Ptolemy's second map projection appears between paragraphs 29 and 30 of *Geogr.* I,24 (fig. 3).[41] Strangely, some manuscripts show a diagram here that is clearly defective: its shape differs so much from its subject matter that it no longer

40 I have briefly pointed out for the first time this erased diagram in Burri 2013, *Die 'Geographie'*, 499, note 587.

41 The authentic text most probably ends with paragraph 29 since *Geogr.* I,24,30-33 is very likely an un-Ptolemaic/later addition.

reflects a clear representation of Ptolemy's second projection.[42] Urb. gr. 82 is also among these manuscripts (see fol. 11r, col. 2). However, after the very end of the chapter (i.e. after *Geogr.* I,24,33), a second diagram of the second Ptolemaic projection follows (see fol. 11v, col. 1), which still has defects in its proportions in some respects but is overall coherent in its shape.[43] In Seragl. G. İ. 57 also both the problematic and the coherent diagrams appear, but they are placed next to each other (analogously to the two drawings of Ptolemy's first projection) after *Geogr.* I,24,29.

In Vat. gr. 191 there is no diagram for Ptolemy's second projection. Yet, the scribe left a *fenestra* between paragraphs 27 and 28 of *Geogr.* I,24 (see fol. 138r, col. 2), which would actually be a very suitable position since the description for how to construct the diagram of the second projection ends exactly with *Geogr.* I,24,27, whereas *Geogr.* I,24,28f. summarizes the advantages and disadvantages of the two projection methods. The dimensions of the blank space suggest the insertion of only one diagram, and there is no blank after the end of the chapter. We can thus hypothesize that in the model of Vat. gr. 191 there was either only the problematic type or the coherent type of the diagram (or maybe both types placed next to each other, like in Seragl. G. İ. 57).

42 For a more comprehensive discussion of this corrupted diagram see Burri 2013, *Die 'Geographie'*, 130–132 with plates 8A–C (showing the diagram in mss. grec 1403 and Supplément grec 119 [both Paris, French National Library] as well as in D 527 inf. [= gr. 997] [Milan, Biblioteca Ambrosiana]); for examples from other manuscripts see Valerio 2012, "Per una nuova ecdotica", 71f. with figs.15-20 (diagram in Vat. gr. 177 and Urb. gr. 82 [both Vatican City, Vatican Library] as well as Gr. Z. 516 [Venice, National Library of St. Mark's], cod. 655 [Mount Athos, Monastery of Vatopedi], and Laurentianus Pluteus 28.09 and 28.38 [both Florence, Laurentian Library]).

43 As stated for the diagrams of the first Ptolemaic projection, see above *i)* (p. 232).

## 4. MECHANISMS OF TRADITION

Urb. gr. 82 and Seragl. G. İ. 57 are among the most ancient extant manuscripts of Ptolemy's *Geography* with maps, actually the oldest codices having the whole set of maps (see above p. 229). Whereas the map of the *oikoumene* in Urb. gr. 82 (fols. 60v–61r) is drawn in Ptolemy's first projection, Seragl. G. İ. 57 is the only known Greek manuscript with a world map in Ptolemy's second projection (fols. 73v–74r). Previous studies concluded that the drawings of the world maps in these manuscripts perfectly followed the instructions given in *Geogr.* I,24.[44] This observation seems to be totally inconsistent with the defects in proportions or even corruption of the diagrams in the very same manuscripts. This graphical discrepancy was recently taken as proof that the world map, such as in Urb. gr. 82 and Seragl. G. İ. 57, could only be a copy from a model containing a world map that was correctly drawn, with other words that only the scenario described above under *g)* (p. 230) is possible: Planudes must have had a model manuscript with maps at his disposal.[45]

However, in terms of tradition mechanisms of graphical elements in manuscripts, the diagrams and the maps do not interrelate. As

44 See Mittenhuber 2009, *Text- und Kartentradition*, 110: "Die Codices U [*scil.* Urb. gr. 82], K [*scil.* Seragl. G. İ. 57] [...] enthalten am Ende des 7. Buches je eine in der 1. oder 2. Projektion ausgeführte Weltkarte, welche exakt nach den καταγραφαί von Kap. I,24 angefertigt sind"; see also Valerio 2012, "Per una nuova ecdotica", 73, but cf. *ibid.* 78f. and my remarks below p. 239.

