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THE STAR CATALOGUE COMMONLY APPENDED TO THE ALFONSINE TABLES

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In earlier works on the history of star names¹ the Alfonsine Tables, or “the authors of the Alfonsine Tables”, or summarily “the Alfonsinians”, were often made responsible for the introduction of new Arabic material into the *corpus* of star names traditionally transmitted, and continuously used until today, in mediaeval Western, and modern, astronomy.

Owing to the knowledge we now have of a considerably larger number of original sources, both Oriental and Occidental, and our better understanding of their historical interdependence, we are now in a position to examine and revise the judgement on the star catalogue included in the Alfonsine Tables. It may be remembered that the Alfonsine Tables were a set of astronomical tables for chronology, for the Sun, Moon, and planets, etc., accompanied by an explanatory introduction (quite in the manner of the Arabic-Islamic *zīj*es), which were compiled and composed by order of King Alfonso X of Castile (reigned 1252-84). Of the Old Castilian original version of the tables made in Castile around 1263 to 1276, only the introductory text has survived.² The Old Spanish text was of no major influence outside Spain. In the first decades of the fourteenth century, however, a Latin version of the Alfonsine Tables was constructed in Paris which later became the most influential handbook of practical astronomy in Europe until the sixteenth century or even later.³ In what follows, when we speak of the Alfonsine Tables, we always refer to their Latin version.

Like every complete *zīj*, or work of astronomical tables, the Alfonsine Tables also contain a star catalogue. When we examine it we find at once that the star catalogue accompanying the Alfonsine Tables is nothing else but Ptolemy's star catalogue in the *Almagest*, in the wording of Gerard of Cremona's Latin translation made in Toledo about 1175 from the Arabic, save for the values of the longitudes (in the coordinates). These were increased against Ptolemy's, for precession, by 17°8' for an assumed epoch 1252, i.e., adopting the value used in several star tables and in the complete Ptolemaic star catalogue included in Alfonso's *Libros del Saber*.⁴ The Alfonsine Tables proved very popular and were circulated in innumerable manuscripts. The star catalogue is included in many of these copies, but it is also transmitted separately in many manuscripts (where naturally it is easily recognized from the 'Alfonsine' longitude value, Ptolemy + 17°8').⁵ The popularity and dissemination of the Alfonsine Tables were certainly increased by several printed editions which, later on, became highly influential in the formation of the nomenclature of the stars. Of these editions I have examined seven: *Alfontij regis castelle illustrissimi celestium motuum tabule*, Venice 1483 [henceforth called *at1*]; *Tabule astronomice Alfonsi Regis*, Venice 1492 [henceforth called *at2*]; *Tabule astronomice Diui Alfonsi Regis*, Venice 1518 (at the end of the book: 1521); *Alfonsi Hispaniarum Regis Tabule*, Venice 1524 [henceforth called *at4*]; *Diui Alphonsi... Regis Astronomicae tabulae*, Paris 1545; the same, Paris 1553 (identical in the text to the preceding edition of 1545); and

Tabulae Alphonsinae perpetuum motuum coelestium, Madrid 1641. In addition, I have looked through a number of manuscripts kept in Munich and Vienna.

Coming back once more to the earlier assumption of “Alfonsine authors”, we now know, for the star catalogue, that no collaborators of Alfonso’s were involved in the establishment of this catalogue. Moreover, some of the later Latin compilers have simply added to the table *corpus* the *Almagest* star catalogue in Gerard of Cremona’s translation. This catalogue is itself known from an old edition⁶ and a number of manuscripts.⁷ That means that, for the history of the stellar nomenclature, the basic text was the *Almagest*, and the Alfonsine Tables did not introduce any contribution of their own.

In comparing, further, the editions of the Alfonsine Tables we find that, while in *at1* the star catalogue is totally identical to Gerard’s version of the *Almagest* (and, thus, rather poor in Arabic star names), in *at2* it contains a number of additional, new star names always connected to the standard text by the formula *...et dicitur...* (“and it [*scil.* the respective star] is called...”).⁸ We shall, however, see soon that no “Alfonsine authors” were involved in the introduction of these new names. As for the succeeding editions, especially *at4*, etc., they retained only some of these additional names and omitted the rest.

In the following I give a list of the 29 ‘new’ names in *at2* and shall afterwards discuss their history and ultimate sources.

1. α UMi (1st star in UMi): *Alrucaba*
2. α UMa (16th star in UMa): *Dubhe*
3. η UMa (27th star in UMa): *Elkeid & Bennenazc*
4. γ Dra (5th star in Dra): *Rasaben*
5. α Cep (4th star in Cep): *Alderaimim*
6. α Her (1st star in Her): *Rasalheti*
7. α Lyr (1st star in Lyr): *wega*
8. α Cyg (5th star in Cyg): *Denebadigege*
9. α Cas (2nd star in Cas): *Scheder*
10. α Per (7th star in Per): *Alchemb*
11. α Oph (1st star in Oph): *Rasalaugue*
12. α Tau (14th star in Tau): *Aldebaran id est oculus vel cor Tauri*
13. β Gem (2nd star in Gem): *Rasalgense*
14. β Leo (27th star in Leo): *Denebalezeth*
15. α Sco (8th star in Sco): *Cabalatrab*
16. γ Cap (23rd star in Cap): *Denebalchedi*
17. α PsA (42nd star in Aqr): *Fomahant*
18. α Cet (2nd star in Cet): *menkar*
19. ζ Cet (14th star in Cet): *Batenkaiton*
20. β Cet (22nd star in Cet): *Denebcaiton*
21. α Ori (2nd star in Ori): *Beldelgenze*
22. γ Ori (3rd star in Ori): *Bellatrix*
23. β Ori (35th star in Ori): *& dicitur Algebar. Nominatur etiam Rigel*
24. τ^2 Eri (19th star in Eri): *Angetenar*
25. θ Eri (34th star in Eri): *Acarnar*
26. k Pup (6th star in Argo): *markeb*
27. α Hya (12th star in Hya): *Alphart*

