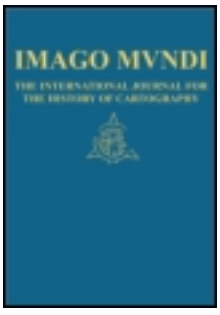

Imago Mundi: The International Journal for the History of Cartography
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/rimu20

Ptolemy's geography in a new light"

Erich Polaschek [a]
[a] Vienna

Published online: 29 Jul 2008.

To cite this article: Erich Polaschek (1959) Ptolemy's geography in a new light" , Imago Mundi: The International Journal for the History of Cartography, 14:1, 17-37, DOI: 10.1080/03085695908592151

To link to this article: http://dx.doi.org/10.1080/03085695908592151

Ptolemy's *Geography* in a New Light*

By Erich Polaschek, Vienna

In a far-reaching essay[1] L. Bagrow has severely restricted Ptolemy's claims to the authorship of the 8 books Γεωγραφικὴ Ὑφήγησις traditionally assigned to him (*Introduction to descriptive geography*). I shall from now on simply refer to it as *G(eography)*. A number of manuscripts, containing only the general parts of the treatise, i.e., *G.* I 1-II 1, VII 5, and VIII 1 and 2 together with scholia,[2] led Bagrow to believe that the astronomer had brought together only these chapters for his introduction; for the parts of descriptive geography therein comprised (*G.* II 2-VII 4, 13) are in his opinion more easily understood as deriving from a geographical atlas than as integral parts of an introduction, and would therefore, like the completed maps, have been added by another hand some centuries later.[3] But *G.* I 18, a chapter which cannot be suspected of being an interpolation, expressly announces in the beginning a special introduction (δι'αὐτῆς τῆς κατὰ μέρος ὑφηγήσεως), and *G.* I 19 anticipates the general arrangement of the contents of this introduction; *G.* II 2-VII 4 cannot therefore be excluded as un-Ptolemaic. This judgement is however justified in respect of *G.* VII 5, describing a completed map of the world, for Ptolemy develops only his theories of projection for such a map (*G.* I 24) and describes its geographical contents in the later books *G.* II-VII. On the other hand, *G.* VIII 1 and 2, if removed, would lose their purpose of introducing chapters *G.* 3-28, which follow them; *G.* VIII 1-28 is homogeneous and can only be denied to Ptolemy as a whole. But that is hardly possible, since *G.* VIII 2 contains a personal reference to Ptolemy's principal astronomical work, the Μαθηματικὴ Σύνταξις.

Bagrow was however influenced besides by the contradictory state of research into the problem whether Ptolemy had appended maps[4] to his introduction. P. Dinse,[5] J. Fischer,[6] O. Cuntz[7] and P. Schnabel[8] said he had, while H. Berger,[9] A. Herrmann,[10] K. Kretschmer,[11] L. Tudeer[12] and Gisinger[13] said he had not. Kubitschek[14] at first refrained from judgement and finally committed himself to the opinion that Ptolemy had "written out an atlas of maps" or had "written a book of text" for such an atlas. E. Honigmann[15] was

---

* MSS. of Ptolemy's *Geography* discussed or mentioned in this paper: A: Vat. Pal. Gr. 388. — C: Parisinus Suppl. Gr. 119. — F: Fabricianus bibl. univ. Havnensis Gr. 23. — K: Constantinopolitanus Seragliensis 57 .— L: Athous Vatopedi 655. — N: Oxoniensis Seldenianus 41. — O: Florent. Laurent. XXVIII 49. — R: Venetus Marc. Gr. 516. — S: Florent. Laurent. XXVIII 9. — U: Vat. Urbinas 82. — V: Vat. Gr. 177. — W: Vat. Gr. 178. — X: Vat. Gr. 191. — Z: Vat. Palat. Gr. 314.

1 *Geografiska Annaler* (Stockholm, 1945), p. 318-387.

2 L. O. Tudeer enumerates 8 MSS., in *Annales Acad. Fennicae*, ser. B., XXI (1927), no. 4, pp. 8 ff.; on these, O. Cuntz (before him) in his partial edition of Ptolemy's *Geography* (II 7 — III 1) (Berlin, 1923), p. 30, 36. — P. Schnabel, *Text u. Karten des Pt.* (Leipzig, 1938), unlike Tudeer, excludes Vat. Gr. 1411 (p. 23 ff, 33).

3 *Ibid.*, p. 346, and previously p. 344; on the maps p. 348 ff.

4 The map MSS. enumerated in Schnabel, *Text u. Karten*, p. 78.

5 *Zeitschrift d. Ges. f. Erdkunde* (Berlin, 1913), p. 754 ff.; *Zentralblatt f. Bibliothekswesen*, XXX (1913), p. 389 ff.

6 *Verhandlungen des 18. deutschen Geographentages* (Innsbruck, 1912), p. 224 ff.; *Petermann's Geogr. Mitt.*, 1912, p. 61 ff.; *Akad. Wien Denkschriften*, phil.-hist. Kl., 59, nr. 4 (1916), p. 74 ff.; in K. Cebrian's *Gesch. d. Kartographie*, 1923, p. 113 ff.; *Codices Vat. selecti*, XVIIII: *Cl. Ptol. Geogr. cod. Urbinas Gr. 82 I/1* (*Prodromos*), 1932, p. 108, 130 ff.; in E. L. Stevenson, *Geography of Cl. Ptolemy* (New York, 1932), Introduction, p. 3 ff.

7 Edition, p. 24 ff.

8 *Text u. Karten*, p. 95 ff.

9 *Gesch. d. wiss. Erdkunde d. Griechen*, 1903, p. 640 f.

10 *Zeitschr. d. Ges. f. Erdkunde* (Berlin, 1914), p. 783.

11 *Ibid.*, 1913, p. 767 ff.; *Petermann's Geogr. Mitt.*, 60 (1914), p. 142 f.

12 *Journ. of Hellenic Studies*, XXXVII (1917), p. 66.

13 Pauly-Wissowa, *Realenzyklopaedie d. klass. Altertumswiss.*, Suppl. IV (1924), col. 666.

14 *Realenz.*, X (1919), col. 2088 ff.; *Akad. d. Wiss. Wien*, phil.-hist. Kl., *Anzeiger*, 1934, p. 84, and *Sitz.-Ber.* 215/5 (1935), p. 20; *Klio*, XXVIII (1935), pp. 111 ff.

15 *Klio*, XX (1925), p. 204; *Realenz.*, XIV (1930), p. 1771 note.

at first doubtful before he decided to follow H. Berger. Bagrow on his part joined the Noes in consequence of his attitude to the scholia MSS.

Those who denied the addition of maps did so arguing that Ptolemy would otherwise not have needed to describe their contents in detail in *G.* II-VII. But in *G.* VIII 1, 2 we read: "After having explained how a proportional scheme (or sketch, ὑπογραφὴ σύμμετρος) of the οἰκουμένη could be done if portrayed as a whole on a single map, it is logical to give in advance the schematic chapters (ὑπογραφαὶ κεφαλαιώδεις) if we distribute the οἰκουμένη on several partial maps in order to list all that is gone through above fully and with more obvious symmetry." And further at the beginning of *G.* VIII 2: "Approaching the cartographic division of the οἰκουμένη with this intention (namely to enter all the above with more obvious symmetry) we have had 10 maps drawn up of Europe, 4 of Libya (= Africa) and 12 of the whole of Asia. We have prefaced them with single schematic descriptions, in which first the continent is named, then the number within its particular sequence of maps on which follow the names of the countries represented, further the particular ratio of the central parallel of the map to the meridian is pointed out and what neighbouring countries border on it (περιορισμός). Finally we have entered in each of these chapters the "important towns" (διάσημοι πόλεις) of each country, their polar height being expressed in their longest days, and their longitude expressed in equatorial hours east or west of the meridian of Alexandria, with the situation on the zodiac zone, also mentioning the single or recurring zenith position of the sun and its distance from the solstices." The astronomer is therefore envisaging similarly placed readers, as he is also in the stereotyped sequence of East, South, West towards North in the individual περιορισμοί, corresponding to the course of the sun in the northern hemisphere.[16] In *G.* VIII 3-28 we have the chapters announced as premise and supplement to the actually executed partial maps of the inhabited world instead of a single map of the whole world. Thus it is clear from Ptolemy's words that the point of view of those who deny the original addition of maps to the preceding descriptions of countries, in *G.* II 2-VII 4, can only be interpreted as a failure to appreciate properly the transmitted text of *G.* VIII and is completely mistaken.

Berger, who was the first to adopt this point of view, had therefore to find a different explanation for the maps mentioned in *G.* VIII if they were not intended to illustrate *G.* II-VII. He therefore maintained that they referred only to *G.* VIII and were meant first and foremost to show the "important towns" and in relation to them also other towns. And since nevertheless descriptions preceded these maps in *G.* VIII 3-28, these had been written in order to allow each regional map to be designed independently even without a prototype. But in these chapters the only help the designer gets for laying down the net of his map is the mention of the relation of the central parallel to the meridian, while there are no data for the peripheral parallels and meridians of the map border. Berger thought he could take them from *G.* VIII 30, but the very position at the end suggests the suspicion that this chapter is non-Ptolemaic.[17] And how should the "important towns" have become more suitable for being entered on maps by being expressed in hour coordinates? *G.* VIII, thus interpreted, inavoidably loses its connection with *G.* II-VII; even more so in Berger's view, since he saw, in the reference of the "διάσμοι πόλεις" to the longitude of Alexandria in Egypt, the indication of a relatively earlier phase in Ptolemy's geographical writing. In this connection he cited Ptolemy's first astronomical work, the so-called Μαθηματικὴ Σύνταξις II 13 end, where we read: "Having discussed the treatment of angles (which are formed by the ecliptic and the horizons of the 7 main parallels and their longitudes), and only the examination of the longitude and latitude of the noteworthy cities of each country (τῶν καθ'ἑκάστην ἐπαρχίαν ἐπισημασίας ἀξίων πόλεων) is wanting in order to calculate their celestial phenomena, we shall publish this list independently, as it requires special, i.e. geographical, treatment, and shall do so relying on the researches of scholars who have worked in this field. We shall write in the margin by how many degrees each of the cities is distant from the equator along the meridian drawn through it and again how many degrees east or west on the equator this meridian lies from that drawn through Alexandria, since we are referring to the equator the time differences of the local coordinates."

---

[16] Kubitschek, *Anzeiger*, 1934, p. 83 ff.; *Klio*, XXVIII, p. 85 very remarkably deduces from this stereotyped production a "pedantic author of Bk 8 ...completely different from the Ptolemy of Bks 2-7".

[17] Schnabel, *Text u. Karten*, p. 100 ff.

Berger referred the special list here announced to the "διάσημοι πόλεις" enumerated in *G.* VIII, although the assumed purpose of the special list, viz. the calculation of all the distinct celestial phenomena, in each case fits only to the so-called κανὼν ἐπισήμων πόλεων, the "basic list of important cities" which is extant in numerous MSS.[18] Schnabel recognised this clearly. It must however be conceded that the Canon does not, as proposed in the Μαθ. Σύνταξις, reckon longitudes from Alexandria, but from a zero meridian drawn through the Fortunate Isles (= Canaries), and also that Ptolemy, when working on the Canon, would have found it not only useful but also better to follow contemporary cartographers and geographers and his immediate and greatest geographical predecessor, Marinos of Tyre, in assigning the zero meridian to that group of islands. But the list of διάσημοι πόλεις in *G.* VIII—they are identical with the cities in the κανὼν ἐπισ. πόλεις and therefore still named as ἐπίσημοι in 2 out of 18 cases[19]—has already been transposed with the intention of calculating celestial phenomena and has therefore been adapted to Alexandria as have been all the other astronomer's aids mentioned in the Ptolemaic treatise on the arrangement and method of calculation of the handlists (Προχείρων κανόνων διαταξις καὶ ψηφοφορία). The mention of Alexandria does not therefore indicate an earlier date of composition in Ptolemy's writings, still less in *G.* VIII. If, then, for these reasons *G.* VIII cannot, as Berger suggests, be regarded as older than, and originally unconnected with the other books of the *Geography*, we can understand the change from ἐπίσημος to διάσημος, for the cities mentioned in *G.* VIII represent a selection from the far longer list mentioned in the other books of the *Geography*. A. Herrmann,[20] on the other hand, who followed Berger on his wrong track, even held that the maps in *G.* VIII were fundamentally those of Marinos and that Ptolemy had simply copied them under his own name with slight alterations to his names. But to judge from chapter *G.* I 20, 3-7, Marinos had really published only a worldmap, probably attached to his first geographical treatise. In the following ones he made only literary alterations and supplements by inserting latitudinal and longitudinal lists, but not adapting to them the universal map, still less making partial maps. Some critical remarks of Ptolemy preclude such maps. He writes *G.* I 15, 8: "Further he (Marinos) places the mount Athos on the parallel of Hellespont, but Amphipolis and what lies north of Athos and the mouths of Strymon in the fourth clima, south of Hellespont." Thereupon *G.* I 15, 9: "Similarly he lays almost the whole of Thracia beyond the parallel of Byzantium, but the inland towns of this province in the clima above." This second remark of Ptolemy can only mean that neither the worldmap nor a partial map of Marinos showed any inland town; only in his papers he had discussed them afterwards. By analogy the former note of Ptolemy is to be interpreted: the worldmap of Marinos marked only the mount Athos, and no partial map in addition the town Amphipolis and the surroundings of it, of which Marinos merely reported. So much against Herrmann. The other Ptolemy-scholars who disallow the maps have not bothered at all about *G.* VIII, while Kubitschek[21] goes as far as to deny the whole book to Ptolemy.