45 Valerio 2012, "Per una nuova ecdotica", especially 73: "Ma già all'epoca di Planude [...] gli schemi all'interno del testo dovevano essere corrotti e non più comprensibili [...]; su quelle basi e con quelle cognizioni non era assolutamente possibile 'ricostruire' le due proiezioni tolemaiche per le grandi tavole dell'Ecumene. Planude non ha quindi potuto che copiare un planisfero già esistente e correttamente disegnato."

stated above in points *a)* and *b)* (p. 223f.), it was usually the copyist who drew the diagrams accompanying a text. Generally copyists were not specialized in sciences and not particularly trained in graphicacy. Skilled or less skilled, they simply reproduced what they saw in their model. As it has already been mentioned, within time the accuracy of graphical elements can gradually deteriorate through continual reproduction (a phenomenon already well known to Ptolemy, see above p. 225), but also obviously through adaptation due to reasons of layout, as showed above (p. 233). Additionally, as analyses of mathematical manuscripts corroborate, diagrams do not usually have metrically correct quantitative relations.[46] They are primarily meant to symbolize the concept behind the item depicted. For this purpose a diagram has to merely represent conceptual information.

In contrast, illuminations in manuscripts, such as maps, were usually carried out by specialists.[47] Moreover, an analysis of the world map in Seragl. G. İ. 57 – drawn in the technically more challenging second Ptolemaic projection – came to the conclusion that it shows no signs (such as impressed lines or pricks) that would connotate that it had been traced.[48] Another detail in this world map is very intriguing:[49] Vladimiro Valerio, historian

46 See Netz 1999, *The Shaping*, 18: "The most significant question from a mathematical point of view is whether the diagram was meant to be metrical: whether quantitative relations inside the diagram were meant to correspond to such relations between the objects depicted. The alternative is a much more schematic diagram, representing only the qualitative relations of the geometrical configuration. Again, from my acquaintance with the manuscripts, they very often seem to be schematic in this respect as well."

47 See, e.g., Marilena Maniaci, *Archeologia del manoscritto: Metodi, problemi, bibliografia recente* (Rome 2002) 135; Raymond Clemens/Timothy Graham, *Introduction to Manuscript Studies* (Ithaca/London 2007) 22.

48 Robert Fuchs/Doris Oltrogge, "Der Codex Seragliensis GI 57, eine kodikologische Beschreibung", in: Ptolemaios 2009, *Ergänzungsband*, 26–33, at 30. According to the study the same holds for all the maps in Seragl. G. İ. 57.

49 See Valerio 2012, "Per una nuova ecdotica", 78f. (= Appendix IV).

of cartography, astutely detected that the curvature of its parallels is bigger than in a reconstructed diagram that strictly follows Ptolemy's instructions. This is obviously due to the fact that on the world map in Seragl. G. İ. 57 the distance between the center point λ (for drawing the parallels) and point η (on the equator) does not correspond to the value indicated by Ptolemy, namely $181^{5/6}$ units (see *Geogr.* I,24,18, based on I,24,16). The distance between the two points mentioned measures only 115 units in the manuscript. This is, on the other hand, exactly the value given by Ptolemy for the first projection (*Geogr.* I,24,2–6)![50] This combination of the first and second projections may be primarily due to practical reasons of executing the construction of the map: drawing on a limited surface of writing material becomes easier if one decreases the distance between the two relevant points. At any rate, the fusion of the two projection methods shows mathematical and practical genius and definitely requires professional expertise in both fields.

50 In Ptolemy's first projection the corresponding points are η (center point for drawing the parallels) and σ (on the equator – see fig. 1).

## 5. MAXIMOS PLANUDES AND PTOLEMY'S *GEOGRAPHY*

Taking up the controversial issue of the origin of the maps in Ptolemy's *Geography* (see above *g)* and *h)*), at this point it should be noted that Maximos Planudes was also a well-trained mathematician: he was the author of a mathematical treatise and of commentaries on ancient mathematical works.[51] There is no doubt that Planudes was able to completely understand and carry out the complicated instructions for drawing a world map in Ptolemy's *Geography*[52] – and that he would have been capable of masterminding the combination of Ptolemy's first and second projections as present in Seragl. G. İ. 57.

Planudes' famous hexametrical poem of praise on the rediscovery of Ptolemy's *Geography*[53] undoubtedly refers to cartographical

51 See Pontani, "Scholarship", 410; the treatise Ψηφηφορία κατ' Ἴνδους ἡ λεγομένη μεγάλη (*Great Calculation According to the Indians*) was edited by Allard 1981, *Maxime Planude, Le grand calcul*.

