183-184).

Texts 11 and 12 (*Maqāla fī 'l-qibla* and *Maqāla thāniya fī 'l-qibla*, pp. 185-190, titles added by the editors) deal with the *qibla* and Djebbar and Aballagh consider them to be authentic works by Ibn al-Bannā'. Both are extant in a second manuscript of the Ṣabīḥiyya Library in Salé. They both express the concern of the contemporaries of the Moroccan mathematician with the problem posed by the different orientations of mosques (see M. Rius, *La alquibla en al-Andalus y al-Magrib al-Aqṣà*. Barcelona, 2000). Ibn al-Bannā's attitude is to appease the consciences of good Muslims stating that all of them have a correct orientation and that it is not licit to change it, for all of them have been established with due intellectual effort (*ijtihād*). To establish the precise value of the *samt al-qibla* one needs to use Menelaos' theorem (*al-shakl al-qaṭṭāʿ*) or an instrument serving the same purpose (*aw mā yaqūmu maqāma-hu min al-ālāt*) and a procedure based on the knowledge of the latitudes of two places as well as the difference in their geographical longitudes: Ibn al-Bannā' does not think that the longitudes mentioned in astronomical tables (*azyāj*) are reliable, due to the different values quoted in the sources. Therefore he does not seem to consider it necessary to use a mathematical method or the standard methods of folk-astronomy to establish the *qibla* and this for two reasons: 1) the results obtained are not necessarily precise, and 2) the knowledge required cannot be demanded from a lay Muslim. The conclusion is that one should follow the direction of the *miḥrāb* of the mosque without further complications.

To end with these remarks: this is an excellent book (with good indexes of authors, works and manuscript copyists in pp. 209-223) which gives an enormous amount of information about what has been done and what remains to be done on the mathematical and astronomical works of Ibn al-Bannā'. It definitely deserves a translation into any Western language, because historians of science who are not necessarily Arabists should be aware of the importance of this Moroccan mathematician.

Julio Samsó

Ihsanoğlu, Ekmeleddin (Ed.): *Osmanli Astronomi Literatürü Tarihi, OALT (History of Astronomy Literature during the Ottoman Period)*. 2 volumes. Istanbul: Islam Tarih, Sanat ve Kültür Arastirma Merkezi (Research Centre for Islamic History, Art, and Culture, IRCICA), 1997. CCIII + 1146 pp.

Ihsanoğlu, Ekmeleddin (Ed.): *Osmanli Matematik Literatürü Tarihi, OMLT (History of Mathematical Literature during the Ottoman Period)*. 2 volumes. Istanbul: Islam Tarih, Sanat ve Kültür Arastirma Merkezi (Research Centre for Islamic History, Art, and Culture, IRCICA), 1999. CXII + 720 pp.

Ihsanoğlu, Ekmeleddin (Ed.): *Osmanli Coğrafya Literatürü Tarihi, OCLT (History of Geographical Literature during the Ottoman Period)*. 2 volumes. Istanbul: Islam Tarih, Sanat ve Kültür Arastirma Merkezi (Research Centre for Islamic History, Art, and Culture, IRCICA), 2000. LXXXIX + 912 pp.

These three studies, each comprising two volumes, are the result of the project launched by IRCICA in 1986 to prepare an inventory of Ottoman scientific literature, both handwritten and printed, which would provide a comprehensive idea of the knowledge of science during this period. Syria, Egypt, and the Maghrib —which belonged to the Ottoman state from the fifteenth century onwards— are included in the studies.

The goal of this project is not to present a full account of the history of the different sciences in the Ottoman period, but to provide access for scholars to the multitude of sources preserved in libraries not only in

Turkey but throughout the world.

The studies follow the tradition of previous reference books such as Suter (1900), Sarton (1927-48), Storey (1927), Brockelmann (1937-49), King (1981-1987), Sezgin (1978-2000) and others.

The entire text is in Turkish, except for a brief foreword in English. However, the main subject headings are in English or in both English and Arabic, which, together with the good organization of the items, makes that the books can be consulted by readers not proficient in Turkish.

The items are arranged in chronological order, according to the death of the author. The authors whose life periods are unknown are placed at the end, followed by anonymous works. The headings start with the order number, followed by the name of the author and the date of death. Where available, biographies and scholarly careers of each author are provided. The works of the author appear in alphabetical order. The title of each work is written in Latin and Arabic characters, and the language of the work (Arabic, · Turkish or Persian) is indicated. Each entry includes information about the work: its incipit; the number of copies with codicological details such as the name of the collection, the call number of the manuscript, number of folios, lines, size, and date of copying, in case of manuscripts, as well as whether the book was printed or not. The colophon is also included if it is available. A related bibliography is given by the authors of the survey at the end of each item.

The first volume of each study starts with a general survey of the topic, followed by a number of tables (presenting summaries and statistics, for example) and a list of the collections where the works are kept.

The second volume ends with an exhaustive bibliography of reference works, a list of manuscript catalogs ordered by countries and very useful indexes on a range of subjects such as catalogs, persons' names, place names, book titles in Latin and Arabic characters, institutions, places and institutions mentioned in the colophons, copyists and copy owners.

The OALT is the first study in the series, and its purpose was to give a compact presentation of Ottoman astronomical literature. It includes authors who were permanent residents of the Ottoman state or who spent part of their lives in the Ottoman lands between approximately 1417 and 1962.