From another point of view, however, *G.* VIII gives rise to certain misgivings if considered as an integral part of Ptolemy's *Geography*. For instance, take the view adopted in principle by Ptolemy I 18, 2 that a literary and mapless treatment of the geographical material should already make it possible to draw exact maps; for if copy were continuously made from copy, each single later one would be more unlike the original. But more important are the astronomer's explanations in *G.* II 1, 8 f.: "Besides, such a manner of treatment shall enable those who wish to describe with corresponding entries also in maps the parts of the οἰκουμένη, be it one or several provinces, or satrapies, according to the scale they choose, as well as with correct proportion and specialisation of the map detail. It will not make much difference then if one draws the meridians parallel to each other and the parallel circles in straight lines, as long as the meridian degrees maintain the same proportion to those of the parallel circles as does the largest circle to the central map parallel." As we can see, there is here no reference to any regional maps to be expected, although *G.* VIII 1, 2 – see p. 18 above – introduces them in such a way as if the reader should have been prepared for them

[18] J. Heiberg, *Cl. Ptolemaei opera omnia*, II: *Prolegomena*, p. CXC ff.; Honigmann, *Die sieben Klimata und die* πόλεις ἐπίσημοι (Heidelberg, 1929), p. 72 ff.; Schnabel, "Die Entstehungsgeschichte des kartographischen Erdbildes des Klaudios Ptolemaios", *Sitz.-Ber. Berlin*, phil.-hist. Kl., 1930, p. 221 ff.

[19] Honigmann, *op. cit.*, 9, 62.

[20] *Petermann's Geogr. Mitt.*, Ergänzungsheft 209 (1930), *Wagner Gedächtnisschrift*, p. 49.

[21] *Klio*, XXVIII, p. 11.

before the beginning of the special geography, i.e., in such a place as they occupy in II 1. Instead, however, of finished regional maps and a book *G.* VIII, the words translated from *G.* II 1, 9 lead us to expect only a table of proportions of the meridian to the parallel of latitude as they change from the equator northwards. Such a table Ptolemy could have supplied without difficulty from his table of chords (*Math. Synt.*, I 11, Herbeig 48 ff.). *G.* VIII 1, 6 refers indeed to a general mention of this at the beginning of the geographical treatise,[22] but with regard to the proportion of the mean map-parallel to the meridian, that is having transposed the terms of the proportion. The sections translated from *G.* II 1 must therefore, in consideration of *G.* VIII, have once been differently worded, and become irreconcilable with *G.* VIII in the new recension.

But *G.* I itself already gives the impression that it has changed its original form. Thus Ptolemy announces at the beginning of *G.* I 18 that he now proposes to treat of the graphical representation of the οἰκουμένη and that, as *G.* I 20 makes one believe, *theoretically*, but after a short reference to its twin subjects of globe and plane map he slides into an excursus on the point of view of the so-called εὔχρηστον (= εὐχρηστότερον *G.* I 6, 2), "the easily usable", or "easy to use", which would be equally demanded in the didactic treatment of both subjects, i.e., it should, as just noted before, by words alone and without visual aid make a pictorial representation plain to the understanding, for mere empirical copying of visual models would lead continuously to ever greater divergence, an experience which Ptolemy may have had with his own maps. And now he goes on in c. 18 to criticise Marinos, not for any inadequate or too unemphatic theoretical instruction, but for making insufficient provision for the graphic representation required to clarify and supplement his determination of positions, which was confused and partly incomplete. The primary requirement of a correct network of degrees and, as regards a plane map, of a correct projection is thus by Ptolemy completely disregarded. He ascribes Marinos' failure to determine positions adequately to the unmethodical and piecemeal character of his introduction, or rather of his three treatises (18, 3 διὰ τὸ δύσχρηστον καὶ διεσπαρμένον τῆς ὑφηγήσεως; 18, 4 ἐν ταῖς συντάξεσι κεχωρισμένως). To this cause Ptolemy had already in *G.* I 17 attributed the contradictions in Marinos previously discussed in 15 and 16. Why then did he not in the same context ascribe to it his inexact and incomplete determinations of places? It is therefore difficult to make *G.* I 18, 2 ff. fit into the method demanded by Ptolemy for a geographical introduction.

The same reason and another also throw doubt on *G.* I 19. Here we read: "Therefore in addition to our twofold task, on the one hand to preserve the spirit of the man (Marinos), apart from occasional corrections, on the other by the use or research of better maps to make it possible as far as we can to enter on maps such things as remained unclear with him, we have further assumed the care for a more practicable method (τοῦ κατὰ τὴν μέθοδον προχείρου) by listing for all provinces their particular borders with definition of their longitude and latitude and within them the distribution of the more important peoples as well as the more exact location of the more important towns, rivers, bays, mountains and other map details, i.e., how many of 360 degrees of the largest globe circle each place was removed from the equator on a meridian drawn through it and on its parallel." After all the previous criticism of Marinos this praise of his spirit seems rather unexpected, but could not have been so in an earlier edition of the Γεωγραφικὴ Ὑφήγησις in which c. 19, as demanded by its reference to a systematically arranged special geography, was placed in front of its opening, in the place where we now find *G.* II 1, which specially refers to περὶ τὴν καταγραφὴν εὔχρηστον, its usefulness for graphic representation.

The paragraph 3 of this chapter is logically less a continuation of the preceding paragraph than of *G.* I 19. To wit: Ptolemy in *G.* II 1, 2 defends the graduation of less known localities with the intention of "filling up the entire inhabited world (συμπλήρωσις)", whence he could not go on: "For this reason we set *all* the particular graduation data in tabular form also at the exterior margins of the columns, but placing the longitudes before the latitudes so that rectifications caused by fuller explorations might possibly be introduced into the intervals of the lists."[23] On the other hand one reads, *G.* I 19 end: "Thus

[22] Καθάπερ ἐν ἀρχῇ τῆς συντάξεως εἴπομεν, that is before the special descriptions of countries beginning with *G.* II 2.

[23] Διὸ καὶ τὰς παραθέσεις τῶν μοιρῶν ἐφ' ἑκάστου τοῖς ἐκτὸς μέρεσι τῶν σελιδίων παρεθήκαμεν κανονίων τρόπον, προτάσσοντες μέντοι τὰς τοῦ μήκους τῶν τοῦ πλάτους, ὅπως, ἐάν τινες ἐμπίπτωσι διορθώσεις ἀπὸ τῆς πλείονος ἱστορίας, ἐνῇ ἐν τοῖς ἐχομένοις διαλείμμασι τῶν σελιδίων ποιεῖσθαι τὰς παραθέσεις αὐτῶν.

(= by this method, see p. 20 for what precedes immediately) we shall be able to know at once each local position and because of such particular precision the lands in relation to each other as well as the whole world (οἰκουμένη)."[24] The supposed transposition of chapter *G.* I 19 from a prior instalment is also referred to and evidenced by Ptolemy's talking in *G.* I 18 of more than one treatise of Marinos and among them of a last one especially, whereas in *G.* I 19 beginning he speaks "of the man's (Marinos') spiritual conception going through the whole treatise",[25] not "through his treatises".

If we take it that Ptolemy was revising the original edition for a second, we could to some extent explain the position of the two chapters which distorts the general arrangement: the excursus in c. 18, caused by the astronomer's subsequent realisation of the vain efforts of most of his contemporaries to design a map for Marinos' last (and third) geographical treatise, and c. 19, as a confrontation of Marinos' treatise with his own. Ptolemy indeed did not want to rearrange and discard too much of what he had previously written. On this supposition, *G.* I 18 reveals a very important fact: that Marinos' last treatise was in fact not yet known to Ptolemy, or rather had not yet appeared when Ptolemy first published his Γεωγραφικὴ Ὑφήγησις.

Only in *G.* I 20 did Ptolemy reach the point of discussing representation on a globe, and he had only a few words left for it. The greater part of the chapter is a criticism of the cylindrical projection used by Marinos for the plane map. In opposition to this Ptolemy begins, in *G.* I 21, to develop his conical projection with straight meridians, but interrupts himself to return first to the representation on a globe. Again a sign of rehandling of the subject. In *G.* I 22 Ptolemy enters upon technical details of globe drawing, and in *G.* I 23 he enumerates the 21 + 1 main parallels, with the intervals in hours and degrees, to be marked on the globe. But the thematic repetition in *G.* I 22 disregards what has previously been said in *G.* I 20. Thus we read there in paragraph 1: "But this (i.e., the representation on the globe) does not allow the use of a hand-size globe at the same time suitable for entering the large number of details..." But in c. 22, 1: "The size of the globe will be determined by the author's interest in the number of details, by his ability and his ambition, with the result that the larger the globe, the more detailed and the clearer will be its design." C. 22 is therefore clearly a new insertion, while c. 23, like c. 19, has been moved from its place in the first draft and allocated a different place. For that this chapter must already have been present is proved by the fact that it disregards the southward prolongation of the African and Asian continents to which Ptolemy had been led by the third treatise of Marinos (*G.* I 7-10; 14), and only enumerates the main parallels to the north of the equator.[26] The southernmost one is only mentioned quite inadequately in the marginal note inserted—to the distortion of the sense—in the chapter as its second sentence: γεγράψεται δὲ καὶ ὁ τὸ νοτιώτερον πέρας ἀφορίζων παράλληλος τοσοῦτον τοῦ ἰσημερινοῦ ἀπέχων πρὸς μεσημβρίαν, ὅσον καὶ ὁ διὰ Μερόης πρὸς τας ἄρκτους. "Likewise the parallel on the more southerly limit (of the οἰκουμένη) should have been drawn, distant just as far from the equator towards the south as the parallel through Meroe is distant from the equator northwards." Placed by the revising author between two columns, this phrase has been erroneously introduced by the scribe into the left-hand instead of into the right-hand one and therefore occurs in the beginning, not (as required) in the ending chapter. The note might have been addressed by Ptolemy to anyone after him who might prepare the second edition of his *Geography*. But the last paragraph of the chapter is not Ptolemy's, although it is an attempt to complete the southern hemisphere, but for this see p. 36.

The main parallels mentioned in c. 23, but not c. 21, are finally referred to in *G.* I 24, 5, which chapter again goes back to the conical projection with straight meridians (1-8) and adds another one with curved meridians (9 to end); this might have been a new addition. But even the first does not seem to be treated without inconsistency. For the widths of circles of 52 and 115 parts assumed for it there (3) are based

[24] Οὕτως γὰρ εὐθύς τε ἕξομεν διαγιγνώσκειν τὴν ἑκάστου θέσιν καὶ διὰ τῆς τῶν κατὰ μέρος ἀκριβείας καὶ τὴν τῶν ἐπαρχιῶν αὐτῶν σχέσιν πρὸς ἀλλήλας τε καὶ τὴν ὅλην οἰκουμένην.

[25] τὴν γνώμην τοῦ ἀνδρὸς τὴν δι' ὅλης τῆς συντάξεως.

[26] The numbered main parallels are repeated from Ptolemy's *Math. Synt.*, II 6, but with a significant difference. Ptolemy does not there omit the equator from the numbering as in *G.* I 23, but counts it as the first parallel, not yet knowing a southward prolongation of the inhabited world. Therefore we would have to assume that Pt. in the first edition was of the same opinion and only makes a change in the second, when taking the equator as the line of demarcation between the two hemispheres. Kubitschek, *Gött. Gel. Anz.*, 1935, p. 382 ff. suspects the chapter as an "interpolation".

on the figure of 40800 stadia for the parallel of Thule, as results from the proportions of 40800:90000 = x:(x+63) for the first width and of 40800:52 = 90000:x_1 for the second. Similarly the calculation of the parallel of Rhodes into almost 93 parts in c. 20, 8 results from the proportion of 40800:52 = 72800:x_2. It is therefore perplexing that in *G.* I 24, 5 Ptolemy calculates the mean longitudinal extension of the οἰκουμένη on the parallel of Rhodes with only 144 parts as against "$79^5/_{12}°$ or circa 80" of its latitudinal extension, that is on the basis of 144:80 = 72000:40000; and expressly mentions these last two figures; for the proportion of 180:x_3 = 115:93 derived from the figures 72800 and 40800 gives a value of 145 parts. Therefore *G.* I 24, 1-8, even if not added in its entirety, nevertheless betrays a later revision and, what is more, a revision by the astronomer himself, who makes a very personal appearance towards its end (22).