52 The same opinion is shared by Fryde 2000, *The Early Palaeologan Renaissance,* 256.

53 Editions of the whole poem by Alfred Stückelberger, "Planudes und die *Geographia* des Ptolemaios", *Museum Helveticum* 53 (1996) 179–205, at 200–202 (with German translation; there is no need for his transposition of vv. 34f. and their insertion after v. 39, as the succeeding editions prove); Filippomaria Pontani, "The World on a Fingernail: an Unknown Byzantine Map, Planudes, and Ptolemy", *Traditio* 65 (2010) 177–200, at 197–200 (with English translation); *id.*, "Esametri nonniani e mappae mundi. L'epigramma di Massimo Planude per la *Geografia* di Tolomeo", in: Claudio Gallazzi/Bärbel Kramer/Salvatore Settis (eds.), *Intorno al papiro di Artemidoro II: Geografia e Cartografia*, Atti del Convegno internazionale del 27 novembre 2009 presso la Società Geografica Italiana Villa Celimontana, Roma (Milano 2012) 197–217, at 205–207 (with Italian translation); Carlo M. Mazzucchi, "Il Tolomeo Ambr. D 527 inf. e i versi di Massimo Planude sulle carte della *Geografia* (Ambr. A 119 sup.)", in: *Miscellanea graecolatina* I, ed. by Federico Gallo (Rome 2013) 259–266, at 263–266 (with Italian translation); and most recently Ilias Taxidis, *Les Épigrammes de Maxime Planu-*

material (and not only to text) by the mention of various topographical details.[54] Also the conspicuous use of words connected with sensory, particularly visual perception, and the mentioning of colorfulness, in the first half of the poem, rather points to an image, i.e. a map or maps, than (only) to text.[55] However, the poem does not explicitly state and there is no need to conclude that "such a great work buried since innumerable years"[56] must refer to a very old, marvelous Ptolemy manuscript *with maps*.[57] The poem can be understood just as well without difficulty as a reference to a reconstructed map (or maps) that made it possible to see the whole world again.[58]

In addition, in two of altogether ten manuscripts containing this poem,[59] the title of the poem reports on a certain creative

*de* (Berlin/Boston 2017) 87–90 (with French translation). See also the notes on Pontani 2010, "The World on a Fingernail" by Carlo M. Mazzucchi, "Ancora sugli esametri di Massimo Planude per le carte di Tolomeo", in: *Miscellanea graecolatina* II, ed. by Lisa Benedetti/Federico Gallo (Milan 2014) 183–189.

54 Cf. Berggren/Jones 2000, *Ptolemy's* Geography, 49.

55 See, e.g., v. 2 (ὑπ' ὄψιν ἤγαγε), v. 4 (οὐ μὲν ἐγὼ [...] ἴδον ποτέ), v. 5 (πολύχροα), v. 13 (εἰ δέ τις ὄμμα βάλῃσι). All quotations from the poem and the translation are taken from Pontani 2010, "The World on a Fingernail".

56 Vv. 28f.: ἔργον ἀτὰρ τόδε τηλίκον οἷον | νηρίθμοις ἐτέεσσι κεκευθμένον.

57 For this interpretation see especially Stückelberger, "Planudes und die *Geographia*", 203–205; Mittenhuber 2009, *Text- und Kartentradition*, 341 and 366, repeated in *id.* 2010, "The Tradition", 113.

58 I suggested this interpretation for the first time in Burri 2013, *Die 'Geographie'*, 522, note 6. A similar interpretation is given by Chrysochoou 2014, "Ptolemy's *Geography* in Byzantium", 256f.

Planudes' rediscovery of Ptolemy's *Geography* is also recorded in four epigrams attributed to Planudes (published in: *Claudii Ptolemaei Geographia*, ed. Carolus F. A. Nobbe [Lipsiae 1843–1845; reprinted *ibid.* 1881/1887, Hildesheim 1966/1990 cum introductione a Aubrey Diller] vol. I, XXXIII; now critically edited by Taxidis 2017, *Les Épigrammes*, 97–102) as well as in two epitaphs for Planudes written by Gregory archbishop of Bulgaria. These epitaphs were published for the first time and translated into English by Pontani 2010, "The World on a Fingernail", 193f., followed by Stella Chrysochoou, "Maximos Planoudes and the 'Diagram' of Ptolemy", in: Taxiarchis G. Kolias/†Konstantinos G. Pitsakis (eds.), *Aureus*, Volume dedicated to Professor Evangelos K. Chrysos (Athens 2014) 113–129 (with 5 plates in the volume's Appendix), at 127f. The two editions differ considerably in several important points. For this reason I plan to reassess them elsewhere.