28. α Crt (1st star in Crt): *Alhes*
 29. γ Crv (4th star in Crv): *Algorab*

This is a considerable number of ‘new’ star names that are not found earlier in the catalogue tradition, i.e. the *Almagest* and its continuation in the Alfonsine Tables (*at1*). After continuous study of relevant source texts I am now able to give here the historical analysis of these 29 ‘new’ names, going in this beyond my earlier findings of 1959.⁹

Whenever we find Arabic material in mediaeval Western texts we can be sure of two things: such material can only be brought in through translation from the Arabic; and a text using such material must, therefore, be itself either a translation from the Arabic, or a work based on a translation. In no other way could Arabic material be introduced into Latin writings. This, of course, also applies to our ‘new’ star names, all of which (with the single exception of no. 22) are visibly Arabic.

Now, the translation period from the Arabic in mediaeval Europe had ended in the twelfth century, or at the latest in the time of Alfonso (who had translations normally made into Old Spanish, whence some texts were then translated into Latin). On the other hand, the compilation and composition of the Latin versions of the Alfonsine Tables in Paris falls in the first decades of the fourteenth century, and we do not know exactly when the star catalogue was added to the *corpus*.¹⁰ Certainly, it would have been well after the end of the translation period. Therefore, all Arabic material found in the Alfonsine star catalogue beyond that which was already contained in Gerard’s translation of the *Almagest* catalogue, must be expected to derive from earlier translated material that lies outside the *Almagest* and Alfonsine Tables tradition. In my 1959 study I could only trace these ‘new’ names back to an “unbekannte Quelle” (“unknown source”), and I offered the suggestion that this unknown source must be sought among the mediaeval literature on the astrolabe.¹¹ This “unknown source” I afterwards located in an astrolabe star list composed, in conjunction with his own star observations, by John of London in Paris in 1246.¹² But John’s table does not contain all of our 29 ‘new’ names, and so further sources must lie behind them.

Looking around, I found that several Alfonsine and related star catalogues in old manuscripts show a similar inflation of star names to that of our *at2*. Especially rich in such nomenclatory additions is a star catalogue in MS Vienna 5415 (datable to 1444), fol. 216v-251r, computed for the epoch 1424, longitudes = Ptolemy + 18°56’, i.e. Alfonsine longitudes + 1°48’. It is a complete catalogue of the 1025 Ptolemaic stars in the well-known Gerard version, apparently copied in relation to the Alfonsine Tables since the longitude difference to *Alfoncius* is explicitly mentioned in the title. The outstanding feature of this catalogue is that its author has compiled numerous Arabic names, both for the constellations and for individual stars, from a great many pre-existing translated or derived texts. The texts, or star tables, involved are “Typ III”, “Typ VI”, “Typ VIII”, “Typ XIII”, and “Typ XV”;¹³ the chapter on the constellations of Abū Ma’shar’s *Introductorium maius* in the Latin translation of Johannes Hispalensis;¹⁴ an astrological text which is still not fully explored; and perhaps a very old astrolabe treatise. In this inflated catalogue, with a few exceptions all our ‘new’ names of *at2* are represented. But Vienna 5415 is not the only specimen of such inflated

Alfonsine star catalogues; others certainly exist.¹⁵

This leads us to the conclusion that the editor of *at2* must have used for his version of the star catalogue a manuscript of the inflated type described above which contained all the 29 ‘new’ names registered here.

It is perhaps not by mere chance that our specimen manuscript of the inflated type is at Vienna (i.e., Vienna 5415), and made for the epoch 1424. Another Vienna MS, no. 5311 (14/15th century), contains four of the five ‘types’ of star tables involved here,¹⁶ and the fifth ‘type’ exists in two other Vienna manuscripts.¹⁷ All, or most, of these manuscripts fall into the first four decades of the fifteenth century, which was the life and working period of John of Gmunden (d. 1442), creator and well-known representative of the first Vienna school of astronomers. In the list of lectures delivered by him in the University of Vienna¹⁸ we see that in 1424 he taught “Sphaera materialis”, that is the celestial globe, for which star catalogues of the sort mentioned above (Vienna 5415 and its Munich relatives, for epoch 1424) were needed, and perhaps directly composed. In 1434 he gave lectures on the astrolabe. And similarly we see in the various copies of his star table devised for the astrolabe that here too he uses most of those ‘new’ names found in the Vienna 5415 catalogue and later in *at2*.¹⁹

Taking all this together, therefore, it would seem that the compilation of those ‘new’ names and their addition to the great star catalogue of the *Almagest*-Alfonsine type, and also their further use in shorter astrolabe star tables, was the work of John of Gmunden or some of his pupils or collaborators. In this way, he — or they — did something similar to what has been done later over and over again by other astronomers who collected and compiled star names from older texts or philological studies and introduced them into astronomical usage, astronomers such as Johannes Bayer (1603) and Giuseppe Piazzi (1814).