But Ptolemy arrives at the latitudinal extension of the οἰκουμένη of $79^5/_{12}°$ or ca. 80° only by prolonging Libya-Africa, under the influence of Marinos' third treatise (*G.* I 7, 4 ff.), to the south of the equator, not as far as Marinos did to the southern tropic, but nevertheless to a parallel of latitude of $16^5/_{12}°$, corresponding to an increase of the longest day by half an hour (I 7-10, 1; 14, 4). With the addition of 63° of north latitude, from Thule, we get the width stated. But this was not the opinion of Ptolemy so long as he had *G.* VIII still more closely connected with his *Geography*. In order to show it I proceed from the 4th regional map of Africa and (in regard to that) from the confrontation, proposed by P. Schnabel,[27] of *G.* VIII 16 and the so-called Ἔκθεσις τῶν πινάκων τῆς οἰκουμένης as we read in Paris. Gr. 2399 (K), "a list of maps of the οἰκουμένη"—in fact the commentary of *G.* VIII 3-28 on the 26 regional maps, made independent; what differs is chiefly its return from Ptolemy's conversion to hours in *G.* VIII back to degrees. Halma, publishing the Ἔκθεσις from the aforesaid Paris,[28] heads this with the title Πτολεμαίου, Θέωνος καὶ Ὑπατίας πρόχειροι κανόνες, of his own choosing. But neither the short introduction nor the prolix appended instruction how to reconvert degrees into longest days points to the author. Leaving aside Ptolemy himself, the astronomer Theon is no less out of the question, as shown by his shorter commentary on Ptolemy's Πρόχειροι κανόνες, published also by Halma, if compared spiritually, and in part thematically, with the Ἔκθεσις. Add to this that the included table of concordances of degrees of latitude and longest days for every 4 minutes of time is defective; from 9°04′ Lat. to 25°06′ Lat. each number of latitude is one behind. The same table recurs also in other MSS. (Vat. Gr. 209; Vat. Pal. Gr. 137; Laur. XXVIII 7 and 12; cf. *Ptol. opera omnia*, ed. J. Heiberg, II, p. CXCV ff.), but I cannot say whether with the same fault also. The instruction for use of the table, as given in the above-mentioned Paris., nevertheless rests on these defects.

Schnabel, *l.c.*, mentions as deriving from the same archetype (Leidensis LXXVIII) not only the aforesaid Paris. codex, but also Laur. XXVIII 12 (F) which introduces the map characteristics packed together before the cities, and Paris. Gr. 2497 (P) which omits the references to the maps. Schnabel had no more precise knowledge of the former codex F. He therefore only quotes from K what it contains on the 4th regional map of Africa and particularly on the mean parallel: Ὁ δὲ διὰ μέσου αὐτοῦ (sc. τοῦ πίνακος) παράλληλος καὶ αὐτὸς τὸν αὐτὸν λόγον ἔχει πρὸς τὸν μησημβρινὸν ὃν τὰ πεντήκοντατρια πρὸς τὰ ἑξήκοντα "The mean parallel of it (viz. the 4th map) has likewise the same ratio to the meridian, viz. 53:60." On the other hand the reading of *G.* VIII, 16 in all MSS. is: Ὁ δὲ διὰ μέσου αὐτοῦ παράλληλος λόγον ἔχει τὸν αὐτὸν ἔγγιστα πρὸς τὸν μεσημβρινόν. "The mean parallel of it stands to the meridian at parity (1:1) approximately." Schnabel, indeed, though mentioning additions in K, implies (in spite of rather tortuous expression) that he considers K to be a primary version, and *G.* VIII a secondary recension derived from it in debased Greek, corresponding to an advanced southern limit of the countries represented and to a consequent alteration in the proportion of parallel to meridian to parity (1:1). But K in fact agrees there with *G.* VIII 28 for the 12th regional map of Asia (Ταπροβάνη νῆσος), where there is no possibility of assuming a later stylistic recension. Ptolemy himself may have written thus in regard to this map.

On the other hand Schnabel is right in deducing from *G.* VIII 16 an advance in the southern border of Africa. For if it stretched from 26°30′ N. Lat. (*G.* IV 1, 1) to $16^5/_{12}°$ S. Lat. (*G.* I 10, 1; 14, 4), or near to

---

[27] "Die Entstehungsgesch.," p. 229 ff.

[28] Θεώνος Ἀλεξανδρέως ὑπόμνημα εἰς τοὺς Πτολεμαίου προχείρους κανόνας. *Commentaire de Théon d'Alexandrie sur les tables manuelles astronomiques de Ptol. III* 1 (Paris, 1822), p. 109-133.

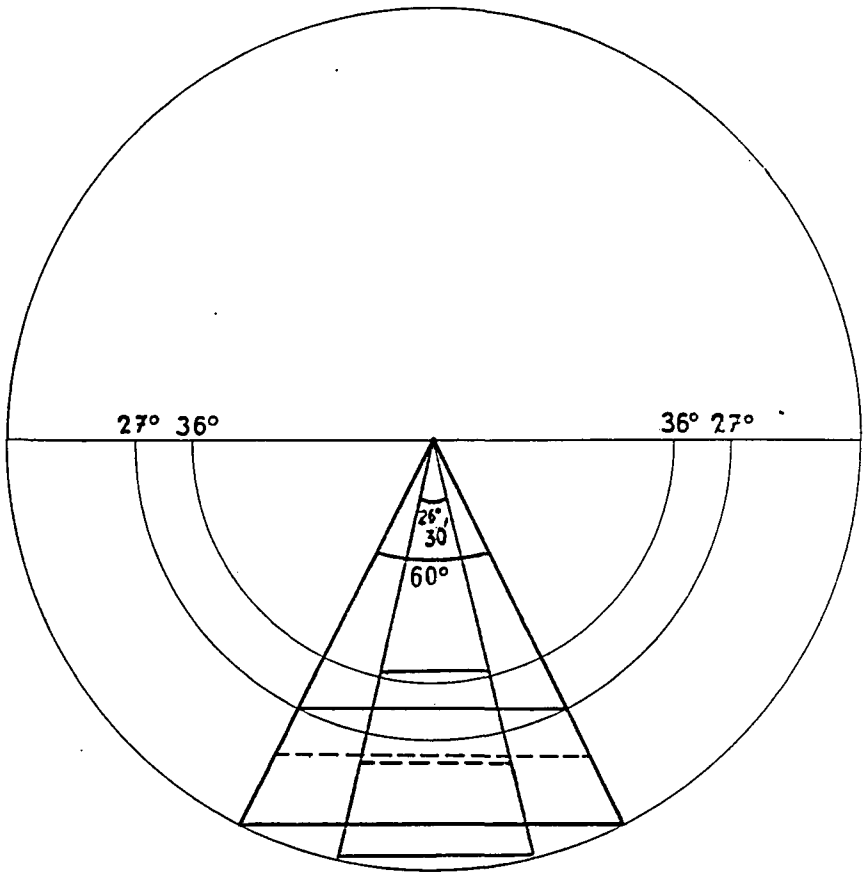

Fig. 1. In black, the ratio of the hatched central parallel to the edge parallel 27° (4th regional map of Africa).
In red, the ratio of the hatched central parallel to the edge parallel 36° (11th regional map of Asia). Longitudinal extent in black 60°, in red 26°30′.

this latitude (*G.* IV 8, 1: 15°), this continent would have had in the 4th regional map a mean parallel of about 5° N. Lat., which according to Ptolemy's table of chords (*Math. Synt.*, I, 11) allowed only a proportion of 1:1. A true fraction like $\frac{53}{60}$ can therefore only be explained if Africa remained north of the equator on the map intended in the Ἔκθεσις. But between a northern map limit of about 27° and the equator the mean parallel comes to 13°30′, which in the table of chords gives only a proportion of $\frac{116^{p}\ 41'\ 04''}{120^{p}}$, ca. $\frac{116}{120} = \frac{58}{60}$ and not as stated $\frac{53}{60}$. Schnabel, who rounded off to $\frac{116}{120} = \frac{58}{60}$, assumed that this proportion, written in Greek ΝΗ:Ξ, had been corrupted in the MSS. to ΝΓ:Ξ; he adduced the fact that in *G.* I 24, 17 Ptolemy calculated the parallel of Meroe (16°25′) with such a proportion. But there it is only to be understood theoretically in connection with the second conical projection; in practice a proportion of $\frac{58}{60}$ is, for the draughtsman, 1:1. Rather does the proportion of 53:60, given in the Ἔκθεσις, become clear, if we consider the extent in length of the fourth regional map of Africa, viz. 8°-65° N. and 14°-73°50′ S. Lat., that is about 60°. With such a length the divergence of the border meridians does indeed become pronounced. And on the flat drawing—see fig. 1—this brings the central parallel, if drawn as a straight line, so close to the circle of the northern border parallel that we are inclined to relate its corresponding chord to the largest.[29] If the northern edge of the map is taken to be 27° N. Lat. the table of chords will give the fraction $\frac{106^{p}\ 55'\ 15''}{120^{p}}$, approximately rounded off to $\frac{106}{120} = \frac{53}{60}$. There is therefore no reason to alter the traditional reading of this in the Ἔκθεσις, which supports an Africa not extending outward beyond the so-called "South Horn" (Νότου κέρας, in *G.* IV 7, 4 according to recension Ξ placed at 2° N. Lat., as Schnabel, correctly, *Text u. Karten des Pt.*, p. 75), according to Strabo, XVI 4, 15 C. 774, the end of the sea route along the east coast of Ethiopia. Thus the Ἔκθεσις attests, as the key to the 4th map of Africa in *G.* VIII, the same

[29] From Ptolemy's conical projection–see H. v. Mžik's translation of Ptolemy's *Geography* in *Klotho*, Bd. 5 (Vienna, 1938), p. 68, fig. 1 – we obtain the same conclusion.

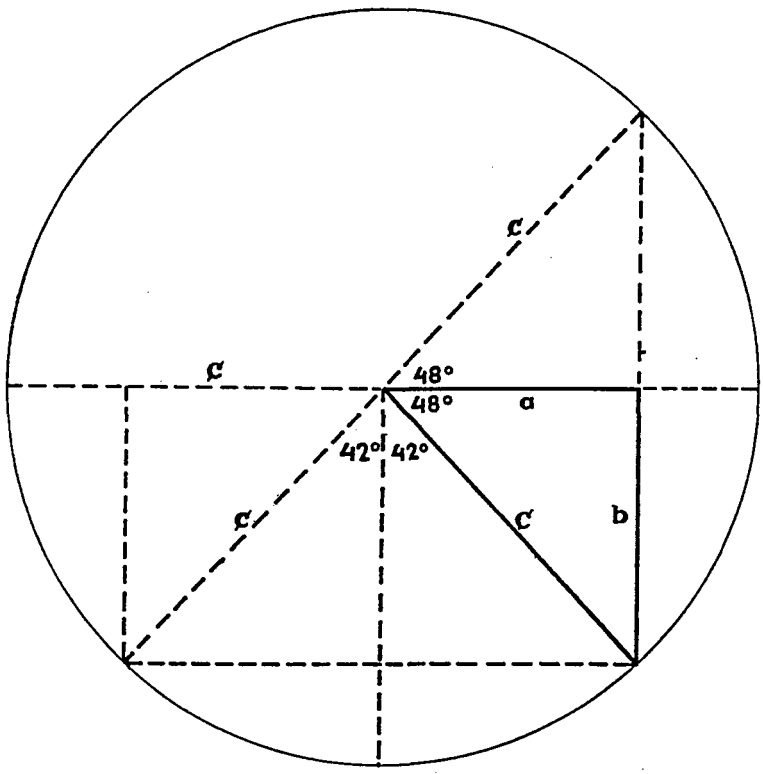

Fig. 2.

status quo ante that Ptolemy allowed us to infer in *G.* I 23, viz. his first restriction of the οἰκουμένη to the northern hemisphere.