59 See the overview in Taxidis 2017, *Les Épigrammes*, 62f.

activity of Maximos Planudes:[60] in codex Ambrosianus A 119 sup. (= gr. 43) (Milan, Biblioteca Ambrosiana) the title reads "Of the most holy and wise sir Maximos Planudes on the diagram of Ptolemy that he himself conceived and drew from the book of Ptolemy without taking his cue from anyone else".[61] The title in codex Laurae K 71 (= 1358) (Mount Athos, Monastery of Great Lavra) is "Of the most ingenious, most erudite, and most honorable among [the] monks, sir Maximos Planudes, on the diagram produced by him from the book of Ptolemy".[62] The titles of both manuscripts – that are, moreover, the most ancient witnesses of the hexametrical poem[63] – obviously refer to the same circumstance, but through other words, and are therefore evidently independent from each other.[64] These facts are a strong

60 For the title variants see the critical apparatus in Pontani's and Taxidis' editions (Pontani 2010, "The World on a Fingernail", 198; Taxidis 2017, *Les Épigrammes*, 89), as well as Pontani 2012, "Esametri nonniani", 201f.

A third significant title version can be found in Vat. gr. 1411 (Vatican City, Vatican Library) from the late 14th c.: Μαξίμου Πλανούδη στίχοι ἡρωϊκοὶ εἰς τὴν Γεωγραφίαν Πτολεμαίου χρόνοις πολλοῖς ἀφανισθεῖσαν, εἶτα δὲ παρ' αὐτοῦ πόνοις πολλοῖς εὑρεθεῖσαν ('Heroic verses of Maximos Planudes on Ptolemy's *Geography* which had disappeared for a long time but then was found by him with great toil' – translation based on Pontani 2010, "The World on a Fingernail", 192) (fol. 127r). It is therefore nearly identical with the title in another witness, Neap. III.C.3 (Naples, National Library), copied also in the late 14th c. (fol. 3r). According to Taxidis' *Stemma codicum* (Taxidis 2017, *Les Épigrammes*, 55), these two manuscripts go back to a common intermediate model.

61 Τοῦ ἁγιωτάτου καὶ σοφωτάτου κυροῦ Μαξίμου τοῦ Πλανούδη εἰς τὸ διάγραμμα τοῦ Πτολεμαίου, ὃ αὐτὸς ἀπὸ τῆς βίβλου τοῦ Πτολεμαίου, μὴ παρά τινος λαβὼν ἀρχάς, διενοήσατο καὶ διέγραψεν (fol. IIv). – According to Mazzucchi 2013, "Il Tolomeo Ambr. D 527 inf.", 262, the hand of Ioannes, one of Planudes' collaborators, can be recognized on this very folio (No. 271 in *RGK*, vol. 2A [Vienna 1989] 111). The translation is from Pontani 2010, "The World on a Fingernail", 192; see also *ibid.* 193 for his notes on the title (reassessed by Mazzucchi 2014, "Ancora sugli esametri di Massimo Planude", 183f.).

62 Τοῦ φιλοσοφωτάτου καὶ λογιωτάτου καὶ τιμιωτάτου ἐν μοναχοῖς κυροῦ Μαξίμου τοῦ Πλανούδη εἰς τὸ παρ' αὐτοῦ γεγονὸς διάγραμμα ἐκ τῆς βίβλου Πτολεμαίου (fol. α΄r); the text is taken from Pontani 2012, "Esametri nonniani", 201f. (Taxidis 2017, *Les Épigrammes*, 89 gives καὶ instead of εἰς τὸ), the translation is mine.

63 See Pontani 2012, "Esametri nonniani", 201 with note 13, as well as Taxidis 2017, *Les Épigrammes*, 36 and 38.

64 Now also confirmed by Taxidis' *Stemma codicum* (Taxidis 2017, *Les Épigrammes*, 55).

argument for the relevance, not to say the validity of the information reported in these titles. This information must not simply be ignored.[65]

But what exactly does the word 'diagram' (in Greek: διάγραμμα) occurring in both titles mean? Does it mean 'map', does it insinuate 'map of the *oikoumene*', or even refer to a complete set of maps? But neither Ptolemy nor Planudes used this word for 'map'. Or does it simply mean 'diagram'?[66] But drawing a diagram was obviously not an especially challenging exercise at the time of Planudes and would have anyway been delegated to a copyist to do. Such an exercise would not have been significant enough to be recorded.

