

On the Mediaeval Arabic Knowledge of the Star Alpha Eridani

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The only first magnitude star (out of about fifteen to twenty) which is not included in the standard catalogues of fixed stars of classical antiquity and mediaeval times is *alpha Eridani*. It was not until the discoveries of the European seafarers in the 15th and 16th centuries that this bright star became known to western astronomers. Johann Bayer introduced it into his famous celestial atlas, *Uranometria*, of 1603, and assigned it the Greek letter *alpha*, while he gave to Ptolemy's "bright and last star" in the constellation of $\pi\omicron\tau\alpha\rho\acute{o}s$, *Eridanus*, the letter *theta*.

These facts have been known to the historians of astronomy for a long time, and have been widely discussed by the editors and commentators of Ptolemy's star catalogue, as such Baily,¹ Ideler,² Knobel,³ Nallino,⁴ etc.

The reason for Ptolemy's omitting this star from his catalogue is obvious. It was due to the limits of visibility of southern stars in the region of Alexandria where Ptolemy is reported to have executed his astronomical observations. The geographical latitude of Alexandria is roughly $31^{\circ}20'$, which limits the visibility of stars in the southern hemisphere to a line of declination of $-58^{\circ}40'$. The position of *alpha Eridani*, in Ptolemy's time (around A.D. 150), and taking into account the value of precession, was at a declination of roughly $-66\frac{1}{2}^{\circ}$. This makes it clear that *alpha Eridani* remained invisible, at that time, north of the geographical latitude of $23\frac{1}{2}^{\circ}$ which corresponds to a line running between Medina and Mecca, and through Mascat in Oman, approximately.

The southernmost stars registered by Ptolemy were some stars of his constellation of *Centaurus*, now commonly known as the "Southern Cross". Assuming a medium declination for them of -60° ,⁵ they were visible at

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1. F. Baily, "The Catalogues of Ptolemy, Ulugh Beigh, Tycho Brahé, Halley, Hevelius", *Memoirs of the Royal Astronomical Society*, 13 (London, 1843).

2. L. Ideler, *Untersuchungen über den Ursprung und die Bedeutung der Sternnamen*, (Berlin, 1809), pp. 231, 234.

3. E. B. Knobel, "The Chronology of Star Catalogues", *Memoirs of the Royal Astronomical Society*, vol. XLIII, (London, 1875-1877), p. 64, n. 3; C. H. F. Peters and E. B. Knobel, *Ptolemy's Catalogue of Stars*, (Washington, 1915), p. 110 ad no. 805.

4. *Al-Battānī sive Albatēnii opus astronomicum*, ed. and trans. C. A. Nallino, I-III, (Milan, 1899, 1907). See vol. II, p. 170.

5. In 1950. See: *Norton's Star Atlas and Reference Handbook*, (15th ed., reprint, London, 1966, and 16th ed., London, 1973), maps 10 and 16.

Ptolemy's time up to the geographical latitude of 39°, that is Athens.

The stellar astronomy of the Arabic-Islamic culture relied heavily on Ptolemy. Together with his *Almagest*, his star catalogue was translated into Arabic and served as the standard catalogue for the Islamic astronomers, from al-Battānī⁶ through al-Šūfī⁷ and al-Bīrūnī⁸ to Ulugh Beg,⁹ just to mention the most important names. This canonized catalogue was also adopted, through Latin translation, in mediaeval Europe, where it was used either in its original text, the *Almagest*, itself,¹⁰ or, derived from it, in the *Alfonsine Tables*¹¹ and other similar works, until the introduction of modern astronomy. In this tradition, the constellation of *Eridanus* was generally known to have its southern end at the star designated by Bayer with the Greek letter *theta*.

Turning then to the Arabs, it is known that they had a certain knowledge of the stellar sky already a long time before their acquaintance with Greek astronomy. The bedouins are famous for having used the stars for orientation in their migrations in the desert. Many star names also found their way into the classical Arabic poetry which was developed to its climax already in pre-Islamic times. Later on, Arabic philologists and lexicographers, in their efforts to collect the genuine ancient Arabic terminologies and vocabulary, composed special books in which they collected all the star names they could find in those old traditions. And it was the astronomer al-Šūfī who then made an attempt, in his book on the constellations composed in A. D. 964,¹² to identify the respective celestial objects according to the scientific Ptolemaic tradition. In a monograph on the indigenous Arabic star names, I arrived at a total number of 329 names which are mentioned in those old traditions.¹³ But there may be still more, as some may have escaped my attention.

In view of this huge number of star names, one would of course expect to find among them also the bright first magnitude star *alpha Eridani*, which was clearly visible in the Arabian peninsula, south of the latitude of 23½° at Ptolemy's

6. Edited by Nallino, see footnote 4 above.

7. *Kitāb ṣuwar al-kawākib or Uranometry* (ed. Hyderabad, 1954) (this ed. is quoted here). Also: H.C.F.C. Schjellerup, *Description des étoiles fixes par Abd-al-Rahman Al-Šūfī*, (French trans. and partial ed. of the Arabic text), St. Petersburg 1874.