In south-east Asia too (we may now presume) Marinos in his third treatise went considerably beyond the equator to the south. Ptolemy does not say so directly in *G.* I 14, but he there compares the extension of latitude in Africa to the south of the equator, in order again to reduce the exaggerated latitude of Marinos; he allows a special latitude of only 3° south for the port of the Sinese, Kattigara. This he arrives at by assuming—cf. here fig. 2—$10^1/_3°$ parallel to the equator from the Golden Peninsula (Χρυσῆ Χέρσονησος) to the city of Zabai, and the same from Zabai to Kattigara in a south-easterly direction; the normal projection of the second distance to the equator is said to be $^2/_3$, i.e. $6^8/_9°$ or, as Ptolemy counts roughly, $6^5/_6°$. Since in *G.* I 13, 3 he has already claimed, for a northern latitude of 13°20′ (Cape Kory in India thus sided the Ganges), that circles drawn in this latitude are hardly distinguishable from the largest circle, it is permissible for our calculation to treat the latitude Golden Chersonese (seaport of Takola 4°40′)—Zabai (4°45′) similarly as if it were identical with the equator. Therefore if we draw a circle from Zabai with $c = 10^1/_3$ as radius, 2c becomes the largest chord of 120^p and if $a = {}^2/_3 c$, $2a = {}^2/_3 . 2c = {}^2/_3 . 120^p = 80^p$, the corresponding arc or angle will be roughly 84°. Thus a chord of $2b$ = ca. 90^p, that is $^3/_4 . 120^p$ or $^3/_4 . 2c$, corresponds to the supplementary angle of 96°. Giving c the value of $10^1/_3 = {}^{31}/_3$, we get $2b = {}^3/_4 . {}^{62}/_3$, therefore $b = {}^{31}/_4°$ or $7^3/_4°$. Subtracting from this the latitude of Zabai $4^3/_4°$, we get 3° S. Lat. for Kattigara.

For the relevant 11th map of Asia the Ἔκθεσις gives the following data in the same codex K as above: Ὁ δὲ διὰ μέσου αὐτοῦ τοῦ πίνακος παράλληλος λόγον ἔχει τὸν αὐτὸν ἔγγιστα πρὸς τὸν μεσημβρινὸν ὃν καὶ ὁ τοῦ δεκάτου πίνακος "The mean parallel of this map has approximately the same ratio to the meridian as in the tenth map". i.e., 11:12. But in *G.* VIII 27 we read the same words as for the 4th regional map of Africa: Ὁ δὲ διὰ μέσου αὐτοῦ παράλληλος λόγον ἔχει τὸν αὐτὸν ἔγγιστα πρὸς τὸν μεσημβρινόν "The mean parallel of this map stands to the meridian at parity (1:1) approximately", i.e., 1:1. Again the proportion $^{11}/_{12} = {}^{110}/_{120}$ is best approximated in a situation north of the equator of the countries here referred to: India beyond the Ganges and the country of the Sinese. Since the northern edge of the two countries is given as 35° (*G.* VI 13, 1; 16, 1), the northern edge of the map can therefore be assumed to be 35°30′ or 36°, the central parallel will be 17°45′ or 18° with a southern extension to the equator, that is a proportion of the

central parallel to the meridian of $\frac{114^{p}\ 17'\ 15''}{120}$ or $\frac{114^{p}\ 07'\ 37''}{120}$, i.e., roughly $\frac{114}{120}$ or $\frac{57}{60}$. The proportion will however approach the given fraction of $\frac{11}{12} = \frac{110}{120}$, if, starting from the τὸ μετ' αὐτὴν (sc. Τάκωλα ἐμπόριον) ἀκρωτήριον (*G.* VIII 2, 5 Renou 45)[30] in 4°20′ N. Lat., i.e., from a southern map edge of about 4°, we divide the resulting latitudinal extension of 36°—4° = 32° by 2, and subtract the latitude of 16° resulting from this from the 36°, thereby getting a central parallel of 20° with the corresponding proportion of this to the meridian of $\frac{112^{p}\ 45'\ 48''}{120}$ which, considering the longitudinal extension of the map field (145° to 173° in the north, 145°30′ to 170° south, therefore middle at 26°30′) may be simplified to $\frac{110}{120}$.[30a]

As is proved therefore by the Ἔκθεσις, Ptolemy when compiling *G.* VIII knew neither Africa nor Asia beyond the equator; the port of Kattigara in Far east Asia had not yet been shifted by him to the southern hemisphere on the parallel 3°, but lay in 8°30′ Lat. N., as given in consonance with the Ἔκθ. by the Κανὼν ἐπισημ. πόλ.[31] and as *G.* VIII also implies from the reference of the town to the summer solstice in MSS.Z S $N^{3}O$.[32] What, however, applies to book *G.* VIII, applies also to the preceding books likewise. Chapters *G.* I 7-10 and 14, disputing against Marinos on the presumed extension of Africa and Asia, were not yet composed as they are handed down, nor did they exist at all when Ptolemy came to the geography. That chapter *G.* I 23 still counted the equator as the first parallel we have already suggested. *G.* I 24 had the first conical projection, not yet enlarged to embrace the southern parts of the two continents in question; the spherical projection which followed it was not yet divined or carried out. *G.* IV 8, dealing with the new Africa, was missing, and *G.* VII concerning Far-east Asia had not yet lowered some of the positions.

We may presume that Marinos exerted already considerable influence on the first edition of Ptolemy's *Geography* (*G.* I 19 beginning; p. 20). But he had then not yet written his third treatise. And his first and second publications, in which he knew Africa and Asia, with the exception of the island of Taprobane, only north of the equator, do not specially distinguish him from the other geographers. Hence, at the beginning of *G.* VIII, the words written by Ptolemy for the conclusion of the first edition of the *Geography*: "I believe the necessary contributions to an introduction to descriptive geography, made from continuous correction by those who have travelled in distant countries and from a cartography constantly striving to become more convenient to use and better improved, may prove sufficient. For would it not be ridiculous to do as our predecessors have done, showing in a final chapter through what places each of the map

LIST I

	X	RW	Ἔκθεσις	
Augustodunum	23°40′ 46°10′	23°40′ 46°30′	23°20′ 46°10′	20′ (Γ) from 40′ (Γ°)?
Lugdunum Seg.	23°15′ 45°20′	23°15′ 45°50′	23°15′ 45°20′	
Narbo	21°30′ 43°15′	21° 43°	21°30′ 43°15′	
Vienna	23° 45°	26° 45°	23° 45°	
Amisia	31°30′ 51°30′	31°30′ 51°	31°10′ 51°30′	10′ (ς) from 30′ (L)?
Scandia ins.	44°30′ 58°30′	44° 58°30′	44°10′ 58°30′	10′ (ς) from 30′ (L)?
Sidronia	43°30′ 44°30′	43°30′ 44°10′	43°30′ 44°30′	
Salonae	43°30′ 43°10′	43°20′ 43°10′	43°10′ 43°30′	Long. changed with Lat.?
Nicaea (Gall. Narb.)	28° 43°25′	28° 43°35′	28° 43°20′	20′ (Γ) from 25′ (Γιβ′)?
Tarracina	37°30′ 41°15′	37°45′ 41°15′	37°30′ 41°15′	
Neapolis	40° 40°55′	40° 40°30′	40° 40°50′	50′ (L′Γ′) from 55′ (L′Γ′ιβ′)?
Taras	42°10′ 40°	42°30′ 40°	42°10′ 40°	

[30] L. Renou's edition of *La géographie de Ptolemée, L'Inde* (*VII 1-4*) (Paris, 1925) will be cited henceforth by the capital R.

[30a] But, if extended beyond the equator to 3° S. Lat. (Kattigara) or beyond, the network of this map would be dominated by a middle parallel of about 16°, that is by the fraction of $\frac{115^{p}03'30''}{120^{p}}$ corresponding to the relative chord in the table, which may be equated by Ptolemy with 1:1.

[31] Vat. Gr. 1291 (Honigmann, *op. cit.*, p. 206 l. 445).

[32] Schnabel, "Entstehungsgesch.", p. 237 ff.—Cf. p. 27 under discussion.

parallels and meridians is drawn, when we have already added the numbers of the parallels and meridians passing through them to all places including those which do not happen to lie on the circles thus marked?" As we can see, the translated passage does not mention any special names, but this is not evidence against a silent intrusion of Marinos.

Not only from the relation to the equator, but also from another aspect have we to judge the Ἔκθεσις. As may be inferred from its origin and from its connexion with the maps of *G.* VIII, it should use the graduation data of *G.* II 2-VII 4, not simply the Canon. I am sorry indeed to confine my attached confrontation to the section of Ptolemy's *Geography* edited by Cuntz (*G.* II 7 - III 1), and on the other hand to Halma's unreliable publication of the Ἔκθεσις based on the Paris. 2399 (K as cited by Schnabel) chiefly; for he frankly confesses that he has combined this text with other Parisini, 2493 and 2494, which differ in particulars.[33] Nevertheless, the Ἔκθεσις, as it peeps out of the list, agrees closely with the MSS. group X Z S for places like the northernmost isle in the Scandia cluster (ς = 10′ and L = 30′ miswritten as often, see Cuntz' edition, pp. 10 and 44), Sidronia, Salonae (Long. and Lat. misplaced in the Ἔκθ.), Neapolis (behind by 5 minutes) and Taras.[34] Thus, seeking the relics of the first edition of Ptolemy's *Geography*, we have had to turn our special attention to the MSS. group mentioned.

LIST II

	Town	Longitude	from Alexandria		Distance in hours	
			60°	60°30′		
1	Augustodunum	XZ 23°40′ Ω 23°40′	2h 25′ 2h 25′	2h 28′ 2h 28′	XZ 2h 30′ Ω 2h 25′	
2	Durocottorum	XZ 23°45′ Ω 23°45′	2h 25′ 2h 25′	2h 27′ 2h 27′	XZ 2h 30′ Ω 2h25′	
3	Massalia	X 24°30′ ΩZ 24°10′	2h 22′ 2h 23′	2h 24′ 2h 25′	XZ 2h 24′ Ω 2h 25′	
4	Narbo	XZ 21°30′ Ω 21°	2h 34′ 2h 36′	2h 36′ 2h 38′	XZ 2h 30′* Ω 2h 35′	* βL′ instead of βL′ιβ
5	Vienna	XZ 23° Ω 26°	2h 28′ 2h 16′	2h 30′ 2h 18′	XZ 2h 30′ Ω 2h 15′	
6	Luppia	XZ 34°30′ Ω 34°30′	1h 42′ 1h 42′	1h 44′ 1h 44′	XZ 1h 45′ Ω 1h 40′	
7	Arlape	X 35° Ω 35°	1h 40′ 1h 40′	1h 42′ 1h 42′	X 1h 44′* Ω 1h 40′	* in excess
8	Iulium Carnicum	XZ 34°30′ Ω 34°30′	1h 42′ 1h 42′	1h 44′ 1h 44′	XZ 1h 44′ Ω 1h 40′	* in excess
9	Poetovio	X 38°20′ ΩZ 37°40′	1h 27′ 1h 29′	1h 29′ 1h 31′	X 1h 30′ ΩZ 1h 30′	
10	Scarbantia	XZ 39°30′ Ω 39°30′	1h 22′ 1h 22′	1h 24′ 1h 24′	XZ 1h 24′ Ω 1h 20′	
11	Emona	XZ 36° Ω 36°	1h 36′ 1h 36′	1h 38′ 1h 38′	XZ 1h 40′ Ω 1h 34′*	* defective
12	Servitium	XZ 41°20′ Ω 42°20′	1h 15′ 1h 11′	1h 17′ 1h 13′	X 1h 16′* Ω 1h 10′	* precisely 1h 16¼′
13	Sirmium	XZ 44°50′ Ω 44°50′	1h 01′ 1h 01′	1h 03′ 1h 03′	XZ 1h 04′* Ω 1h	* in excess
14	Brundisium	XZ 42°30′ Ω 42°30′	1h 10′ 1 10′	1h 12′ 1 12′	XZ 1h 12′ Ω 1 10′	
15	Ravenna	XZ 34°40′ Ω 34°40′	1h 41′ 1h 41′	1h 43′ 1h 43′	XZ 1h 44′* Ω 1h 40′	* precisely 1h 43¼′

[33] Halma, *op. cit.*, p. 108.

[34] The port of Taras is mentioned in *G.* VIII only by cod. X. The city of Roma has, indeed, in the Ἔκθ. the Long. 36°20′ as in the Canon and as reckoned from *G.* VIII 8, not 36°40′ as in *G.* III 1, 54.