Next we shall analyse the historical background of the 29 ‘new’ names, of which — as should be noted — many have lived on into our own time.

A major group of these names was first applied in the star table of “Typ VI” and afterwards also incorporated into “Typ VIII”,²⁰ so that the fifteenth-century compiler may have taken them from either of the two, or from the two together; to this group belong our nos. 2, 4,²¹ 9, 10, 11,²² 12,²³ 13,²⁴ 14, 16, 18, 19, 20, 21,²⁵ 24,²⁶ 26,²⁷ and 27.

One name, no. 15, occurs in identical spelling in “Typ III”, “Typ VI”, and “Typ VIII”, so that it cannot safely be determined which of these sources was in fact used by the compiler. Some names occur in similar spelling in “Typ III” and “Typ VIII” so that one or other of these, or both, could be the source for the compiler: these names are nos. 1,²⁸ 3,²⁹ 7, and 29.

“Typ XIII” is at the base of the names of our nos. 8,³⁰ 17,³¹ and 23.³² No. 25 is derived from “Typ XV” (existing, e.g., in MS Vienna 5311).³³

Four names require special treatment. No. 6 is also found in the Vienna tradition (John of Gmunden; Vienna 5415, etc.; the 1468 astrolabe of Regiomontanus kept in the Germanisches Nationalmuseum at Nuremberg, reg. no. WI 5), but in no earlier source; it must, therefore, be assumed that the Vienna authors themselves ‘constructed’ this name, compounding the well-known element *Ras* (“head”, mostly written by them, owing to a confusion in the name of α Dra, as *Razd*) with the Arabic constellation name of Her as transmitted in the *Almagest*-Alfonsine tradition, *algiethi*, their spellings being such as *Razd*

algethi/algeti/algieti/alchieti, razalgeti, etc. No. 22 is a Latin name occurring for the first time in astrological texts related to Abū Ma'shar and Johannes Hispalensis, and was originally used for α Aur; the transfer to γ Ori seems to have been made in the Vienna school of astronomers.³⁴ No. 28 was again first applied in the Vienna school where, originally, *alhes* was the name of the constellation Crater;³⁵ it was collected from Johannes Hispalensis's Latin translation of Abū Ma'shar's astrological work *Introductorium maius*, in the chapter on the description of the celestial bodies and the constellations of the fixed stars.³⁶ The transfer of *Alhes* to the star α Crt is first visible in the star lists of John of Gmunden (Vienna 5268, 2nd list; Melk 1099 = St Florian XI. 619, etc.); Regiomontanus's Nuremberg astrolabe of 1468 has the star as *Alies*. (The star list in Vienna 2352, fol. 101r (*cf.* ref. 10, above) also mentions the name, but still as the constellation name: *Alhes id est vas vel Crater*, intended to accompany γ Crt (2nd star of Crt in *Almagest*) whose descriptive text, however, was wrongly placed in the line above.)

The last remaining name, no. 5, is the most difficult to explain. The Typ III-tradition has a star called *aldiraan*, etc. (III, no. 22), whose name basically designates α Gem, but the star is mostly confused with α Hya or with a star in the "forehead" of Leo.³⁷ Typ VI (no. 1) later applied *aldramin*, etc., for α Cep, but it is not evident whether here the older spelling of Typ III was living on, or whether the author of Typ VI had formed a new and independent name from another Arabic original.³⁸ Typ VIII, again later, has retained both names, the form from Typ III (= VIII, no. 18), and the form from Typ VI (= VIII, no. 42). The use of the name for α Cep, and the spelling, in the tradition of the Vienna school and in *at2*, follow the use of Typ VI, but we cannot ultimately confirm the etymology of the name in Typ VI.³⁹

Thus, the history of all the 29 'new' names in *at2* is established. But it has become evident that no "Alfonsine authors" were involved at all. The tradition in the texts seems to indicate that most of these 'new' names were added to the traditional *corpus* in the first half of the fifteenth century by the Vienna school of astronomers, who compiled them from a number of older sources. The role of the Alfonsine Tables in the history of star nomenclature was in the propagation and dissemination of certain names, but they did not play an active and productive part in this history. The erroneous assumption of earlier authors that the "Alfonsinians" were the authors, or creators, of those 'new' names may have been formed under the impression that a greater number of astronomers from all the contemporary cultures co-existing in Spain, Christian, Jewish, and Muslim, were assembled at Alfonso's court where they constructed the star catalogue and thereby brought in elements of their foreign nomenclature. That the number of Alfonso's collaborators was limited is now known,⁴⁰ and that these were not in any way involved in the formation of the specifically Alfonsine star nomenclature (found in *at2*, etc.) has been demonstrated here.