8. *Al-Qānūn al-Mas'ūdī*, (ed. Hyderabad, 1954-1956). See vol. III, pp. 1012-1126.

9. Th. Hyde, *Tabulae longitudinis et latitudinis stellarum fixarum ex observatione Ulugh Beighi*, (Oxford, 1665); 2nd ed., by Dr. G. Sharpe, *Syntagma Dissertationum*, (Oxford, 1767); E. B. Knobel, *Ulugh Beg's Catalogue of Stars* (Washington, 1917).

10. Translation by Gerard of Cremona from the Arabic, A. D. 1175; existing in many manuscripts, printed Venice 1515.

11. Existing in numerous manuscripts and several printed editions: Venice 1483, 1492, 1518 (at the end 1521), 1524, Paris 1545 and 1553, Madrid 1641.

12. See above, footnote 7.

13. P. Kunitzsch, *Untersuchungen zur Sternnomenklatur der Araber* (Wiesbaden, 1961).

time, or south of 26¼° (that is a line through Khaibar and Bahrain, approximately) in A.D. 700. This, however, seems not to be the case. Al-Šūfī, in his identifications of these names, was limited to Ptolemy's catalogue in which, as we have seen, *alpha Eridani* was not included. Beyond that, al-Šūfī was living and working in Iraq and, occasionally, at Shiraz in Iran. So his own visibility of the southern sky was limited to a declination of -56°, or at most -60½°. Whereas, on the other hand, Arab tribes were living as far south as the Yemen at a geographical latitude of 13° which allowed them a visibility up to -77° in the southern sky. So, a belt of 17° to 20° could not actually be controlled by al-Šūfī. This led to a number of errors and doubtful cases among his identifications of certain traditions relating to southern star names.¹⁴

An example is the pair of stars called by the Arabs *al-ẓalīmān* (الظليمان), "the two ostriches". This name also occurs in the respective collections of the philologists Ibn Qutayba (d. A. D. 884 or 89)¹⁵ and al-Marzūqī (who declares that he follows, in this section, the philologist Abū Ḥan-fa al-Dīnawarī, d. A.D. 895).¹⁶ The two citations are nearly identical, and explain that *al-ẓalīmān* are two bright stars above another pair of stars consisting of *alpha + beta Gruis*,¹⁷ and that they are separated from each other, when both reach the same height above the horizon, by 100 *dhirā'*.

The value of 100 *dhirā'* given in this definition is strongly misleading, and apparently a fault in the textual transmission. One *dhirā'* with al-Šūfī, and also, approximately, in the definitions of the philologists, equals 2°20'. 100 *dhirā'* would then mean a distance of 233° between those two stars, which is of course impossible.

Al-Šūfī identified the "two ostriches" as *alpha Piscis Austrini* and *theta Eridani*. The distance between these two is about 60°.

In 1974, I spent some time at Malindi, Kenya, in order to study and control the indigenous Arabic traditions on certain star names and al-Šūfī's identifications. The place is situated just south of the equator, so that I had the opportunity of observing the sky down to the southern pole. My observations confirmed that the descriptions of the Arabic philologists were mostly correct and adequate to identify the objects mentioned in their texts.¹⁸

With regard to the pair of stars called *al-ẓalīmān* I found that they comply with the philologists' definition as to being at the same altitude and above the

14. Cf. P. Kunitzsch, in *Der Islam* 51 (1974), 52f., with footnote 19.

15. Ibn Qutayba, *Kitāb al-anwā'*, (ed. Hyderabad, 1956), p. 73.

16. Abū 'Alī al-Marzūqī, *Kitāb al-azmina wa al-amkina*, (ed. Hyderabad, vols. I-II, 1332 H.). See vol. II, p. 383.

17. I.e. *al-yamīnatīn*; cf. P. Kunitzsch, *Untersuchungen* (as in footnote 13 above), p. 117, no. 319.

18. Cf. my report "Die arabischen Sternbilder des Südhimmels" (II), in *Der Islam* 52 (1975), 263-277.

pair *alpha* + *beta Gruis* when these are setting. In this situation, there appears a pair of stars of equal brightness above *alpha* + *beta Gruis*, equally high in the sky. These two stars are *alpha Piscis Austrini* (which was also fixed by al-Šūfī), and *alpha Eridani* (not *theta*, as stated by al-Šūfī).¹⁹

Al-Šūfī, who had no knowledge of the actual view of the southern sky, and was dependent entirely on his written sources, and perhaps a celestial globe, saw no better way than to identify the pair of the "two ostriches" with the two Ptolemaic stars *alpha Piscis Austrini* and *theta Eridani*. Actually, however, *theta Eridani* is not only perhaps too far distant from *alpha Piscis Austrini* to be included together with this in an asterism, but moreover it is apparently much less bright than *alpha Piscis Austrini* (*theta* is of magnitude 3^m4, *alpha* 0^m6). To form a pair of equal brightness, in that position, as required by the texts of the Arabic philologists, besides *alpha Piscis Austrini* the only suitable component can be *alpha Eridani*.²⁰

So, from a critical examination of the texts, combined with actual observation of the sky, it was found that al-Šūfī committed a mistake in his identification of the old Arabic asterism of the "two ostriches", and that the bright first magnitude star *alpha Eridani* was not unknown and not unnamed with the old Arabic star gazers. They included it, together with *alpha Piscis Austrini*, in the name of the "two ostriches", *al-ḡalīmān* (in the dual).