Stella Chrysochoou recently convincingly suggested that the term indicated a "graticule formed by the intersection of the parallels and meridians, on which the map of the *oikoumene* was constructed".[67] She showed that Planudes as well as, later on, John Chortasmenos (*ca.* 1370 – *ca.* 1439) used the word διάγραμμα in this very meaning, the former in a note preserved in Vaticanus graecus 129 (fol. 96v), the latter in his commentary on the theoretical parts of Ptolemy's *Geography*, preserved in an autograph manuscript, Urbinas graecus 80 (both mss. Vatican City, Vatican Library).[68]

65 So does Mittenhuber 2009, *Text- und Kartentradition*; *id*., "Karten und Kartenüberlieferung" (basically a resumé of the former title).

66 For all these suggestions see Stückelberger 2011, "Das Ptolemaios-Diagramm", 142f. and 145; Chrysochoou 2014, "Maximos Planoudes and the 'Diagram'", 125, note 63.

67 Chrysochoou 2014, "Maximos Planoudes and the 'Diagram'", 123–127 (citation at 125); Chrysochoou 2014, "Ptolemy's *Geography* in Byzantium", 253f.

68 Planudes' note in Vat. gr. 129 was first published by S. Kugéas, "Analekta Planudea", *Byzantinische Zeitschrift* 18 (1909) 106–146, at 116. Apart from Chrysochoou's essays (as above in note 67), on the note see also Leo Bagrow, "The Origin of Ptolemy's Geographia", *Geografiska Annaler* 27 (1945) 318–387, at 370; for Chortasmenos' commentary see also Vasilios Tsiotras, Ἡ ἐξηγητικὴ παράδοση τῆς Γεωγραφικῆς ὑφηγήσεως τοῦ Κλαυδίου Πτολεμαίου. Οἱ ἐπώνυμοι

## 6. CONCLUSION

To conclude, a closer look at the diagrams in some of the oldest extant Greek manuscripts of Ptolemy's *Geography* cannot answer the question of whether this work also originally had cartographical material or not: the diagrams in the manuscripts, as stated above under ***a)***, were drafted by copyists, not by specialists, and ***b)*** they were subject to distortion by continuous copying. On the other hand, they were not expected to be metrical, as shown above under ***i)***, they simply had to represent, to visualize information. Consequently, as long as we do not have material or literary evidence for a map or maps in the original work of Ptolemy's *Geography*, as mentioned above under ***c)***, and even despite the fact that the work circulated for a certain time with maps (see above under ***d)***), we can only hypothesize about this question.

However, the examination of the diagrams and their interrelation with the maps, as well as latest findings regarding the maps in the manuscripts and the use of the term διάγραμμα may give some hints to resolving the problems brought up above under ***e)*** to ***h)***. In view of two different title versions for Planudes' hexametrical poem, it is irrefutable that *Planudes on his own produced a 'diagram' 'from the book of Ptolemy'*. Let us suppose that διάγραμμα/'diagram' is indeed a 'grid' or a 'graticule'. If Planudes used 'the book of Ptolemy', i.e. obviously only one particular

σχολιαστές (Athens 2006) 156–193, 433–444 (critical edition of the commentary), and plates 4 and 6.

*Geography* book and not the whole work,[69] for producing a grid, only books I or VII or VIII come into question. Book VIII is about the regional maps. But would drawing a grid in the orthogonal cylindrical projection, used for the regional maps, not have been effortless for Planudes and as such not worthy of further discussion? There remain books I and VII with the projection methods for a world map. Indeed, drawing a grid for (one of) the Ptolemaic projections is an undertaking that asks for the skills of a specialist, in particular of a specialist in geometry. This is most probably what Planudes did according to the poem titles. Such a task could neither have been accomplished by an illuminator, i.e. an artist (and not a scientist), who would later color in the grid drawn by Planudes or, more probable, drawn by a draftsman under Planudes' guidance.

Still, it is difficult to say what kind of *Geography* manuscript(s) Planudes came across and exactly what his contribution was to the new edition of the work (as pointed out above under ***e)*** and ***f)***). One can deem that he got access to a *Geography* manuscript that *at least* lacked one or two maps of the *oikoumene*[70] (it could also have completely lacked a map of the *oikoumene* or even any map) and that Planudes drew a graticule according to *at least either* the third Ptolemaic projection (from *Geogr.* VII), *or* the first *or* the second Ptolemaic projection (from *Geogr.* I). On the basis of the extant manuscripts with maps the latter suggestion (first or second projection) is far more probable. For these reasons, resuming the questions phrased above under ***g)*** and ***h)*** on

69 The same interpretation was given by Stückelberger 2011, "Das Ptolemaios-Diagramm", 143, note 11; cf. Chrysochoou 2014, "Maximos Planoudes and the 'Diagram'", 124.