This relationship is consistent with the fact that in recension Ξ in *G.* VIII, represented by MSS X, Z and from c. 27 onward by N^3, O, and S,[35] the meridian of Alexandria in Egypt from which it reckons in hours the longitude—counted in degrees from a zero meridian through the Fortunate Isles, both by the Κανὼν ἐπισημ. πόλ. and by the Ἔκθεσις, and also by *G.* II 2-VII 4—lies in 60°30′ (*G.* IV 5, 4) and not 60° as stated in recension Ω. If, as shown in List II above the part-edition of Cuntz, p. 102 ff., recension Ω in MSS. R and U (the only ones considered here) is based on Alexandria as in 60°, this meridian is merely a secondary reverse derivation from the fact that the distance of Alexandria counted in hours from the Fortunate Isles is 4^h 02′, i.e., ca. 4 *h.* But on no account is Ptolemy to be suspected of this kind of inverted reckoning, so that recension Ξ, which happily does not show it, reckons as Ptolemy himself reckoned or intended to reckon in the first edition of his *Geography.* Apart from the towns enumerated in our list, the hour longitudes of Ancona ᾱ L′ιε′ (1^h 34′) and of Beneventum ᾱ δ′ (1^h 15′ simplified from 1^h 16′) —cod. X is in both these cases corrupt—represent the basic point of Alexandria in Ω unequivocally as in 60° Long. The method of conversion in recension Ω is in any case secondary and un-Ptolemaic for yet another reason: it presupposes the method used in Ξ and retains some of its peculiarities and corruptions. Thus the cities Sidronia (Liburnia) and Roma are retained at the hour-distances of ᾱ η′ (1^h 7½′) and ᾱ L′η′ (1^h 37½′) as in Ξ, instead of having been altered to ᾱ ιβ′ (1^h 05′) and ᾱ L′ιβ′ (1^h 35′) in accordance with Alexandria in 60°. We find in Ω the longitude of Lugdunum Segusiavorum reckoned in hours as β̄ L′ (2^h 30′), taken over from X, instead of β̄ γ′ιβ′ (2^h 25′), and for the longitude of Nemausus (Gallia Narb.) we find X's error of β̄ L′ (2^h 30′) instead of β̄ L′ιβ′ (2h 35′). Again, just as in Ξ, Ω gives the longitudes of Amisia (Germania Magna), Aleria and Mariana (Corsica) as β̄ (2^h) which seems to have originated from ᾱ L′γ′ς′ (1^h 56′), with a misreading of the last digit from ϛ′ (6) to ς′ ($^1/_6$). For fractions are of course calculated from integers, and so we must not be surprised if occasionally we come across some remaining traces of these. Finally, the longest days of Arlape, Scarbantia, Tarracina and Ravenna, given in *G.* VIII for their latitude, are too long by 5 minutes in Ω just as in Ξ.

X and Z, the chief representatives of recension Ξ in *G.* VIII, lead us back therefore in this book to the first edition of Ptolemy's *Geography*, a convergence which is explained by derivation from their common type Ξ. Its relation to that of Ω is illustrated in a very interesting way by the comparison of MSS. published by Schnabel from *G.* VIII 27, 10-13 (Aspithra, Thinai, Kattigara, Argyre) in three columns.[36] He ranges in the first column MSS. X and F, in the second MSS. O and S adding later Z and N^3, and in the third MSS. U, V and A, hereto later R C W besides,[37] these representing recension Ω. According to all these, the towns of Kattigara and Argyre are uniformly placed, no longer as by the Ἔκθεσις and earlier by the Κανὼν ἐπισημ. πόλ. in 8°30′ lat. N., but in 8°30′ lat. S. Starting with the third column, we notice that the addition, belonging to it, of the phrase τοῦ νοτίου πόλου ὑπὲρ γῆν ἐξηρμένου, "with the south pole raised above the horizon", has been wrongly introduced before the number of hours' distance from Alexandria, instead of being related to the determination of the longest day. It is therefore a marginal note originally added later in Ω. Besides, as U shows clearly for Argyre—Schnabel wrongly renders χειμερινῆς for really θεριυῆς—, previously both towns had had their distance on the ecliptic reckoned from the summer solstice, and not (as handed down) from the winter solstice. The MSS. in the second column are obviously enriched by those in the third column in so far as for Kattigara and Argyre they take over the same additional phrase relating to the south pole and not the reference to the winter solstice, a sign of mathematical and astronomical incapacity. The addition referred to has there been introduced in an even worse place, viz. after the distance in hours from Alexandria; thus these MSS. too drew on marginal notes. The MSS. of the second column further agree with those of the third column on the transposition of the island of Argyre into the capital of the island of Ἰαβαδιόυ;[38] but they do not take over its simultaneous removal from the country of the Sinese to India beyond the Ganges and therefore they do not put it within *G.* VIII 27 rearranged

[35] Schnabel, *Text u. Karten*, p. 55 f. and 76.
[36] "Entstehungsgesch.", p. 236 f.
[37] Cf. note 35. *Ibidem*, p. 76 note 2, the author accuses himself of having confounded the second and third column, wrongly as it seems.
[38] Pt understood the name as genitive case, hence his commenting Ἰαβαδίου, ὃ σημαίνει χριθῆς (*G.* VII 2, 29 R. 59 lines 5 f.).

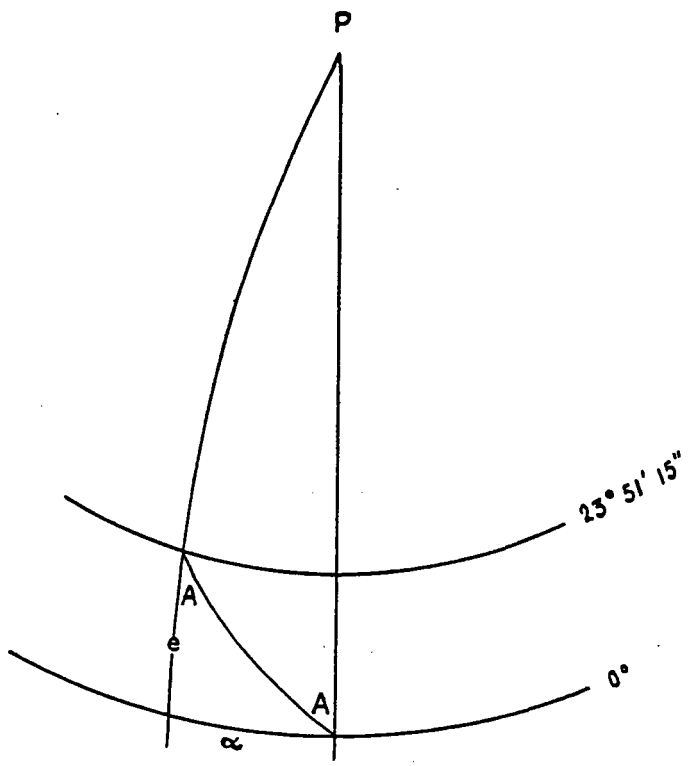

Fig. 3.

before Aspithra, as is done in the MSS. of col. 3. Here, too, incomplete marginal notes must have intervened, but transmitted from the MSS. of col. 3 to those of col. 2 as Argyre shows. Resting however on an earlier stage they do not enter on the reckoning of hours from Alexandria in 60° L. as carried out by the MSS. of col. 3.

We are led from the second into the first column by the little word ὁμοίως which in both precedes Argyre in the south pole interpolation and by the wrong verb form ἐξηρτημένου instead of the correct ἐξηρμένου. Both columns have also in common the special latitude of Thinai. For according to the table of ecliptic obliquity (Κανόνιον λοξώσεως *Math. Synt.*, I, 15, Heiberg 82) the ecliptic degrees, appearing in the two columns, give a latitude of 10°20′, which we get also from the longest day of ιβ̄ L′η′ (12ʰ 37½′), if we take η to be equal to 7′, bearing in mind the fact that the Greek had no other symbol to express 7′ as a fraction of an hour, and that *G.* VIII represents the longitudinal difference between Alexandria 60°30′ and Roma 36°20′, i.e. 24°10′ = 1ʰ 36′ 40″ as α̅ L′ή (p. 27), thus coming to 12ʰ 37′. The spheric-trigonometrical formula of cotg A $= \frac{\text{tg e}}{\sin \alpha}$ results in a latitude of 10° 20′ 04″, that is ca. 10°20′ (fig. 3), taking A as the required geographical latitude, e as the obliquity of the ecliptic (acc. to the above mentioned Καν. λοξ. 23°51′20″) and α as the distance from the equinoctial point on the equator of 4°37′30″ resulting from $\frac{37'}{2}$ increase for half a day's course of the sun. If we follow the theorem developed by Ptolemy (*Math. Synt.* I, 13, Heiberg 74, 11 ff. = C. Manitius' translation I pp. 49 f. "A" and 63) for re-conversion into the longest day, we get the result 12°37′25″, exactly ιβ̄ L′η′ as in the MSS. But the Greek expression of 10°20′—given wrongly by Schnabel[39] as 10°30′—is ῑγ, not very different from ῑγ̄ = 13° as is generally the MSS. reading for the latitude of Thinai.[40] The error of ῑγ for ῑγ̄ accounts in all probability therefore for the conversion in *G.* VIII as given in the MSS. of Schnabel's first and second columns, an indication thus that it was not Ptolemy himself who made this conversion, but that he had it done by an assistant.[41] Finally, the above mentioned MSS.

[39] "Entstehungsgesch.", p. 239.

[40] *G.* VII 3, 5 R. 65; Κανὼν ἐπισήμ. πόλ. Vat. Gr. 1291 Honigmann, *op. cit.*, p. 206 line 444; Ἔκθεσις Halma, *op. cit.*, p. 130.

[41] A similar error accounts for the longest day as given for Neapolis in Italy *G.* VII 8. It is derived from a latitude miswritten or misread by prescribing or converting to hours in X as μ̄ς γ′ιβ′ instead of μ̄ L′γ′ιβ′ with the frequent transposition of L and ς.

of col. 1 and 2 are even more closely associated by their conversion of the longitudes of Aspithra and Kattigara from Alexandria as 60°30′. Thus according to them Aspithra is said to have a distance in hours from Alexandria of 7ʰ 40′, exactly calculated from a difference of 175°30′ – 60°30′ = 115°, while the MSS. of the third column read instead 175°30′ – 60° = 115°30′ = 7ʰ 42′ (ζγο′ καὶ λ′). The distance of Kattigara in 177° L, as all have it from Alexandria, is given in the first two columns as 7ʰ 45′, rounded from a difference of 177° – 60°30′ = 116°30′ = 7ʰ 46′, while the third column, reading ὥραις ζ L′γ′ ἢ ὅλαις η̄, rounds off the difference of 177° – 60° = 117° = 7ʰ 48′.

There is no doubt therefore that X and Z accompanied by N³, O and S go back in *G.* VIII 27, 10-13 to a common type Ξ, influenced later by type Ω. X itself as transmitted here differs indeed from O and S in the mathematically correct rendering of the text. Not only do we find the addendum τοῦ νοτίου πόλου ὑπὲρ γῆν ἐξηρμένου in the right place and the express mention of the winter solstice, but X also differs in its preference for the formula ἐφ' ἑκάτερα τῆς... τροπῆς instead of τῆς... τροπῆς ἐφ' ἑκάτερα. But all this is independent evolution. What there was textually before, the other descendants of Ξ in this place have told us while carelessly retaining the reference of Kattigara and Argyre to the summer solstice as signs of their former position above the equator. But as in Ξ the relation to the south pole is wrongly added also in Ω. Both the types therefore have here the same basis and show that Ptolemy did not work over the book *G.* VIII as we had already supposed generally before (p. 19).

It is, however, not the same basis on which Ξ and Ω meet in the countrywise description of *G.* II 2 - VII 4. Limiting my examination to the part-edition by O. Cuntz (*G.* II 7 - III 1) because of its complete apparatus of textual criticism, I proceed from chapters II 13 (Noricum) and 14 (Pannonia superior) in order to illustrate moreover how MSS. X and Z within the reach of type Ξ make play with Ω, now converging, now diverging from each other. Unfortunately the edition of Cuntz is based, according to Schnabel,[42] on too few MSS. He does not take into account, for example, the mixed MS. A which is important for judging X. Nor did Cuntz know Ms. Constantinopolitanus Seragliensis 57[43] which was only brought to light by A. Deissmann in 1930. For the following discussion my attached map is to be compared. Thus in *G.* II 13, 1, describing the frontiers of the province of Noricum, all MSS. define the eastern frontier by the Mons Cetius, but only X lays down its northern and southern limit with the coordinates 37°30′ L. 46°50′ Lat. N. and 37°30′ L. 45°30′ Lat. N., as Ptolemy probably did. All the other MSS. omit the southern end of the mountain range, with the result that in them the eastern frontier of Noricum, if restricted to the Noric chapter, becomes undefined. The southern frontier of Noricum is said to run opposite Istria (Italy) along the Karvankas, and its centre to be in 35° L. 45°20′ Lat. N., as all MSS. agree; since this mountain range begins at the western frontier of Noricum, i.e., in meridian 34°, we get a development in length from 34° to 36°. But all MSS. including X nevertheless include the mountain range in the western frontier of Upper Pannonia (*G.* II 14, 1), which should be identical with the eastern frontier of Noricum, thus running αὐτῷ τῷ Κετίῳ ὄρει, as given for this frontier of Noricum, but in no way τῷ Κετίῳ ὄρει καὶ ἐκ μέρους τῷ Καρουάγκᾳ. X attempts a compromise by stating in bad Greek τῷ Κετίῳ ὄρει καὶ ἐκ μέρους τοῦ Καρουὰγκα ὄρει, as if to suggest only an outlier of the Karvankas. The other MSS., however, with the exception of Z and S, that is Schnabel's recension Ω as far as Cuntz regards it, show in the Noric chapter the inserted phrase τὸ δὲ μεταξὺ λ̄ζ̄ μ̄ε̄ γο′ in order to determine the transition of Mons Cetius into the Karvankas within the western frontier of Upper Pannonia. This insertion, added in the type Ω between two columns, has been wrongly drawn by the scribe into the left-hand column on Noricum instead of into the right-hand column on Upper Pannonia, or rather on the western frontier of Upper Pannonia where it would be no less unconnected syntactically. It is therefore clear that the change in the frontier definition begins in recension Ω. There also, as is necessary, the town of Κελεία in Noricum is placed higher on the meridian,

---

Ptolemy apostrophises one of his assistants named Syros in several works, so in the prefaces to the Μαθηματικὴ Σύνταις (*Cl. Ptol. opera omnia*, I, ed. J. Heiberg, 1898), to the synopsis of the Πρόχειροι κανόνες, entitled Προχείρων κανόνων διάταζις καὶ ψηφοφορία (*Cl. Ptol. op. comn.*, II, ed. J. Heiberg, p. 159), and to five other treatises (J. Fischer, *Cl. Ptol. Geogr. cod. Urbinas Gr.* 82 *I/l Prodromos*, p. 26 f. with notes 1-4).