For the sake of completeness I should add one more detail. From *at4* on, there was added to the editions of the Alfonsine Tables an astrological survey of the fixed stars.⁴¹ This survey contains also a number of Arabic names, of certain constellations and individual stars, which were much discussed in Renaissance times but most of which are now obsolete.⁴² This survey was derived from Ptolemy's astrological work *Tetrabiblos* (Book I, ch. 9), in the Latin translation of

Plato Tiburtinus made from the Arabic.^{43,44}

The reader should note that no etymologies of the Arabic names have been given in this article. For these, the reader is referred to the works cited in references 9 and 13.

Addendum. Since we are here discussing the contribution of the Vienna school of astronomers to the formation of the *corpus* of modern star names, I should like to take this opportunity to comment on two more puzzling star names, in the formation of which the Vienna school was heavily involved (but which, however, were not transmitted within the Alfonsine Tables).

In modern astronomy α Peg is commonly called Markab, and β Peg Scheat. This arrangement is already found with John of Gmunden and in the other relevant Vienna texts mentioned above. More exactly, α Peg is there called *Markab Alferaz id est humerus equi*, and β Peg *Scheat Alferaz id est crus equi*.

β Peg is a star mentioned in almost all mediaeval astrolabe star lists and on most of the existing astrolabes. In Typ III, no. 6 we have it as *alferat*, etc., abbreviated from its full Arabic name *mankib al-faras*, “the Horse’s Shoulder”. Typ VI, no. 39 gives the full name as *menkeb alferaçh* and *mekebalferaz*,⁴⁵ but most of the manuscripts have a parallel name, *bedalferaz*,⁴⁶ instead. Typ VIII, later, has adopted the star from both III (no. 46 in VIII, equally called *alferaz*) and VI (no. 47 in VIII, corrupted in its spelling to *mentichel*, etc.⁴⁷). Here lies the reason for greater confusion to come because later readers of course assumed that nos. 46 and 47 in Typ VIII represent two different stars whereas, in reality, the compiler of Typ VIII has inserted the same star, β Peg, twice, not recognizing its identity because of the different names in his two source star tables, viz. Typ III and Typ VI. In Typ XIII, no. 21 we have β Peg correctly as *mankab alferaz*.

Further, Typ VI, no. 38 — that is, immediately preceding β Peg, no. 39 — had listed *sceath id est crus...*, δ Aqr.⁴⁸ This star was also taken over by the compiler of Typ VIII and inserted immediately before his *alferaz*, i.e. VIII, no. 45; the text reads *sceach* (in the column for the Arabic names), and *crus* (in the column for the Latin descriptions).⁴⁹

Afterwards, readers and users of these tables were evidently confused as to the correct identifications of these stars, especially in Typ VIII where the twofold mention of the same star, β Peg, under different names had happened, this being overlooked by later readers who were, of course, not in command of Arabic and so could not interpret the Arabic names correctly. Therefore, the Typ VIII-stars no. 45 (*sceach*, δ Aqr) and 46 (*alferaz*, originally β Peg) were conflated into one new star, now called with a seemingly-complete Arabic name *scheat alferaz*, and assumed to designate β Peg (for which also the Latin equivalent of the former *scheat* in Aqr, *crus*, “the shin”, was retained).⁵⁰ Subsequently, the second *alferaz*-name of Typ VIII, no. 47, and of the other sources cited above, in its full spelling as *markab*⁵¹ *alferaz*, and with its traditional correct Latin equivalent *humerus equi* (originally designating β Peg in the texts),⁵² was applied to α Peg. Thus, in the Vienna school of astronomers and down to modern times, both these stars were called by their wrong names, α Peg as *Markab* (which originally was the Arabic *mankib*, “shoulder”, of β Peg), and α Peg as *Scheat* (which originally was the Arabic *sāq*, “shin”, of δ Aqr).⁵³