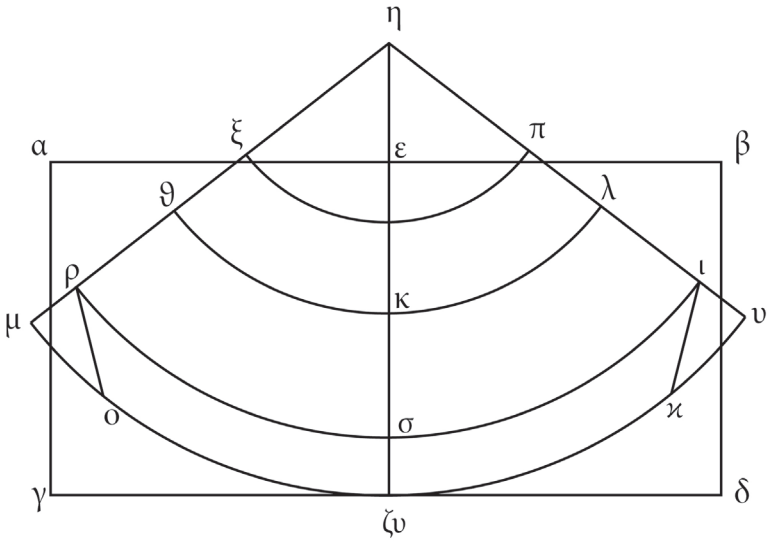
70 Of course, we do not know whether there were ever manuscripts of Ptolemy's *Geography* that contained more than one map of the world. None of the extant Greek or Latin manuscripts does (see also above note 12).

whether the maps in the most ancient surviving manuscripts are copies of a model or reconstructions, I assume that the map in Ptolemy's second projection *at the very least* – extant only in Seragl. G. İ. 57, in an ingenious way adjusted for easier realization – is a late Byzantine reconstruction by virtue of Planudes' efforts.

## FIGURES

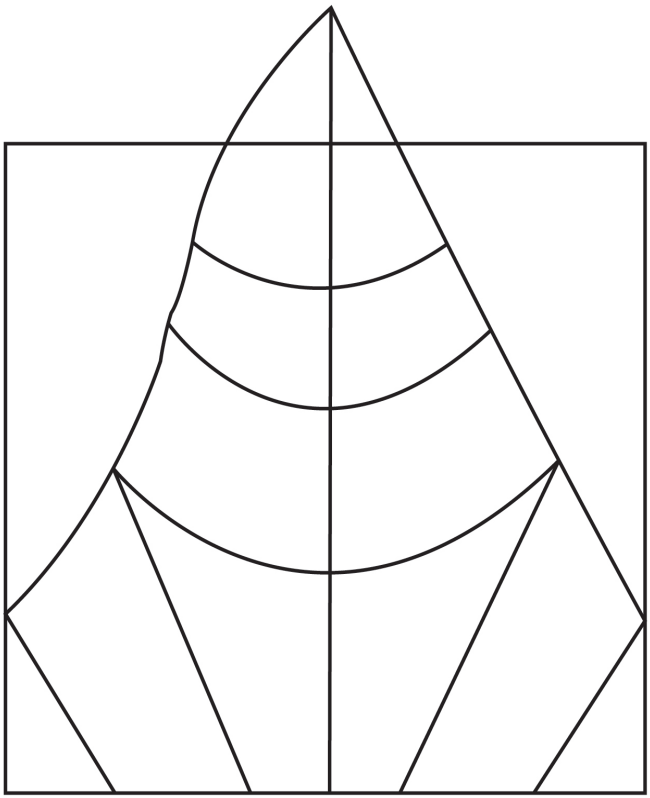
### *Figure 1*

Reconstructed diagram of Ptolemy's first map projection according to Ptol., *Geogr.* I,24,1–9.



## *Figure 2*

Sketch of the erased diagram of Ptolemy's first map projection in Vat. gr. 191, fol. 137r, col. 1, dimensions of the parallelogram 53x54 mm (by Renate Burri).



## *Figure 3*

Reconstructed diagram of Ptolemy's second map projection according to Ptol., *Geogr.* I,24,10–27.