[42] *Text u. Karten*, p. 40 ff.

[43] Schnabel, *op. cit.*, p. 25 nr. 28.

from 45°30′ to 46°30′ Lat. N. X and Z with S keep this town in its old position, X in half-concealed contradiction, Z and S in open contradiction to the fact that they both omit in *G.* II 13 (Noricum), as does the type Ω, the southern end of the meridional Mons Cetius and take over from Ω its partly altered description of the western frontier of Upper Pannonia.

The change in the western frontier of Upper Pannonia is connected with the change of its southern frontier κατὰ παράλληλον γραμμήν (45°20′); if, as before, Noricum was to extend in the east to 45°30′ and in the west even further south, it would make the SW corner of Upper Pannonia very narrow indeed. But the new reading is in all MSS. without exception, including X, although in X the Upper Pannonia towns of Σίσκία, Σίσωπα, Οὐισόντιον are placed on latitudes further south, i.e., Siscia in 45° (in Z and S 45°15′), the other two in 45°15′ (so also Z and S). Their position necessitates a pronounced southerly curve in the frontier with two points on its original course still preserved: the north end of the western frontier of Illyris by both the main recensions in 36°30′ L. 45°10′ Lat. N. (*G.* II 16, 1)—X has a mistake here in writing the number of the latitude $\overline{\mu\varepsilon}$ ς′ for $\overline{\mu\varepsilon}$ L′—and the point preserved only in X, where the Upper Pannonian southern frontier meets the southern frontier of Noricum, as long as it was drawn in a straight line westwards, from the meridional south end of Mons Cetius, in $\overline{\lambda\varsigma}$, $\overline{\mu\varepsilon}$ γ′ιβ′ (36° L. 45°25′ Lat. N.). But such a curve could, from a regional map such as Ptolemy would have drawn, not be taken as παράλληλος γραμμή, rather as κυρτὴ or ἐγκεκλιμμένη γραμμή,[44] but it could induce anyone who approached the type Ω for collating and read παρ. γρ. at the corresponding place, if he disregarded the partial map of Ω, to call to mind independently the plane projection sketched in *G.* I 24 and to take over that expression by giving up Ptolemy's own and proper term. Ξ as he ancestor of X did so. And Z subsequently looking into Ξ would, being no longer acquainted with Ptolemy himself, interpret παρ. γρ. again as a curve and only try to reduce it by raising Siscia to the latitude of the two other Pannonian towns (45°15′), unless this town had happened in X to lose its minutes and change from 45°15′ to 45°. Ξ if mistaking Ω goes therefore ahead in this place and Z follows after. But the type Ω indicates the "parallel line", which forms the boundary of Upper Pannonia in the south, clearly and sharply as parallel 45°20′, so that in it no town of the province lies further south. Hence Ω originated the change in the southern frontier of Upper Pannonia in connection, as has been said, with the altered western frontier of Upper Pannonia.

The same parallel 45°20′ defines also the terminal point of the eastern frontier of Upper Pannonia; all MSS. give it as $\overline{\mu\alpha}$ L′ $\overline{\mu\varepsilon}$ γ′ (41°30′ L. 45°20′ Lat. N.). But this does not agree in the MSS. X and Z with the generally common ascription of the town of Σερβίτιον to Lower Pannonia; X and Z have the town on the coordinates $\overline{\mu\alpha}$ γ′ $\overline{\mu\alpha}$ δ′ (41°20′ L. 45°15′ Lat. N.), and therefore Ξ probably had them already at the bottom. But in this way it would form part of Upper Pannonia. Since all MSS. agree in attributing the town to Lower Pannonia, we cannot well assume that the type Ω especially has displaced the southern point of the eastern frontier of Upper Pannonia, rather that the genuine longitude $\overline{\mu\alpha}$ ς′ (41°10′) had originally been misread as $\overline{\mu\alpha}$ L′ (41°30′)[45] and therefore became for Ω the motive for displacing Σερβίτιον to a higher position.

The alterations in the frontiers of Upper Pannonia furthermore affected the northern frontier of the province also. The type Ξ leads again the more clearly to this conclusion by retaining through X more of the original text: ἀπὸ δὲ ἄρκτων τῷ εἰρημένῳ μέρει τοῦ Νωρίκου τῷ ὑπὸ τὸ Κέτιον ὄρος καὶ τῷ τοῦ Δανουβίου μέρει τῷ ἀπὸ τοῦ Κετίου ὄρους μέχρι τῆς κατὰ τὸν Ναραβῶνα ποταμὸν ἐκτροπῆς. The words quoted τῷ ὑπὸ τὸ Κέτιον ὄρος are omitted by Cuntz in his edition, but they are the necessary premise for the alteration in the type Ω from the earlier μέρει to ὄρει, as if the western frontier of Upper Pannonia which it had altered could at the same time be its northern frontier. The preposition ὑπὸ has here the same meaning as in chapter *G.* II 15, 3 where ὑπὸ τὸν Δανούβιον ποταμόν describes the towns along the river on its more or less north-south course. Since in the passage we are considering the words are only ὑπὸ τὸ Κέτιον ὄρος and not also καὶ Καραουάγκαν, it is possible that Ptolemy himself wrote it. But after its alteration of the western frontier of Upper Pannonia

---

[44] For this expression cf. *G.* I 24, 11.

[45] I rely upon J. Fischer's standard work *Cl. Ptolemaei Geographiae codex Urbinas* 82 in *Codices e Vaticanis selecti*, vol. XVIIII (Lugd. Bat. and Lipsiae, 1932), tom. prodromus I 2.

the type Ω would have had to cancel the reference to a part of Noricum in the description of the northern frontier of Upper Pannonia.

Ω also includes in the southern frontier of Aquitania a part of the eastern frontier which immediately precedes it, viz. the section of the latter along the Narbonensis, in order to provide a pendant for the ridge of the Pyrenees as it bends the southern frontier of Aquitania up in a north-westerly direction at the other end. Recension Ω reads *G.* II 7, 4 as: Ἡ δὲ μεσημβρινὴ πλευρὰ συνῆπται τῆς τε Πυρήνης μέρει καὶ τῆς Ναρβωνησίας. The words immediately following are only a gloss on this later and contradictory accretion to the southern frontier of Aquitania coming from the Narbonensis. X follows Ω and takes over the gloss, but varies the words quoted above as follows: Ἡ δὲ μεσημβρινὴ πλευρὰ συνῆπται τῆς Πυρήνης μέρει καὶ μέχρι τῆς Ναρβωνησίας. The connection between X and the true Ptolemaic expression here is the preposition μέχρι, the difference between the two is the conjunction καί which brings it closer to Ω. If we translate it by "and", the sentence becomes impossible in syntax and sense. But if we translate καί by "also" and thus take it to mean "the southern frontier is connected with a part of the Pyrenees also as far as Narbonensis", the sentence becomes a weak attempt of X, or rather Ξ, at reconciliation of two versions, similar to the attempt we found in the description of the western frontier of Upper Pannonia. One finds a certain analogy with a passage in the description of the frontiers of Italy *G.* III 1. Here the Γάργανος ὄρος is named at the eastern end of the northern frontier and beginning of the eastern frontier, the first concluding with the words μέχρι τοῦ Γαργάνου

LIST III

		X (Ξ)		Ω		
1	M(üller) 229,5 Borbetomagus	27°50′	48°50′	27°50′	48°45′	Z differs from X
	M. 229,6 Argentorate	27°50′	48°45′	27°45′	48°50′	
2	M. 239,7 Baeterrae	21°30′	43°15′	21°30′	43°30′	Z differs from X
	M. 240,2 Narbo	21°30′	43°15′	21°	43°	
3	M. 242,5 Valentia	20°20′	44°30′	23°	44°20′	Z differs from X
	M. 243,3 Acusio	20°20′	44°30′	23°	44°40′	
4	M. 330,7 Taras	42°10′	40°	42°30′	40°	X and Z here agree
	M. 361,11 Caelia	42°10′	40°	42°10′	40°15′	
5	M. 349,4 Suana	34°40′	42°20′	34°50′	42°25′	X and Z here agree
	M. 349,9 Clusium	34°40′	42°20′	34°40′	42°20′	
6	M. 351,1 Urbe Salvia	36°50′	43°10′	36°55′	42°55′	X and Z here agree?
	M. 351,2 Septempeda	36°50′	43°10′	36°55′	43°10′	
7	M. 352,10 Nuceria	35°50′	42°40′	35°50′	42°20′	Z differs from X
	M. 352,13 Arna	35°50′	42°40′	35°30′	42°40′	
8	M. 356,14 Ferentinum	38°	41°30′	38°	41°40′	Z differs from X
	M. 356,16 Setia	38°	41°30′	38°	41°30′	
	M. 226,6 Vetera	27°	51°50′	27°30′	51°50′	
	M. 226,7 leg XXX Ulpia	27°30′	51°50′			

ὄρους, the other introduced with ἀπὸ δὲ ἀνατολῶν τῇ ἀπὸ τοῦ Γαργάνου ὄρους παραλίῳ μέχρι τοῦ Ὑδροῦντος. In the copy of Ptolemy's *Geography* on which Ω is based the scribe strayed, however, from the first Γαργ. ὄρ. to the second similar genitive, so that the passage ἀπὸ δὲ ἀνατολῶν τῇ ἀπὸ τοῦ Γαργ. ὄρους has fallen off. In consequence of this blank Ω deals with the text as if there were a continuation of the Italian north frontier, and Italy should be bordered on this front besides παραλίῳ καὶ μέχρι τοῦ Ὑδροῦντος. In the copy of Ξ the words fallen off had been preserved, but not as completely as we should expect; the contiguity of the Illyris is missed. The postulated original text should have read there as follows: ἀπὸ δὲ ἀνατολῶν <τῇ τε Ἰλλυρίδι καὶ> ἀπὸ τοῦ Γαργάνου ὄρους παραλίῳ καὶ μέχρι τοῦ Ὑδρούντου ποταμοῦ. The second καὶ which X and Ω have in common is therefore a trace of the first original drafting revealed by X with Ξ as intermediary, and Cuntz ought not to have omitted καὶ as he did in his edition.

As evidenced therefore by the items mentioned, X more than Z keeps in the special description of the countries (*G.* II 7-III 1) many important peculiarities of Ptolemy's first edition and might be expected to render many more of them, if a modern edition were published. But also Z itself leads occasionally closer to Ξ, whereas X in its later stages diverges widely. This is shown in a very interesting manner in the difference between the two MSS. in their data on the course of the Danube immediately after the anonymous tributary coming from the north along the Luna mountains has joined it, probably the modern March (*G.* II 11, 4). X reads: ἡ ἐφεξῆς ἐπιστροφὴ ἀφ' ἧς πρὸς ἄρκτους ἄρχεται ἐπιστρέφειν (viz. ὁ Δανούβιος) μ̄ γο′ μ̄ζ̄ L′. But the next northern loop of the descending Danube is fixed from its vertex and moreover with the nearby lying town Καρπίς (*G.* II 11, 4; partly repeated 15, 1); consequently one is expecting that Ptolemy determined also the preceding turn of the river to the north from its vertex and not from its initial point. The X-passage quoted therefore is hardly Ptolemy's own. The MSS. Z, S, U in erasa manu 1 and O come closer to the data we expect from Ptolemy in this place: ἡ ἐφεξῆς ἐπιστροφὴ, ἀφ' ἧς πρὸς μεσημβρίαν ἐπιστρέφει μ̄ γο′ μ̄ζ̄ γ′ "the following turn, wherefrom it (viz. the Danube) bends to the south 40°40′ L. 47°20′ Lat." This wording makes us indirectly understand a previous turn of the river to the north continued by the next one indicated to the south. Matters would admittedly be clearer, if the original text read ἡ ἐφεξῆς ἀρκτικωτέρα ἐπιστροφὴ, ἀφ' ἧς "the following more northern turn wherefrom". The latitude, however, as stated, is incongruous with the entering of the tributary Ναραβών (now Raab) in μ̄α̅ μ̄ζ̄ γο′ 41°L. 47°40′ Lat., which follows next easterly, and would further push the Upper Pannonian town of Κερτόβαλος (*G.* II 14, 3) away from the Danube into Greater Germania, which cod. X would prevent by raising to the Lat. 47°30′ as above mentioned. Grashof therefore in Wilberg's edition of Ptolemy's *Geography* proposed to correct the given latitude μ̄ζ̄ γ′ in μ̄ζ̄ L′γ′ which in fact cures the apparent blemish in a very simple and plausible manner. By such a climbing of the river course its bend to the south as required by Ptolemy is easy to understand. Thus MS. Z, before the others we named, shows us the way to Ptolemy himself. It must, however, be admitted that the same highpoint should emerge also in the drawing where the vertical line rising from 47°20′ Lat. intersects the oblique one falling off by the side of the joining Ναραβών to the south east at 42° L. 47° Lat. When keeping therefore the tradition, our MSS.-group can claim some intelligence. Significant is the relation the other main recension Ω bears to the matter. While puzzled how to amend the transmitted defect, Ω entirely passes over the river bend spoken of and marks only where the Ναραβών had to enter in the Danube.