REFERENCES

1. There may be mentioned, as the most influential, L. Ideler, *Über den Ursprung und die Bedeutung der Sternnamen* (Berlin, 1809), and R. H. Allen, *Star-names and their meanings* (New York, 1899; reprinted as *Star names, their lore and meaning* (New York, 1963)). Allen largely depends on Ideler as far as Arabic matters are concerned.
2. Printed in *Libros del Saber de Astronomia del Rey D. Alfonso X de Castilla*, ed. by M. Rico y Sinobas, iv (Madrid, 1866), 111-83 ("Libro que a por nombre el de las taulas Alfonsies"). This text originally was not part of the *Libros del Saber*, but was included by Rico in his monumental edition; cf. G. Bossong, *Probleme der Übersetzung wissenschaftlicher Werke aus dem Arabischen in das Altspanische zur Zeit Alfons des Weisen* (Tübingen, 1979; Beihefte zur Zeitschrift für romanische Philologie, 169), 62 (no.4) and 69.
3. See J. D. North, "The Alfonsine Tables in England", in *ΠΡΟΣΜΑΤΑ. Naturwissenschaftsgeschichtliche Studien: Festschrift für Willy Hartner* (Wiesbaden, 1977), 269-301; cf. also O. Gingerich, "The astronomy of Alfonso the Wise", *Sky & telescope*, lxix (1985), 206-8. In a useful edition (*Les tables alfonsines avec les canons de Jean de Saxe* (Paris, 1984)) E. Poulle has recently presented what can be taken as the nucleus of the Alfonsine Tables and which consists of chronological and planetary tables, always in harmony with the accompanying canons of John of Saxonia; the star catalogue, as being part of the "membra adjuncta", was not included in this edition; cf. there, pp. 6f., 26 (at c), 224. For a Hebrew translation, made in 1460 from the Latin, see B. R. Goldstein, "The survival of Arabic astronomy in Hebrew", *Journal for the history of Arabic science*, iii (1979), 31-39 (esp. pp. 36f.). Most striking is the lack of reference to the Alfonsine Tables in the work of the Hebrew astronomer Levi ben Gerson (in southern France, 1288-1344), cf. B. R. Goldstein, *The astronomical tables of Levi Ben Gerson* (Transactions of the Connecticut Academy of Arts and Sciences, xlv; New Haven, Conn., 1974), 21.
4. 1 June 1252 was the date of Alfonso's accession to the throne and was afterwards applied as the epoch for his Tables; cf. North, *op. cit.* (ref. 3), 270. While the Alfonsine precession value was adopted by the compilers of our 'Alfonsine' star catalogue, the Spanish text of the Ptolemaic catalogue in the *Libros del Saber* remained without any visible influence on the Latin text of our catalogue which is pure Gerard of Cremona. Gerard's Latin version of the *Almagest* star catalogue was similarly included in what could be called the "mediaeval Latin tradition of al-Sūfī", here using the longitude value of al-Sūfī, i.e., Ptolemy + 12°42' (cf. P. Kunitzsch, "Sūfī Latinus", *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, cxv (1965), 65-74). The star catalogue in Copernicus's *De revolutionibus orbium coelestium* (Nuremberg, 1543) (at the end of Book II, 46v-62v) is an exact replica of Ptolemy's catalogue in the *Almagest* (with the only difference that the longitudes of the stars are smaller by 6°40' than those in the *Almagest*, because Copernicus started the counting at Ptolemy's 1st star of Aries, γ Ari — thus avoiding the problem of precession, while Ptolemy started with the vernal equinox as Ari 0°0', and therefore in his system the longitudes are subject to precession); but the wording of the star descriptions in Copernicus's catalogue is related neither to Gerard's translation from the Arabic nor to Georgius Trapezuntius's translation from the Greek (printed in Venice, 1528; Basel, 1541 and again in 1551), nor to the Latin translation made from the Greek in Sicily around 1160 (I am grateful to Prof. M. Folkerts of Munich who allowed me to examine his microfilm of ms Vat. lat. 2056; R. Lemay of New York is about to present new evidence for the origin of this translation). L. A. Birkenmajer earlier had found a series of parallels between *De revolutionibus* and George Valla's *De expetendis et fugiendis rebus...* (Venice, 1501), which includes a Latin version by Valla of Ptolemy's star catalogue made from the Greek, cf. L. A. Birkenmajer, *Stromata Copernicana* (Cracow, 1924), 154-68, esp. pp. 161-2 (in Polish; I have used a German translation: "Dienstliche Uebersetzung der Publikations-Stelle in Berlin-Dahlem", ausgeführt von Gymnasial-Prof. Bassman (no date [c. 1942], reproduction from the original typescript); I am indebted to Dr H. M. Nobis who put the copy kept in the Copernicus-Forschungsstelle, Deutsches Museum, Munich, at my disposal); see also J. Dobrzycki, "Katalog gwiazd w *De revolutionibus*", *Studia i materialy z dziejów Nauki Polskiej*, Seria C, Z. 7 (Warsaw, 1963), 109-52 (English summary on p. 153). In order to verify these contentions, I recently made my own comparison between Valla's star catalogue (from a xerox-copy kept in the Copernicus Research Centre mentioned above; the catalogue is found in vol. i, Book XVII, pp. ddii^r-eevi^r, of Valla's *De expetendis...* (Venice, 1501)) and Copernicus's catalogue (from a new critical edition: Nicolaus Copernicus, *Gesamtausgabe*, ii: *De revolutionibus libri sex*, ed. by H. M. Nobis and B. Sticker (Hildesheim, 1984); the catalogue is here to be found on pp. 114-79). This comparison proved that Copernicus's verbal descriptions of many stars are identical to those of Valla, and many others are obviously inspired by Valla's formulae. In several other stars, however, Copernicus's text deviates from Valla's to a greater or less extent (or is correct where Valla's is defective), so that it must be assumed that Copernicus had at his disposal other source material in addition to

