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-*

dhawī 'l-abṣār wa 'l-baṣā'ir [Book on the Revision of Optics for those who have good sight and penetrating intelligence], in which we can find an improvement on Ibn al-Haytham's ideas on the rainbow, for which he gives an adequate explanation. In al-Andalus, the mathematician al-Mu'taman (d. 1085) planned to include a chapter on Optics in the second volume of his great treatise *Kitāb al-Istikmāl* [Book of Perfection]. It is also possible to believe, if one accepts the authority of Ibn Khaldūn (d. 1406), that this chapter was published independently. In fact we know that al-Mu'taman owned a certain number of Ibn al-Haytham's works such as his *Kitāb al-taḥlīl wa'l-tarkīb* [On analysis and synthesis] and his *Book on Optics*, and that he adapted six geometrical lemmas of the fifth book of this latter work, precisely those which allow him to solve the well known "problem of Alhazen". It is, therefore, reasonable to imagine that the work or the project on Optics was conceived as an extension or a clarification of the contributions of Ibn al-Haytham.

The *Kitāb al-manāẓir* deals with visual perception from a physical, mathematical, physiological and psychological point of view. It contains seven books which deal with three main topics: the straightline propagation of light and colours and the psychology of vision (*Books* I-III), the reflection of light and the vision through rays reflected on plane surfaces or mirrors (*Books* IV-VI) and, finally, refraction (*Book* VII). After the important study on the *Treatise on Optics*, published in the early nineteen forties by Muṣṭafā Naẓīf, we needed a complete and reliable critical edition which would allow scholars to undertake two complementary tasks: to exploit the contents of the *Treatise* in the framework of new research and to place it within both the Arabic and the Latin traditions, the latter developed from the thirteenth century onwards as a result of the Latin translation of the work. A.I. Sabra began this important editing task in the nineteen seventies. The first part of this project was published in 1983 and contained the Arabic text of the three first books, together with a substantial introduction on the optical work of Ibn al-Haytham. This was followed, in 1989, by the English translation of these three books. The second part of the treatise is the object of this new publication and it contains the edition of *Books* IV and V, which deal, respectively, with "the reflection of light and the perception of objects by reflection", and "the place of images seen by reflection". In *Book* IV we find the results of experimental research which establish the general laws of the reflection of light and colours. These experiments are made with plane, cylindrical, spherical and conical mirrors, having in mind the convexity and concavity of the three latter models. Book V deals with results obtained using mathematical techniques and we find here the famous "problem of Alhazen", concerned with the determination of the point of reflection of a ray of light coming from a luminous source having a known position, on the surface of a convex spherical mirror which reaches the eye, whose position is also known. We also find similar problems related to mirrors with other shapes and which have been the object of experimentations in *Book* IV.

In his introduction to the first volume, Sabra analyses the specific problems posed by the edition of these two books, which are the result of the textual history of the *Kitāb al-Manāẓir*, in both its Eastern Arabic and Latin stages. The second part contains the critical edition. The volume also contains an English introduction in which the editor summarises Ibn al-Haytham's project, presents the documents used for his edition, and describes the difficulties he has faced and the reasons which led him to abandon the idea of

preparing a bilingual Arabic-Latin lexicon, as he had done previously with *Books* I-III. This introduction is accompanied by a table of concordances of the contents of the two manuscripts of the *Kitāb al-manāẓir* used (Fātiḥ 3215 and Köprülü 952) as well as of al-Fārisī's *Tanqīḥ*.

The second volume contains the critical apparatus, the figures and three appendices. The first one is the edition of a text by al-Fārisī which describes, with the help of a diagram, an instrument, called "copper plate", designed by Ibn al-Haytham to determine "how reflection takes place". The second appendix is a list of corrections to his own edition of Books I-III. Finally the third one is a most useful analytical index which gives the reader a quick and precise idea of the contents of the different sections of *Books* IV and V.

In order to establish the text of these two books of the *Kitāb al-manāẓir*, A.I. Sabra had only three manuscripts, belonging to two different families, but he completed his information by using five copies of the text of al-Fārisī's *Tanqīḥ al-manāẓir* as well as the edition of this latter work made in Hyderabad between 1928 and 1930. This work has been most useful for the reconstruction of the numerous figures which are missing in the known copies of Ibn al-Haytham's treatise. As for the Latin translation, the editor has willingly given up the idea of using it for his critical edition, due to the large number of extant copies and, especially, due to the substantial differences (in *Books* IV and V) between its contents and those of the Arabic version and of al-Fārisī's *Revision*. We find, in fact, a large number of additions both in the diagrams and in the texts accompanying them.

As they wait for the English translation announced by the editor, scholars have at their disposal a large part of Ibn al-Haytham's *Optics*, presented according to the rules of critical edition and complemented by the historical, bibliographical and terminological materials necessary for continuing research on this exceptional work. The quality of what has already been produced augurs well for the project of the edition of the whole work. One can only hope that it will be completed promptly and thus provide scholars with a most useful tool.

Ahmed Djebbar

José Chabás and Bernard R. Goldstein, *The Alfonsine Tables of Toledo*. Archimedes. New Studies in the History and Philosophy of Science and Technology. Volume 8. Kluwer Academic Publishers. Dordrecht/ Boston/ London, 2003. XIV + 341 pp.

When Manuel Rico y Sinobas published (Madrid, 1863-1867) the five volumes of his edition of the Alfonsine *Libros del Saber de Astronomía*, he included (IV, 111-183) a text that was, apparently, unrelated to the collection: the Castilian canons of the Alfonsine Tables. He used, for that purpose, the only extant manuscript (Biblioteca Nacional MS 3306) and it is well known that his edition (like that of the *Libros del Saber*) was full of defects. In spite of the fact that better editions of the *Libros* have been prepared by scholars like Kasten *et al.* (1997, in CD-ROM), and by Cárdenas (1974, Ph.D. thesis, not available in print), these works were not accompanied by an adequate astronomical commentary. Most fortunately, this task has been undertaken by Chabás and Goldstein who present, here, a reliable edition of the *Libro de las tablas* (pp. 19-94), with an introduction (pp. 1-19), a detailed astronomical commentary (pp. 135-224), a glossary of technical terms (pp. 95-133), a summary of the Alfonsine astronomical corpus (pp. 225-241), and, finally, a chapter on the