To sum up, the same damage underlies both the MSS. classes of Ptolemy's *Geography* at bottom and seems to have stuck already to the first fair copy of Ptolemy's working papers. But to recognise what he had indeed written in this place, the maps of the codices of the main recension Ω are of the greatest interest. In the fourth map of Europe (Germania) the Urbinas (U) draws the river course as its manus 2 in *G.* II 11, 4 modifies it, viz. leading the first of the two bends uphill towards the mouth of the Ναραβών (47°40′), but not higher. It is different in the fifth map of Europe: the river ascends there to a latitude of 47°50′ as we argued methodically for Ptolemy before, and joins the Ναραβών after flowing off to the south-east. In agreement with the Urbinas are the cod. Athous Vatopedi (L), although slovenly drawn, and probably the Venetus Marc. 516 (R), from which J. Fischer reproduces only the fourth map of Europe, and the fragmentum Fabricianum (F) to which Fischer refers with the fifth map of this continent. This curious feature of the MSS. named is probably accounted for by the cartographer Ἀγαθοδαίμων who,

appealing nominally to the eight books of Ptolemy's *Geography*, now made changes in the original maps which a new redaction of the text had rescinded (as in *G.* II 11, 4), now left all as it was where the text had remained the same or did not again refer to the subject, as in the Pannonian chapters of *G.* II 14 and 15 for the relative section of the Danube. Add to this that the fourth and fifth maps of Europe in Ptolemy's work were not on the same scale and so prevented Agathodaimon from realising that he had committed a contradiction in the drawing. Diverging from all the MSS. mentioned the codex Parisinus Gr 1401 (a) leads the Danube in a vertical line up to the north whence it should fall off in an oblique line to the junction with the Ναραβών as the codices Z S U O gave us to guess.

The special description of all the countries distinguishes Ξ from Ω in a still stranger and *particularly* important aspect, inasmuch as in the part edited by Cuntz two neighbouring towns occur eight times on the same geographical coordinates. As shown on List III (above) five such pairs of cities can be traced in Italy (*G.* III 1). To these must be added one such pair from Germania Superior (*G.* II 10) and two in Narbonensis (*G.* II 9). MSS. X and Z agree in no. 4-6, in the other Z ranges itself on the side of Ω. The matter can hardly be explained otherwise than as X registering each time a place newly taken over from Ω without however considering the coordinates of the associated town which had simultaneously been altered in Ω. In this respect X followed the archetype Ξ in not altering its own figures, as we have seen in *G.* VIII 27 and in the chapters *G.* II 13 and 14. We find in identical positions in both types Ξ and Ω the towns of Borbetomagus, Clusium, Setia, therefore these may have been taken over by Ξ from Ω. For if we tried to maintain that they had kept their original position in both, then we should have to assume that their partner towns had had identical coordinates in Ω at the time of transition to Ξ and had passed them on to Ξ. But that is impossible because Ω has been made on a cartographic foundation and therefore made distinctions. Of the other pairs Τάρας (= Tarentum) was represented in Ξ already before comparison with Ω, because in *G.* VIII 8 only MS. X lists this port as an "important city". The same applies to Ναρβών because this is also an "important town" in *G.* VIII 5, and besides has in common with Z a wrong distance in hours from Alexandria at 60°30′ L, i.e. $\bar{\beta}$ L′ (2^{h} 30′) instead of $\bar{\beta}$ L′ιβ′ (2^{h} 35′). The position of both towns is slightly altered in Ω, no less that of their partners Καιλία and Βαιτιραί. Also among the remaining pairs no towns have identical coordinates in both MSS., there are always slight differences. The integration must therefore have taken place at an earlier stage of Ω and must therefore be referred to the type Ξ. It strikes one that the towns mentioned in pairs 1, 2, 6-8 of our list follow on each other directly or almost directly in X, but this can be explained on formal grounds by remembering that Ξ worked with marginal notes which the scribe simply inserted, or it can perhaps be explained on inherent grounds by assuming that two towns could well be at a distance of less than 5′, the lowest distance Ptolemy allows.

It is important to recognise from the pairs of towns discussed that the copy of Ptolemy's *Geography* underlying the archetype Ξ had a relatively smaller stock of towns than Ω, again creating the impression, already made by its agreement with the Ἔκθεσις, that it was the first edition. For as Ptolemy indicates in *G.* II 1, 2, he tried even after the first edition to increase the amount of detail given for the οἰκουμένη. And as long as he did not consider a new edition of his *Geography*, he could have made corresponding entries and cancellations in his working copies of the maps. Only under the impact of Marinos' third treatise, which extended the οἰκουμέβη latitudinally as far as the southern tropic and longitudinally to 225°, did Ptolemy determine to prepare a new edition (p. 19 f.), For this purpose he rewrote *G.* I down to II 1, and in *G.* II 1, 3 he speaks of its (the *Geography's*) newly arranged tables of places as if these had already previously been published. But none of the MSS. takes any notice of the new special distances and special positions demanded by him in *G.* I 10, 1; 14, 4 and 17, 5 in relation to southern Africa, and in I 11-14 in relation to the southern coast of Asia.[46] It seems therefore that, probably because of his death, Ptolemy did not leave a finished revision ready for the professional scribe, but perhaps only working maps, as is made specially probable for South Africa by *G.* I 17, 5, a chapter open to the reproach brought against Marinos, of having drawn no maps. It is, however, a different question whether these maps reconciled fully the new

[46] In central Asia Ptolemy revises merely the position of the so-called "Tower of Stone (Λίθινος Πύργος)" in the land of the Σάκαι north of 'India within the Ganges' (ἡ ἐντὸς Γάγγου ποταμοῦ Ἰνδική). From *G.* I 12, 3 and 9 he unambiguously indicates a longitude of 132°; in *G.* VI 13, 2 Wilberg, however, we read 135° L.

and the old positions. The editor in charge of the second edition projected by Ptolemy would therefore have to rely largely on the first edition. This may have been known to the initiator of Ξ.

It is therefore not surprising that a critic working from the second edition should have also proceeded from the first edition. But if we ascribe this intention to the compiler of type Ξ, we must first of all reaffirm that he was not directly interested in the figures of degrees, as we saw from the above-mentioned additions of places in pairs. But as comparison of the first and second editions would bring out, there also emerged in particular not only the altered spelling of place names, but above all the badly corrupted descriptions of frontiers of countries in type Ω, which, as we have seen for Noricum, Upper Pannonia and Aquitania, cannot be attributed to Ptolemy. This is a fairly general assessment of type Ω. The return to the first edition of Ptolemy's *Geography*, as undertaken by the type Ξ, is thus comprehensible, although the revision it combined with it remains highly unsatisfactory.

Let us emphasize once more that the type Ξ is fundamentally the first edition of Ptolemy's *Geography*, influenced by and supplemented from the type Ω. In this way the additions, especially in regard to southern Africa and southern Asia, were taken over from Ω into Ξ. Schnabel[47] is grievously mistaken when, comparing the position of Cape "South Horn" in equatorial East Africa and that of the next four places southwards in MSS. X and A on the one hand and in Ω on the other, he concludes by inferring that type Ω as we now have it is the older. That the procedure of Ω in composing the new edition was not quite what Ptolemy had intended could easily be realised by Ξ for the South African positions of Ἀρώματα and Πράσον. Ἀρώματα did not lie in 4¼° Lat. N. (*G.* IV 7, 3) nor Cape Πράσον in $16^{5}/_{12}$° Lat. S. (*G.* IV 8, 1), as Ptolemy had it in *G.* I 10, 1 and 14, 4; the latitudes in Ω were rather 6° N. and 15° S. Nevertheless the distance in latitude came to 21°, not very different from the $20^{2}/_{3}$° as required by Ptolemy. Since Ptolemy did not exclude later alterations of positions (*G.* II 1, 3), Ξ would feel justified in following Ω. According to *G.* I 14, 5 Kattigara was situated south of the equator. But the compiler of Ξ was, as has been said (p. 27), neither a mathematician nor an astronomer, he was thus unable to calculate the latitude of that port which Ptolemy had only given indirectly; he therefore relied on the numbers of degrees given by Ω in *G.* VII 2 and 3 for Kattigara and its vicinity. Although cod. X omits all the degree figures from *G.* V 12, 7 Müller 943, 13 to VII 4, this can be deduced from the adherence of Ξ to Ω in *G.* VIII 27 (pp. 27 ff.).

On the other hand the post-Ptolemaic lowering of the latitude of Kattigara to 8°30′ S., discussed repeatedly, may be not so much an isolated instance as rather connected with an altered conception of the Indian Ocean, enlarged towards the south. *G.* VII 3 R. 63 concludes with a noteworthy sentence: περιέ‹ρ›χεται δ' ἀπὸ τῶν Καττιγάρων πρὸς τὰς δυσμὰς ἡ ἄγνωστος γῆ περιλαμβάνουσα τὴν Πρασώδη θάλασσαν μέχρι τοῦ Πράσου ἀκρωτηρίου ἀφ' οὗ ἄρχεται, ὡς εἴρηται, ὁ τῆς Τραχίας θαλάσσης κόλπος (cf. *G.* IV 8, 1) συνάπτων τὴν γῆν τῷ τε Ῥαπτῷ ἀκρωτηρίῳ καὶ τοῖς νοτίοις μέρεσι τῆς Ἀζανίας. "From Kattigara the unknown earth rounds towards the west, embracing the Leek-green Sea as far as Cape Πράσον where the Shallow Sea begins, linking the land with Cape Ῥάπτον and the southern parts of (the African region of) Azania." The Indian Ocean, then, is here joined in the south by the Leek-green Sea and forms with it a basin which is closed in the south by the unknown earth. This is taken to be a land-bridge extending from Kattigara (177° L. 8°30′ Lat. S.) to Cape Prason (80° L. 15° Lat. S. according to *G.* IV 8, 1); this framework explains the lowering of the latitude from 3° S. to 8°30′ S. in the east and the raising of the latitude from 16°25′ S. to 15° S. in the west (Cape Prason). The Leek-green Sea has been introduced as a supplement also into the description of the frontiers of India beyond the Ganges (VII 2, 1 R. 42) and more exactly into the description of its southern frontier, as we can guess from a map which had the name of the Sea entered between the island of Μενουθιάς, situated near Cape Prason—its position given in *G.* IV 8, 1 as 85° L. 12°30′ Lat. S. (thus X, 12° cet.)—and the islands situated in front of the "Great Gulf" κατὰ παράλληλον γραμμήν. India beyond the Ganges and the country at the Sinese to the east of it meet in this gulf at 170°20′ Lat. N. (*G.* VII 2, 7 R. 47, 15). But the name of the Sea has not been included in the description of India this side of the Ganges, nor is it mentioned in connection with Cape Prason, whence it is really derived. Nor is there

[47] *Text u. Karten*, p. 75 f.

any mention there of the land link with Asia. Therefore the Leek-green Sea and the land-bridge from Africa to Asia must obviously be later supplements to the text. New information helped to fill the new ocean space, modifying the earlier version. Thus, besides Kattigara, Argyre too is transposed to the south as capital of the island of Iabadiu and simultaneously moved west to India beyond the Ganges. *G.* VII 2, 27 and 28, as also 30 and 31 R. 59 ff., mentioned a whole archipelago.