- Valla's work. The source background of Copernicus's star catalogue, therefore, still needs more detailed investigation.
5. An easy means in star catalogues to find the longitude applied in the catalogue, is to examine the star α Hya (12th star of Hydra in *Almagest*), which in the *Almagest* has longitude Leo 0°0' so that the addition can directly be read off (e.g., in the Alfonsine Tables: Leo 17°8').
 6. *Almagestum C1. Ptolemei Pheludiensis Alexandrini Astronomorum principis...* (Venice, 1515)—to be distinguished from other editions containing the Renaissance translation of Georgius Trapezuntius made from the Greek.
 7. There are c. 35 manuscripts of Gerard's version that are complete with regard to the star catalogue. A critical edition is presently prepared by P. Kunitzsch, to appear later as vol. ii of a major edition project.
 8. Even in cases where Arabic names were already used by Gerard, the addition of *at2* can be clearly discerned; cf. α Cyg (5th star of Cygnus in *Almagest*): *Lucida que est in cauda: et est aridef[at 2: Arided]: et dicitur Denebadigege*, where the element opened by the words *et dicitur* is 'new'.
 9. P. Kunitzsch, *Arabische Sternnamen in Europa* (Wiesbaden, 1959).
 10. John of Saxonia in his canons, datable to around 1327, speaks of a recent verification of the coordinates of the fixed stars by *Alfontius* (Canon 26, ed. Poulle (ref. 3), 100-1) which seems to be a reference to what we here call the Alfonsine star catalogue (cf. also Poulle, *loc. cit.*, 6f. and 224). Further there exist some longer excerpts from the Alfonsine Tables' star catalogue dating from the fourteenth century: 276 stars, by Jean de Lignères, one of the first commentators of the Alfonsine Tables (in the 1320s—the table is found, e.g., in MS Paris, BN lat. 10264, fol. 36v-38v; the longitudes are Alfonsine, i.e. Ptolemy + 17°8'. Of the 'new' names, it has already two: *benenarum* = no. 3 above, and *Razcaban* = no. 4); 60 stars for epoch 1340, long. = Ptol. + 18°0', by Heinrich Selder, another commentator of the Alfonsine Tables (he wrote in 1364), found, e.g., in MS Munich, Clm 27, fol. 178r-179r (none of our 29 'new' names appears, but instead two others both of which are taken from one of the sources from which the 'new' names were also borrowed); 226 stars, anonymous, for epoch 1338, long. = Ptol. + 17°52', found, e.g., in MS Erfurt, Ampl. 2° 395, fol. 104v-105v, and Munich, Clm 26667, fol. 46v-47v (here, many of the stars are without textual description; the names are often utterly corrupted; cf. ref. 44, below); 87 stars of 1st, 2nd and 3rd magnitudes, anonymous, for epoch 1357, long. = Ptol. + 18°15' in most of the stars (in a few stars the minutes end in 1', 2', or 4'), MS Vienna, 2352 (datable to 1393), fol. 100r-v (of the 'new' names there appear *Edub* = no. 2, *Benenan* = no. 3, *Raschaben* = no. 4, *vega* = no. 7, and *rigel Algebar* = no. 23; η Peg is curiously called *Adam*, or "in the right knee of *Adam*", of unknown connection. On fol. 101r-v there is a further list of 51 1st, 2nd and 3rd magnitude stars, now with long. = Ptol. + 18°18', partly containing the same stars as the first list, and mentioning some more of the 'new' names, but the additional nomenclature cited here in the last two columns is often in wrong arrangement).
 11. See Kunitzsch, *Arabische Sternnamen in Europa*, 45 and 92-94.
 12. See P. Kunitzsch, "John of London and his unknown Arabic source", *Journal for the history of astronomy*, xvii (1986), 51-57.
 13. Reference is here made to certain types of mediaeval star tables as edited by P. Kunitzsch, *Typen von Sternverzeichnissen in astronomischen Handschriften des zehnten bis vierzehnten Jahrhunderts* (Wiesbaden, 1966).
 14. Not edited; I compared MSS Munich, Clm 374 and Clm 122.
 15. From Munich, I mention the star catalogues of MSS Cgm 595 (15th cent.), fol. 44v-59v (long. = Ptol. + 17°8', i.e. the Alfonsine value); Clm 10662 (15th cent.), fol. 129v-146r (long. = Ptol. + 18°56', as in Vienna 5415); and Clm 24103 (15th cent.), fol. 141r-155r (epoch 1424, long. = Ptol. + 18°56', also as in Vienna 5415). But even the older MS Munich, University Library 4° 740 (13/14th cent.), fol. 1r-17r, with its 'pure' Ptolemaic-Alfonsine catalogue (long. = Ptol. + 17°8') has at least added two of our 'new' names: *Edib* (= our no. 2), and *benenaz* (= no. 3). Cf. also ref. 10, above.
 16. I.e., "Typ XV" (fol. 129v; on the top of the page, another [later?] hand has added a longitude computation for the year 1428), "Typ III" (fol. 130rb), "Typ VI" (fol. 130v), and "Typ XIII" (fol. 131r; again computation for the year 1428 added on top). Evidence for the use of 5311 by the compiler of the inflated star catalogue in 5415 can be gleaned from the mention of *alhadib* among the names of the constellation Lupus in 5415 (and its Munich relatives Cgm 595 (here added to the 1st star of Lupus), Clm 14583 and 24103 (in these two MSS spelled *alhadibh*)). *alhadib* is the traditional Arabic name of β Cas and was transmitted to the West in the star table of "Typ III" (in Kunitzsch's edition cited in ref. 13, above). In some branches of the "Typ III"-tradition, *Alhadib* was explained in a Latin gloss as *in telo* (which was incorrect because the star has no relation to *telum* which could hardly be anything other than the northern constellation of Sagitta). In 5311, fol. 130rb, instead of the traditional gloss *in telo*, to the right

of *alhadip* is written *lupus*. This was the source for the compiler of the catalogue in 5415 who, subsequently, entered *alhadib* among the names of the constellation Lupus.

