Arabic text and Latin translation (by Robert of Ketton) of some excerpts of al-Kindī's *Forty chapters* (see Burnett in *Ar. Sci. and Phil.* 3 (1993), pp. 77-117), which seem to be one of the sources used by al-Qabīṣī for the compilation of his *Mudkhal* (pp. 386-393). The volume also contains, finally, a bibliography (pp. 394-398), an index of all the manuscripts and early editions mentioned (pp. 504-510) and a general alphabetical index (pp. 511-515).

J. Samsó

Mūsà ibn Nawbajt, *Kitāb al-azmina wa-l-duhūr. Tratado de astrología mundial.* Edición del texto árabe, introducción y notas por Ana Labarta. Análisis del contenido astronómico por Àngel Mestres. Área de Estudios Árabes e Islámicos. Universidad de Valencia. Valencia, 2005. 62 + 80 pp.

Ana Labarta published (Madrid-Bellaterra, 1982) Mūsā b. al-Ḥasan b. Nawbakht's collection of 93 historical horoscopes, entitled *al-Kitāb al-Kāmil*. This interesting collection attracted the attention of, at least, two scholars: on the one hand, John North (*Horoscopes and History*, London, 1986, pp. 52-56) analyzed the problems involved with the positions of ascendant and midheaven and tried to ascertain both the epoch used by the author and the latitudes for which these horoscopes were computed; more recently (*Centaurus* 41 (1999), 213-243) G. van Brummelen has published a most illuminating analysis of the astronomical information related to the solar and planetary positions in these horoscopes. In her study about the *Kāmil*, Labarta used information gathered in the *Kitāb al-azmina*, the other work of Ibn Nawbakht which is extant, but no edition was available. The purpose of the present book is to present such an edition, without a translation, but with two detailed commentaries of its contents prepared by the editor herself (in Spanish) and by A. Mestres (in English). The complete work constitutes an excellent piece of scholarship and brilliantly rounds off a task which Labarta began more than twenty years ago.

The edition is based in the only extant manuscript: Istanbul University Library A-315, fols. 56v - 160r, foliated by a modern hand, though there is an older one, used here, which assigns an independent number to the folios corresponding to this work (fols. 1r - 105r). This MS was probably copied in Egypt in the 15th c. Labarta has prepared an extremely conservative text, which shows great respect to its source and she acknowledges sincerely that she has doubts in some of her readings and hopes that a future editor might understand better the text and correct the doubtful passages which, in my opinion, are very few and for which I cannot give a better alternative.

Mūsā ibn Nawbakht was a member of a prestigious family of Iranian astrologers, translators and scholars which goes back to Nawbakht al-Fārisī (d. 777), who predicted the accession to the caliphate of al-Manṣūr (754-775) and participated in casting the fundational horoscope of Baghdad in 762. A history of the Nawbakht family between ca. 750-950 (with the addition of an offspring in the 13th c.) appeared in the introduction to the *Kāmil* (pp. 15-21) and is updated in the *Azmina* (pp. 0.9-0.14). The very little that is known about the biography of the author of both works, Mūsā b. Nawbakht (fl. ca. 860-940) is summarized in the introductions to the *Kāmil* (pp. 23-27) and to the *Azmina* (pp. 0.15-0.18, 0.27). Arabic sources ascribe to Mūsā a book named *al-Kitāb al-Kāfī fī aḥdāth al-azmān* a title that does not agree with those of his two extant works. Labarta (0.17-0.18, see also Mestres pp. 0.28-0.29) emphasizes the fact that the *Azmina* and the *Kāmil* were written in two consecutive

years: the *Azmina* is dated 936 while the *Kāmil* was completed in 937. This is one of the arguments she uses to establish the convincing hypothesis that they are the two parts of a single book, the *al-Kitāb al-Kāfī fī aḥdāth al-azmān*, of which the *Azmina* deals with the theory of world astrology, while the *Kāmil* contains a collection of "examples" of historical horoscopes, dated between -2129 and 947 A.D.

Labarta's introduction in Spanish (pp. 0.19-0.26) deals with the manuscript and with its contents. The work contains a detailed explanation of the cycles used in world astrology (Saturn-Jupiter conjunctions, thousands, *fardāriyyas*, *qismas* or *tasyīrs* and *dawrs* or *intihā's*: see Mestres' commentary on pp. 0.43-0.50). The number of revolutions of Saturn and Jupiter, as quoted in the text, in a period of 360000 years is identical to that used by Abū Maᶜshar and is one of the many instances showing that Ibn Nawbakht follows an Indo-Iranian tradition. Surprisingly enough van Brummelen (pp. 231-232) has shown that the times and positions of the mean great conjunctions (with shift in the triplicity) of the two superior planets, when computed from the actual horoscopes in the *Kāmil*, do not use sidereal mean motion parameters, but tropical ones clearly derived from the Ptolemaic tradition. On the other hand, the *Azmina* gives information about the maximum equations of Saturn and Jupiter, which, again, are Sassanian. It is obvious that Ibn Nawbakht uses technical information gathered from different sources. Thus, he seems to refer, in the *Azmina*, to two different lengths of the solar year (6,5;15,36,17,16,48 days and 6,5;15,33,30,31,40,48 days). The second value is, probably, more accurate and it is near the one calculated by van Brummelen who has established (pp. 220-221), using horoscopes 78, 82 and 86 (confirmed by 54. 58, 62, assuming a logical error) of the *Kāmil*, that the parameter used is 6,5;15,30,22,30, which is the *Sindhind* value. Ibn Nawbakht was clearly a sloppy computer and this is shown in Labarta's calculation of the length of the year using the whole set of horoscopes of spring equinoxes of consecutive years in the *Kāmil* (horoscopes 38-90): she obtains (p. 0.24) 6,5;15,12,12, the last digit being sometimes replaced by 10 or 9. A different set of computations made by Mestres (pp. 0.52-0.53), and based on a limited set of spring equinox horoscopes dated between 940 and 946, leads to a value of the excess of revolution between $6;12,9^h$ and $6;12,12^h$, which is near the value used by al-Khwārizmī ($6;12,9^h$) and is obviously, in agreement with van Brummelen's approximation. What is clear in all cases is that Ibn Nawbakht is using a sidereal year.