The "Golden Peninsula" (Χρυσῆ Χερσόνησος, Malay Peninsula) deserves special attention. Ptolemy, as has been shown (p. 24), knew it only up to the promontory south of the town of Τάκωλα in his second edition, not beyond. In the cartographic revision of the south coast of Asia which he makes in *G.* I 13 and 14 eastwards from Cape Kory opposite the northern point of the island of Taprobana, he does not now mention, in coming to the "Golden Peninsula", any southerly change of direction. We may probably infer his earlier opinion from *G.* I 17, 4 where he cites information obtained from mariners and travellers concerning a general west-to-east course from India towards the Golden Peninsula and from there to the port of Kattigara. It lies therefore at the eastern end of a line, which, although descending from 177° L. 8°30′ Lat. N., its older and first point of departure, westward by way of Zabai to 168°20′ L. 4°45′ Lat. N., as generally handed down, as far as the promontory south of the town of Takola 158°20′ L. 4°20′ Lat. N. (p. 25), rises subsequently to the "port of departure for travellers to the Golden Peninsula" (τὸ ἀφετήριον τῶν εἰς τὴν Χρυσῆν Χέρσόνησον εἰς ̂πλεόντων), situated near the commercial town of Αλοσύγνι in India this side of the Ganges at 136°20′ L. 11°20′ Lat. N. (*G.* VII 1, 15 R. 9, 4), thus running more or less east to west through 40° longitude. Since here Ptolemy claims better knowledge than Marinos, it must be supposed that in their discussion at the time Marinos was of a quite different opinion. But in his third treatise Marinos, according to *G.* I 14, 1, was quoting from Alexandros, probably the Polyhistor who lived ca. 80-35 B.C. and gave the Romans much news of the Far East, and not from a ship's captain as supposed by Schnabel,[48] A. Herrmann,[49] and lastly O. Th. Schultz.[50] True, F. Jacoby does not include the quotation in *Die Fragmente der griechischen Historiker*, III A, p. 96 ff., no. 273. According to Marinos, Alexandros is said to have written that the coast ran from the Golden Peninsula for 20 days' voyage as far as Zabai facing the south (ἀντίαν... τῇ μεσημβριᾷ), but from then onward in order to reach Kattigara sailors would have to steer southward and more to the left (πρὸς νότον ...καὶ μᾶλλον εἰς τὰ εὐώνυμα). Obviously so vague a statement cannot derive from a captain's log. Marinos, under the influence of this statement, represented the sea route from Zabai to Kattigara as canted at an angle of more than 48° to the south; this emerges from the fact that Ptolemy, who in the second edition of his *Geography* yielded up to a point to Marinos, but did not want to place Kattigara below 3° Lat. S. (p. 24), still accepted this angle (cf. fig. 2). But Ptolemy also interprets the words "facing the south" as equivalent to "parallel to the equator", with the express explanation "because the land in between is said to extend facing the equator" (διὰ τὸ τὴν μεταξὺ χώραν ἀντίαν ἐκτετάσθαι τῇ μεσημβρίᾳ). It is rather questionable whether Marinos himself understood Alexandros so unequivocally or whether his statement might not to some extent imply knowledge of a passage through the Malacca straits, a knowledge which Ptolemy renounced in his desire not to go too far south. At any rate he did not depart even in his second edition from the assumed west-east course India—Golden Peninsula—Kattigara (*G.* I 17, 4), although it now no longer accorded with the transposition of Kattigara to 3° Lat. S. The new deltoid shape of the Golden Peninsula, reaching to 3° south of the equator, as described in *G.* VII 2,5 R. 45 f. is therefore strongly to be suspected as non-Ptolemaic. This shape was however already known to Markianos of Heraklea (4th/5th century; *Geogr. Gr. min.*, ed. C. Mueller, ch. 41, p. 536), for he reckons the latitudinal width of India beyond the Ganges, to which the peninsula belongs, at 19000 stadia, i.e., since he follows Ptolemy (one degree on the meridian equal to 500 stadia), 38 degrees latitude, i.e., as in Ptolemy's *Geography*, 35° to the equator plus 3° to the south as far as the southern point of the deltoid peninsula. Since Markianos, as Cuntz was able to show, used type Ξ for his edition, his copy may already have contained this enlargement of the Far East. Besides, cod. X, in its list of towns on the peninsula

[48] *Text u. Karten*, p. 74.

[49] "Das Land der Seide und Tibet im Lichte der Antike", = *Quellen u. Forschungen zur Geschichte der Geographie u. Völkerkunde*, I (1938), pp. 63 ff.

[50] *La Nouvelle Clio*, III (1951), pp. 321 ff.

extending beyond the town of Τάκωλα (*G.* II 2, 5 R. 45 f.), does not name the rivers (*G.* VII 2, 12 R. 50 f.), thus appearing to rest on an earlier stage, which the type Ξ may have represented. In that case Ξ would have been already in existence before Markianos.

If on the other hand we place the type Ω in temporal and spiritual vicinity to Ptolemy, we come up sharply against the conversion of longitudes into hours referred to Alexandria in 60° L. (*G.* VIII 15, 10; 27, 12). We are confronted with the choice, either of assuming that the anonymous author responsible for type Ω of the geography of special countries in *G.* II 2-VII 4 did not include *G.* VIII in his revision, since, as has been said (p. 20), Ptolemy did not want to include it any longer in the second edition of his *Geography*; or to place him (the reviser) later in time. The first theory appears more reasonable, combined with the assumption that this conversion may have taken place at a later date.

To sum up, the Γεωραφικὴ Ὑφήγησις handed down under the name of Ptolemy, gives us the original text of Ptolemy only in *G.* I-II 1, the general part, from the second edition, and in *G.* VIII 1-28 from the first edition. In the general part the two main recensions Ξ and Ω agree more or less with each other, but Ξ alone has the original first text for *G.* VIII 1-28 apart from the above-mentioned additions to the towns of Kattigara and Argyre (p. 27 f.). It is type Ω which later introduced these additions and possibly still later based the conversion of the longitudes to hours on Alexandria in 60° L., not 60°30′ L. as it was before.

The description of separate countries *G.* II 2-VII 4, which Ptolemy himself did not manage to rewrite, was revised by an anonymous author on the basis of the first edition with the help of the working maps left by Ptolemy and of his textual supplements, e.g. for *G.* IV 8. This revision is reproduced in the main recension Ω. Ξ, which compared with Ω is fundamentally the real first edition of these books, is completed from Ω, with a tendency to compromise in the so-called περιορισμοί and, moreover, incorporating data and places eclectically without altering its own figures.

A new edition would have to be based on recension Ξ from *G.* II 2 onwards,[51] the differences between the two recensions would have to be displayed in individual maps in the manner of the one attached, and supported by these maps the text would have to show clearly in italics whatever obvious alterations, deteriorations and additions Ξ took over or might have taken over from Ω. Much of this would have to be relegated to the critical apparatus. I have shown how to carry out such textual criticism from p. 29 onwards. On no account should any positions be handled as Cuntz does, putting together the one coordinate from Ξ, the other from Ω.

But much remains to be rejected, as not by Ptolemy, that hitherto has aroused no, or not enough, suspicion. Thus in *G.* I 20, where the last paragraph anticipates out of their place the plane projections discussed in *G.* 24; similarly the last paragraph in *G.* I 23. Not only is the fact that the parallel here mentioned as 8°25′ to the south of the equator also passes through Kattigara un-Ptolemaic; but above all we find here degrees, not parallels as in *G.* I 24, 5 and 14, on both sides of the equator described as "facing each other". Un-Ptolemaic also are the chapters 5-7 inserted between *G.* VII and VIII, including the transitional sentence in *G.* VII 4 introduced by ἐπεί. For c. 5 describes the content of a world map, and Ptolemy had not drawn such a map (p. 18). Some other peculiarities of the chapter are no less incompatible with him, as in the beginning the supposed autopsy, not to be found anywhere else in Ptolemy—for he had not even a more comprehensive knowledge of Egypt, the course of the Nile or the Great Mountain ranges of the country[52]—and the alleged purpose "in order that no single useful thing capable by knowledge thereof to grace the soul and arouse it to physical acuteness may be withheld from those desirous of knowledge". Compare this with Ptolemy's words in *G.* I 1, 7. In paragraph 4 the Indian Ocean is described expressly as an enclosed sea and in paragraph 5 the landbridge between Africa and Asia is mentioned, both (as has been explained on p. 34 f.) post-Ptolemaic features. Among the gulfs (par. 10) we are told simply of the Μέγας κόλπος although Ptolemy gives this name both to the gulf formed by the western ocean on the west coast of

[51] From *G.* V 12, 7 Müller 943, 12 onward – the last place with geographical coordinates is Ἀνάριον in Great Armenia – cod. X ceases stating the degrees. According to Schnabel, *Text u. Karten*, p. 55 MSS.Z and A ought to be our guides for supplying or reconstructing X respectively henceforth. Schnabel's assertion (*op. cit.*, p. 59) that O and Z have for India (*G.* VII) a longish extract from the original text of X inserted merits special attention.

[52] K. Sethe in *Sitz. Ber. Akad. Berlin*, phil. hist. Kl., 1933, p. 899 ff.

Africa (*G.* IV 8, 1 and 3) and to the gulf that divides India beyond the Ganges and the country of the Sinese (*G.* VII 2, 1 and 4; 3, 1 and 4), and not to the latter alone, which is the one which seems to be implied here. Still more could be said about this chapter. In *G.* VII 6 a plane projection of the οἰκουμενή is developed by means of the astronomical instrument, the armillary sphere.[53] But for Ptolemy the terrestrial globe is only a dot compared with the vault of heaven (*Math. Synt.*, I, 6), and the armillary sphere therefore expresses a quite false relation of sizes. As enjoined, the result is such a distortion of the image of the earth that no mathematical drawing can any longer be made with the help of the given degrees. As ch. 7 is a shorter repetition of ch. 6 we must reject both chapters.

In *G.* VIII none of the chapters following 28 can be attributed to Ptolemy. Schnabel, *Text u. Karten*, p. 61 ff., has shown this for ch. 29; and for ch. 30 the decision results from the fact that it is unknown to recension Ξ (Schnabel, *loc. cit.*, p. 96 ff.). Impossible for Ptolemy is also the table of solstices which is contained also in MSS. of recension Ξ (Z and O; Schnabel, *op. cit.*, p. 64 ff.). Finally we must delete all the summaries of contents which precede the separate books of the *Geography*. The repetition of the astronomer's name in each of them proves that he had nothing to do with them. A future new edition of Ptolemy's *Geography* could only print all these un-Ptolemaic accretions in small type.

I have been induced to write this article by Bagrow's protest against the general opinion of the Γεωγραφικὴ Ὑφήγησις as a genuine work of Ptolemy throughout. I have to admit that he is right to a large extent in condemning the geography of individual countries in it as un-Ptolemaic, and I am grateful to him for the warning to be cautious in this respect. For I too had previously accepted the general opinion. However, as always, truth is found somewhere between the extreme views. I hope that my article has proved this also, that we should not surmise *one* single late Byzantine influence on the Γεωγρ. Ὑφήγησις. Perhaps Bagrow is right concerning the countries of what is now southern Russia; that is a challenge to Russian scholars to find out. But Markianos of Heraklea has taught us that already before the second half of the 4th century alterations were being made in the geographical work of Ptolemy.

The new edition of Ptolemy's *Geography* ought, however, to be preceded by one of the Ἔκθεσις τῶν πινάκων τῆς οἰκουμένης and also by one of the Κανὼν ἐπισήμων πόλεων. Schnabel was prevented from undertaking these two tasks by his early death. It would also be desirable to have Theon's larger commentary on Ptolemy's Πρόχειροι κανόνες in print. Much in this commentary might contribute to a better understanding of Ptolemy's geographical work.

BIBLIOGRAPHY

Müller, C., Κλ. Πτολεμαίου Γεωγραφικὴ Ὑφήγησις, *Cl. Ptolemaei Geographia T.1* (Book I-III) (Paris, 1883); *T.2* (Book IV-V), ed. by C. Th. Fischer (Paris, 1901).—Sigle M.

Nobbe, C. F. A., *Cl. Ptolemaei Geographia* (Lipsiae, 1843-1845). Complete edition, only cited however for book VIII.

Renou, Louis, *La Géographie de Ptolemée, L'Inde (VII 1-4)* (Paris, 1925).—Sigle R.

Schnabel, Paul, "Die Entstehungsgeschichte des kartographischen Erdbildes des Klaudios Ptolemaios," *Sitz. Ber. Akad. Wiss. Berlin*, phil. hist. Kl., XIV (1930), p. 214 ff.

—— *Text und Karten des Ptolemäus = Quellen u. Forschungen zur Geschichte der Geographie u. Völkerkunde*, hsg. von A. Herrmann, Bd. 2 (Leipzig, 1938).

Wilberg, J. G. and Grashof C. H., *Cl. Ptolemaei Geographiae libri 8 graece et latine* (Essendiae, 1838-1843). Contains only books I-VI. Is only cited for book VI.

[53] Schnabel, *op. cit.*, pp. 117 ff. and *J. Fischer*, op. cit., prodromus, I 1, pp. 106, 1 and 418 are in any case of the opinion that Ptolemy drew his "lost" worldmap by this method.