17. I.e., "Typ VIII", in MSS 2323 (14th cent.), fol 80v-81r, and 2367 (15th cent.), fol. 194r.
18. See R. Klug, *Johannes von Gmunden, der Begründer der Himmelskunde auf deutschem Boden* (Vienna and Leipzig, 1943; Akad. d. Wiss. Wien, Phil.-hist. K1., Sitzungsberichte, 222. Band, 4. Abhandlung), 18.
19. As a specimen we may use the two neighbouring star tables in MS Vienna 5268, fol. 30v-31r, written in 1437 by John of Gmunden himself; the first: 44 stars computed for the epoch 1436, long. = Ptol. + 19°2' (identically found in MS Munich, Univ. Libr. 4° 738, fol. 10r-v, but here the longitudes are 1' greater, for the year 1438), and the second: 41 stars computed for 1432, with *mediatio coeli* and declination (identically found in Munich, Univ. Libr. 4° 738, fol. 11r; Munich, Clm 14504, fol. 226r-227r; and Nuremberg, Cent. VI 18, fol. 73r (autograph by Regiomontanus)).
20. The reference is to the edition cited above, ref. 13.
21. Already found with Jean de Lignères; cf. above, ref. 10.
22. It should be mentioned that Typ III (followed later by Typ VIII) and Typ VI had different types of spelling. Later, with John of Gmunden, in Vienna 5415 etc., we find that these two traditions were merged and confused. The Vienna authors applied *Razd alhawe* (Typ III-spelling in the second word) for α Oph, and *Razd alangue* (thus spelt, from the Typ VI-tradition) for α Ser (perhaps misled by the assonance of *alangue* to Latin *anguis*, "serpent"; but in reality *alangue*, originally spelled *alauge*, was but a Latinized rendering of Arabic *al-hawwā'*, "the Snake Collector", the traditional Arabic term in the *Almagest* for Ophiuchus). In modern times, Rasalhague is used for α Oph, in a 'corrected' Renaissance spelling.
23. The Latin gloss, *id est oculus vel cor Tauri*, is found in VI, no. 10 (MS d), and in VIII, no. 9.
24. Originally, the Arabic name was added to α Gem (VI, no. 15, MSS d and f; VIII, no. 14; John of Gmunden (ref. 19), first table, no. 16; second table, no. 16; MS Munich, Cgm 595 (ref. 15)), while in some texts it was transferred to the next star, β Gem (thus in Vienna 5415). α and β are both located on "heads", each on the head of one Twin.
25. Here, only Typ VI has been involved; Typ VIII has another name that stems from Typ III.
26. While Typ VI (and subsequently Typ VIII) and most of the fifteenth-century texts gave this name to γ Eri (10th star in *Almagest*), *at2* has applied it more fittingly to the 19th star = τ^2 Eri.
27. Originally given to ρ Pup (2nd star of Argo in *Almagest*), but transferred to the 17th star (ζ Pup) in Vienna 5415, Cgm 595, Clm 10662 (here added both to the 2nd and to the 17th star on the outer margin), and Clm 24103. Not in John of Gmunden's two star tables (ref. 19), but in some other tables by him, e.g., MSS Melk 1099 (dated 1445), p. 228, and St Florian, XI. 619, fol. 192v (no. 14) — here for the 1st star of Argo (= 11 Pup); equally so in Clm 10662, fol. 99v (computed for the year 1430). In *at2*, eventually, given to the 6th star of Argo (k Pup). In modern times, Markeb lives on as a name for the star k Vel.
28. In III and VIII given to θ UMa. The transfer to α UMi is effected in Vienna 5415, Cgm 595, Clm 24103, and John of Gmunden (ref. 19).
29. The element *Bennenzc* occurs in all three types, III, VI, and VIII. But the element *Elkeid* only occurred in some of the oldest Western astrolabe treatises (MS Paris, BN lat. 7412, fol. 19v: *Alkais*, cf. Kunitzsch, *Arabische Sternnamen in Europa*, 90; and MS Ripoll 225: *Alkaid*, cf. *ibid.*, 78, no. 40) and must have been borrowed from that tradition. Typ III as such is also related to those oldest texts.
30. The other sources use another Arabic name or, in VI, only the constellation name *adigege*, without the *deneb* element. But XIII, no. 20, is complete.
31. Some manuscripts still have retained the fuller form of XIII, no. 12, as, e.g., Vienna 5415: *fomahant algeista*, similarly also Clm 10662 and Clm 24103. The modern form is Fomalhaut, derived, with a slight change, from a 'corrected' Renaissance spelling.
32. Here, the basic standard form *rigil algebar* (XIII, no. 2) has been broken up and rearranged contrary to the original Arabic formula. But John of Gmunden's second table (cf. ref. 19), no. 12, has the correct *Rigil Algebar* (whereas his first table, no. 9, applies *Rigil Algeuze*, after the Typ VI-tradition). *Rigil algebar* also appears in further star tables of John of Gmunden, e.g. in MS Melk 1099, and St Florian XI. 619, Munich Cgm 739, and Clm 10662.
33. Typ VIII, no. 5 contains the same star, calling it by the Latin name *finis fluxus* alone (without an Arabic parallel name), but it is not known from which source it was derived. (The declination (called "latitudo"), 4°30', must be a mistake for 40°30'; MS f alone has 32°30'.)
34. For details cf. P. Kunitzsch, "Abū Ma'sar, Johannes Hispalensis und Alkameluz", *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, cxx (1970), 103-25. A Vienna MS showing this strange application (to α Aur) is Vienna 3124 (15th cent.), fol. 163r. The original Arabic form lying behind *Bellatrix* cannot be guessed; corresponding Arabic texts still must be found.