The study comprises CCIII + 1146 pages, in two volumes. The first volume has a wide-ranging introduction divided into two sections. The first section (pp. XL-XCVIII) gives information on scientific life in Anatolia during the pre-Ottoman Seljuk period. The second section (pp. IC-CCIII) is devoted to the astronomical activities during the Ottoman period, and institutions such as the Istanbul observatory, directed by Taqī al-Dīn (1525-1585) under the patronage of sultan Murād III (1574-1595), and destroyed in 1580.

The first part of the study (pp. 1-735) gives information about the authors (582 in total) arranged in chronological order, and their works. A supplement offers information about the authors who lived in periods unknown to the editors. A separate section (pp. 736-940) contains a long list of anonymous works classified alphabetically according to subject, dealing with general astronomy, instruments, astronomical tables and calendars.

The book gives an idea about the subjects of interest of the Ottoman astronomers: treatises on astronomical instruments (astrolabe, quadrants, and Andalusī universal instruments and related quadrants); planetary models and cosmology (hay'a); zījes or astronomical tables; almanacs of ephemerides and texts applied to mathematical astrology (casting of houses, projecting of rays, observation of comets and eclipses); and material on timekeeping (qibla, time of prayers, visibility of the Moon).

The OMLT is the second study in the series and it was published to coincide with the 700th anniversary of the foundation of the Ottoman Empire.

The study comprises CXII+720 pages +13

reproductions of pages of manuscripts and printed pages of mathematical texts, in two volumes.

The first volume contains an introduction in Turkish dealing with the characteristics of mathematical literature in the Ottoman period. The work does not claim to cover the history of Ottoman mathematics exhaustively, but it is a good starting point. The main objective is to give a compact presentation of Ottoman mathematical literature, bringing to light the available material preserved in libraries in Turkey and elsewhere. The work includes authors who were permanent residents of the Ottoman state or who spent part of their lives in the Ottoman lands between approximately 1417 and 1965. The study focuses on 491 mathematicians who lived between the 15th and the 20th centuries. The earliest author included is Qāḍī Zāde Rūmī. Authors such as Ibn al-Hā'im, Ibn al-Bannā', Ibn al-Yasāmīn are mentioned in some mathematical works produced in this period. As in the OALT, the first part of the study (pp. 1-559) is devoted to authors, arranged in chronological order. Pages 560-567 give information on authors whose life periods are unknown, and pages 588-611 include works whose authors are unknown, classified in alphabetical order.

The areas of interest of the Ottoman mathematicians range widely. Together with works on *ḥisāb* (arithmetics), *handasa* (geometry), *jabr* (algebra), *muthallathāt* (trigonometry) we find works on weights and measures, or on *feraiz* (*fara'iḍ*, inheritance dividends). There are comments on the contents of each work. In all, 1116 mathematical works are mentioned.

As for the languages used, we find works in Turkish (561), Arabic (524), Persian (8), French (14), French-Turkish (2), French-Arabic (2), Arabic-Turkish (2), English (1), and two more in an unidentified language. Arabic is by far the most frequent until the end of the 17th century, when the works of al-Bīrūnī, for instance were still the object of explanations, as is the case with Muṣṭafā Ṣidkī (d. 1769) who writes on the construct-

ion of the regular heptagon, on algebra (and *muqābala*), etc., following al-Bīrūnī.

In the 18th century, the use of Turkish as the language of mathematics became more and more frequent. Gelenbevi (d. 1790), for instance, wrote in Turkish on trigonometry, algebra and logarithms, and other subjects.

Indeed, one can identify two periods: a first period until the 16th Century which sees the culmination of the Islamic scientific tradition and a second period which sees the first steps towards the learning and introduction of European mathematical sciences.

The OCLT, is the third study in this series and deals with several subjects: geography, cosmography, cartography, travel reports and topography.

The whole study comprises LXXXIX + 912 pp. + figures in two volumes. The first volume comprises the corresponding foreword, the list of contents, introduction, tables and collections as well as the beginning of the entries from number 1 (800H/1398AD) to number 289 (1326H/1908AD), and ends with several pages of illustrations. The second volume comprises entries from number 290 (1327H/1909AD) to 407 (1967AD), plus numbers 408 to 441 (undated). After this there are three more sections: one on anonymous works, another on atlases and the last one on charts and sketches. This second volume ends with the bibliography, indexes and illustrations, which, as in the first volume, are mainly cartographical.

The two volumes include the authors who produced geographical works as well as the anonymous works on this subject written in the Ottoman Empire during the Ottoman period: in total, 1628 works including writings and cartography. It is however a pity that such a comprehensive study cannot include information about most of the maps kept at the Topkapi Palace. When the information for the OCLT was being collected, the Museum was preparing a catalog of their maps, and therefore, the editors had to rely on other sources and, consequently, the information is not

complete.

Apart from this, the account is impressive. The exhaustive treatment of the items together with the accompanying bibliography and indexes make this survey extremely useful for anyone interested not only in Ottoman geography but in related areas as well.

This enormous work is an excellent series of reference books which identify the sources to be explored in an assessment of the Ottoman contribution to almost five centuries of history of science.

We eagerly await the next survey, which will deal with natural sciences and promises to be as interesting as the ones reviewed here.

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