Apart from the passages cited above, I have found some additional evidence, again in the compilation of al-Marzūqī already mentioned. In another place, and apparently again quoting the same Abū Ḥanīfa, he gives a list of thirteen bright stars, i.e. first magnitude stars (in Arabic: *darārī*).²¹ Here there occurs an otherwise unknown name which can be read *al-maḥnath*, or *al-muḥnit* (المحنث).

The word appears in the texts usually in connection with two stars called *ḥaḍāri* and *al-wazn* (حضار والوزن).²² Their identification was disputed even among the pre Islamic Arabs, and so the philologists said these two are *muḥlifān* or *muḥnithān*, i.e. "disputed, and causing a man to perjure himself with regard to their identity". Al-Šūfī wavered in their identification between *alpha* + *beta Centauri*, or *alpha* + *beta Columbae*.²³ According to my findings, only the second of these two pairs can be correct.²⁴ Nevertheless, from these texts it can be inferred that al-Marzūqī's *al-muḥnith* (which seems to be the better reading) could designate one of the two first magnitude stars *alpha* and *beta Centauri*.

19. Cf. P. Kunitzsch in *Der Islam* 52 (1975), 271 f.

20. The distance between these two is roughly 45°.

21. Al-Marzūqī (as in footnote 16, above) vol. II, p. 370.

22. Cf. P. Kunitzsch, *Untersuchungen*, p. 65, no. 118, and p. 116, no. 315; also p. 81 f., nos. 174 and 175.

23. *Kitāb suwar al-kawākib*, pp. 289, 302, 333.

24. Cf. P. Kunitzsch in *Der Islam* 51 (1974), 43 f.

There are, however, later testimonies showing that *al-muḥnith* should be identified with *alpha Eridani*. These are contained in a younger class of texts giving rich material on stellar nomenclature.

Around A.D. 1500, two Arabic navigators of the Indian Ocean, Aḥmad ibn Mājid and Sulaymān al-Mahrī, composed a number of texts, both in prose and in verse, on the art of sailing in the Indian Ocean.²⁵ They had of course a good knowledge of the sky, and of the southern hemisphere especially, because, as in navigation until today, they used the stars for keeping their course and fixing their position.

Both these authors knew *alpha Eridani* and made constant use of it. Their name for it is either *al-salbār* (السلبار), a non-Arabic word of uncertain pronunciation and origin,²⁶ or the Arabic *al-maḥnath* or *al-muḥannith* (as they pronounce it). In view of their use of the latter, the name in al-Marzūqī (quoted before) seems also to refer to *alpha Eridani*.

Thus it is proved that *alpha Eridani* was known to the Arabs in different epochs: in their ancient indigenous stellar traditions, and again in their nautical traditions of the 15th and 16th centuries. To their scientific astronomers, however, who strictly followed Ptolemy and his catalogue of stars, and who were living too far north to observe this region of the sky themselves, *alpha Eridani* and several other objects of the southern sky remained unknown or unidentified.

25. There is a facsimile edition of two Paris manuscripts by G. Ferrand, *Instructions nautiques et routiers arabes et portugais*, vol. I-II, (Paris 1921-23 and 1925). Recently I. Khoury has published five text volumes in print: *Al-ʿUlūm al-baḥriyya ʿinda al-ʿArab* vols. I, 1, 2 and 3 (Sulaymān al-Mahrī), Damascus, 1970 and 1972, and vol. II, 1 (Aḥmad ibn Mājid), Damascus, 1971, and another of Ibn Mājid's works in *Bulletin d'Etudes Orientales* (Damascus, t. XXIV, 1971), pp. 249-386. Ibn Mājid's *Kitāb al-fawā'id* was translated into English by G. R. Tibbetts, *Arab Navigation in the Indian Ocean Before the Coming of the Portuguese*, (London, 1971).

26. Cf. P. Kunitzsch, *Arabische Sternnamen in Europa*, (Wiesbaden 1959), p. 100, footnote 1; Kunitzsch, *Untersuchungen*, p. 104, no. 160. Another pronunciation of the name is *al-sillibār*, which is metrically supported by a verse, in the metre *ḡawil*, of Aḥmad ibn Mājid himself, see ed. Khoury, vol. II, 1, p. 120 and P. Kunitzsch in *Der Islam* 51 (1974), 47, with footnote 8.