Both Labarta and Mestres deal with astrological geography (pp. 0.25-0.26, 0.27-0.41) and both underline the strange character of the place-names corresponding to the seven climates, which seem impossible to identify with any known location. A chapter of the *Kitāb al-azmina* (see pp. 14-19 of the Arabic edition) contains the coordinates of 60 fixed stars belonging to the first (15) and second (45) magnitudes, derived from al-Ḥajjāj's translation of the *Almagest*, with their longitudes increased by 7;56°: this corresponds to a period of 795 years after the date of Ptolemy's star catalogue (137 AD) (137+795=932 AD) using a Ptolemaic rate of precession (1° per century) (pp. 0.26, 0.41-0.42).

A. Mestres makes (p. 0.28) an important point regarding the purpose of the astrological history represented both in the *Azmina* and in the *Kāmil*: it has a clear Shīᶜī character and is "an attempt to introduce the astrological methods of investigation into the theological doctrine of the imamate". Both works insist on the importance of the *al-Qā'im* and most of the

conjunctions of Saturn and Jupiter with change of triplicity have their own *Qā'im*. Most of the ideas related to general astrology (natures of the planets and signs, on pp. 0.32-0.36) seem to derive from Ptolemy's *Tetrabiblos*, while those concerned with world astrology (pp. 0.43-0.50) have a Sassanian origin. Mestres ends his commentary with a recomputation of 13 horoscopes, corresponding to years comprised between 333 (horoscope 14) and 947 A.D. (horoscope 93). For that purpose he uses a computer programme, prepared by Prof. E.S. Kennedy and revised by Dr. H. Mielgo, which yields the planetary longitudes with the parameters and theory of al-Khwārizmī's *zīj*. In spite of the fact that Mestres acknowledges that he has selected those horoscopes for which the recomputation gives the best results, there is no doubt that they are excellent and confirm the hypothesis formulated in 1999 by van Brummelen: al-Khwārizmī's *zīj* is, quite probably, the tool used by Ibn Nawbakht for the computation of his horoscopes and this seems correspond to a tradition of sidereal astrology which, at least in al-Andalus and the Maghrib, lasted for a very long time. There is, here, a clear contrast with the fact that Ibn Nawbakht is working in the first half of the 10th c. and is perfectly aware of the existence of a different kind of astronomy, in the Ptolemaic tradition: it is clear that he uses the *Tetrabiblos*, the star catalogue of the *Almagest* and, as van Brummelen has proved, Ptolemaic parameters for the computation of the great conjunctions of Saturn and Jupiter.

J. Samsó

Ibn al-Haytham: *Kitāb al-manāẓir li l-Ḥasan Ibn al-Haytham, al-maqālatān ar-rābiᶜa wa l-khāmisa fī inᶜikās al-aḍwā' wa-mawādiᶜ al-khayālāt al-mubṣara bi l-inᶜikās* [al-Ḥasan Ibn al-Haytham's Treatise on Optics. Books four and five on the reflection of light and the place of images seen by reflection]. A. I. Sabra (ed.), Kuwayt, al-Majlis al-waṭanī li 'l-thaqāfa wa 'l-funūn wa 'l-ādāb, 2002. Vol. 1, XIV + 426 pp. Vol. 2, 297 pp.

For those who specialize in the history of optics, Ibn al-Haytham's *Kitāb al-manāẓir*, written in Cairo during the first quarter of the eleventh century, is the most important scientific contribution to this discipline during the period between the second and the seventeenth centuries, that is until the publications of Kepler and Descartes. It represents the final stage of a long Arabic tradition which began with the translation and assimilation of Greek works related to the study of light (especially those of Aristotle, Euclid, Anthemius of Tralles, Ptolemy and Diocles). This tradition was continued, from the ninth century onwards, by the contributions of al-Kindī, Qusṭā ibn Lūqā, Aḥmad ibn ᶜĪsā, ᶜUṭārid, Abū 'l-Wafā', Ibn Sahl and others.

The *Kitāb al-manāẓir* implies two important changes in relation to the earlier Greek and Arabic contributions. On the one hand, it abandons the theory of the emission of rays by the eye and adopts a new approach: that of considering that the eye receives the visual forms of light and colour. The second change is to be found in the method of research which introduces a close association between experimentation (as a research tool and as a way to establish physical laws) and mathematics and, especially, geometry (considered as another tool for devising theories describing these laws).

One should also remember that, although the publication of this work was not immediately followed by new research, it was not the last Islamic production in the field of Optics. In the East, al-Fārisī (d. 1319) became a productive follower when he wrote the *Kitāb tanqīḥ al-manāẓir li-*