35. E.g., in Vienna 5415, Munich Clm 10662, Clm 24103; *cf.* also Vienna 2352 cited above in the present article.
36. Book II, ch. 1. *Cf.* MSS Munich, Clm 374 (13th cent.), fol. 15rb-va (spelling abbreviated: *al'es id est uas*), and Clm 122 (spelling: *albes id est uas*). The translation of Hermannus de Carinthia has *crater libri patris* (!) instead, *cf.* the edition of Venice, 1506, p. b3^r.
37. I.e., the 10th lunar mansion of the Arabs consisting of ζγηα Leo. The confusion about this star is already observed in the oldest Spanish-Arabic star table, by Maslama, *cf.* Kunitzsch, *op. cit.* (ref. 13), 18, note to no. 8. The many various spellings of the name sometimes show a relationship to our no. 5 (*cf.* *Aldirahemin*, MS Paris, BN lat. 7412, fol. 19v, cited in Kunitzsch, *Arabische Sternnamen in Europa*, 91 [sub q]; *Aldiranemin*, *ibid.*, 72, no. 24).
38. See Kunitzsch, *op. cit.* (ref. 12), 55 and ref. 25.
39. Apart from the possible implications of Typ III, there is also the 7th lunar mansion of the Arabs consisting of αβ Gem, called in Arabic *al-dhira*^c, whose name was spread in the West in countless translations and varieties among which some are quite close in spelling to the Typ VI-spelling, as, e.g., *Alderaaim* (MS Berlin, Phill. 1830 (12th cent.), fol. 3r); *Alderaam* (see E. Svenberg, *Lunaria et Zodiologia Latina* (Göteborg, 1963), 49ff., from MS London, Brit. Libr. Egerton 821 (12th cent.), fol. 17vff.).
40. *Cf.* North, *op. cit.* (ref. 3), 269.
41. In *at4*, pp. 106r-107v; in the edition of Paris, 1545, pp. 208-11.
42. With the exception of *açubene* (1545: *acubenae*), now used as Acubens for α Cnc; *almucedie alaraph*, now sometimes mentioned separately as Almuredin for ε Vir, and Alaraph for β Vir; and *alasha* which gave rise to an erroneous conjecture in Renaissance times as a result of which the 'corrected' spelling Lesath is now used for υ (and sometimes λ) Sco.
43. The text of Plato's translation can be consulted in some early printed editions, the fullest being that of Venice, 1493, which gives the two translations of Plato Tiburtinus and of Aegidius de Tebaldis as well as the commentary of 'Alī ibn Ridwān (Haly Heben Rodan), the three texts for each section being assembled together. In Kunitzsch, *Arabische Sternnamen in Europa*, Plato's version is abbreviated as *Pq*, and the derived survey in *at4*, etc. as *Pqg* (*cf. ibid.*, 39 and 43).
44. The anonymous list of 226 stars (mentioned in ref. 10, above) is also related to the *Tetrabiblos* chapter, but some of the Arabic names used here are derived from another, anonymous, Latin translation from the Arabic dated 1206, found, e.g., in MS Wolfenbüttel, Gud. lat. 147 (14th cent.), fol. 162ff. (the section on the fixed stars is on fol. 166v-167v).
45. Spelled *menkeb alpharaz*, and twisted into *alferaz mentel*, etc., in Typ VII, no. 30, a direct derivate from Typ VI.
46. Also authentic, from Arabic *yad al-faras*, "The Horse's Fore-foot".
47. But MSS o and p have the 'better' spelling *mekebalfera*.
48. Again continued in Typ VII, no. 29, in corrupted spellings such as *scenath*, etc.
49. Continued in Typ IX, no. 24, as *straach*, *scheat*, etc. The same star is spelled *Cenok* in a related star table in MS Cambridge, Univ. Libr. Add. 6860 (14th cent.), fol. 71r.
50. In reality, the term *crus*, "shin" is not used for any star of Pegasus in the *Almagest*, but it was used there for δ Aqr (the 18th star in Aqr).
51. Thus corrupted from the correct forms *mankab*, *menkeb*, etc.
52. Also in the *Almagest* tradition, *humerus* occurs in the description of β Peg.
53. This erroneous Vienna arrangement of the two names was also followed by Johannes Stöffler in the star tables of his *Elucidatio fabricae usque astrolabii* (Oppenheim, 1512; at the end of the book: 1513), p. XX^v (second table, giving ecliptical coordinates). His first star table (giving *mediatio coeli* and declination) is incomplete in the edition, for it breaks off after α Aql (p. XVIII^r); but the rest of the table exists in the manuscripts, as, e.g., MS Cologne, Historisches Archiv, GB fol. 64 (17th cent.), fol. 265r, where the same Vienna arrangement is found.