Reviews

Lirola Delgado, Jorge and Puerta Vílchez, José Miguel (Dir.): *Enciclopedia de al-Andalus. Diccionario de autores y obras andalusíes. Tomo I : A - Ibn B.* Granada: Consejería de Cultura de la Junta de Andalucía, 2002. 717 p.

For many years, the most important reference book on Andalusi authors, their lives and their works has been the *Ensayo bio-bibliográfico sobre los historiadores y geógrafos arábigo-españoles*, by Francisco Pons Boigues, first published in 1898. The *Ensayo* was a very notable work, but its usefulness progressively eroded due to the progress of research during the 20th century. The task of rewriting it became more and more complicated as new manuscripts were discovered and edited, and more refined techniques of scholarship were developed. By the end of the last century, it was clear that only a team of researchers, including specialists in many different fields, could undertake such as task.

The book now under review (henceforth, *DAOA*) pretends much more than just bringing up to date the *Ensayo* by Pons, although this is also accomplished. In its introduction, the two directors of the work state clearly their ambition of creating a work "useful for the researcher as well as for any person interested in approaching the rich and complex reality of al-Andalus." As for the researcher, there is no doubt that the *DAOA* will become an indispensable tool, playing for Andalusi studies the same role that, for Islamic studies in general has been played by the works of Brockelmann and Sezgin. It is to be expected that the next volumes of this dictionary will appear soon, thus crowning an entreprise deserving only praise and thanks from all of us.

The introduction also explains the guidelines of the work in a way both accesible, for a more general reader, and illuminating for the specialist. Some of these criteria can be discussed, and the long explanation about the decision of translating Arabic titles reveals the difficulties of attaining a general consensus in this as in other difficult areas. There is a certain lack of balance between some very long articles which are real monographs on authors like Abū Ḥayyān al-Garnāṭī (p. 181-217) or Ibn Bājja (p. 624-663), and other much shorter entries (an author like Ibn Bassām receives a very synthetic treatment). But in general, the richness of information from Arab sources as well as from secondary studies is always well reflected, and it has to be noted that many articles are written by the very specialists in the authors described. As for the least known Andalusi authors, they also have received careful attention, extracting from the biographical dictionaries and other similar sources the few data preserved on them. As an instrument for research, the *DAOA* will thus be doubly useful. In the articles devoted to well-known Andalusi authors, it is possible to find a "state-of-the-art" and a well-balanced information on the most important questions related to figures such as al-Biṭrūjī or Ibn al-ʿArīf. Lesser known authors, frequently quoted in Arabic

sources and whose identification is normally a time-consuming effort, are now available thorugh the *DAOA* in short but informative articles, which will become the standard reference for many of these shadowy figures.

The readers of *Suhayl* may be interested in knowing that scientific authors are well represented in *DAOA*. Errors and omissions excepted, I have found the following entries in this respect: medical authors (Al-ʿAzafī, Abū l-Qāsim Muḥammad; Al-Gāfiqī; Ibn ʿAbd Rabbihi, [Abū ʿUṯmān], Ibn ʿAbdūn al-Jabalī, Ibn Abī ʿUmar, Ibn ʿAzrūn); botanists and prhamacologists (al-Gāfiqī, Ibn ʿAbd Rabbihi [Abū ʿUṯmān], Ibn Abī l-Ṣalt, Ibn al-Bayṭār, Ibn Buklāriš), agronomists (Ibn Abī l-Jawād, Ibn ʿArrād, Ibn al-ʿAwwām, Ibn Baṣṣāl), astrologers, astronomers and mathematicians (al-Barqī, al-Biṭrūjī, al-Ḍabbī, al-Ḥawfī, Ibn Abī l-Šukr, Ibn Aflaḥ [Jābir], Ibn Arqam, Ibn Badr, Ibn Bāṣuh); and a group of theologians who produced mathematical work applied to *farāʾiḍ* (al-Faraḍī [Abū Ayyūb], al-Faraḍī [Abū Bakr], al-Faraḍī [Abū Gālib], Ibn ʿAyn al-Zaŷŷāŷ). The anonymous calendaric work of the 13th century *Risālat fī awqāt al-sana* has also an entry (under "Awqāt al-sana, Risāla fī-").

Each article begins with a biographical introduction, followed by a list of the author's works, extant or lost. In the first case, manuscripts and editions are also listed, and the content of every work carefully presented and analysed. At the end of the article, the bibliographical information is divided into Arabic sources and secondary literature. It is well-known that, in the case of scientific authors, biographical information is not abundant, and that on the contrary, problems of manuscripts' attributions and of authorship are quite frequent. In the *DAOA* all these questions are expertly dealt with, and no query from the reader remains unanswered. Jorge Lirola and José Miguel Puerta, who had the idea of creating this work, have done a great service to the scientific community, and not only by their own contribution, but also as coordinators of a collective endeavour. This first volume of *DAOA* was written thanks to the contributions of 72 authors, belonging in their most part to Spanish Universities and centers of research. The list of contributors' names is not only impressive by its number, but also because it shows the increasing weight of the younger generations of Spanish Arabists in the general panorama of the field. As a final note, this is certainly an optimistic one, and we await eagerly for the continuation of the work.

Manuela Marín

İhsanoğlu, Ekmeleddin (Ed.): *Osmanlı Mūsikī Literatürü Tarihi, OMLT (History of Music Literature during the Ottoman Period)*. Istanbul: İslam Tarih, Sanat ve Kültür Araştırma Merkezi (Research Centre for Islamic History, Art, and Culture, IRCICA), 2003. (LXXVII+ 479 pages).

This new study continues 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 this study, as in the previous ones. Although the objective is to produce a systematic compilation of the information available in previous studies, this project does not aim 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 entire text is in Turkish, except for a brief introduction in English. However, the main subject headings during the book are

in English or in both English and Arabic, which, together with the good organization of the items, means that the book can be consulted by readers not proficient in Turkish. The English introduction constitutes a good summary of the book's contents and an abridged introduction to the history of music in the Ottoman world, from its beginnings as a part of the Semitic-Iranian tradition, influenced by the Greeks and by the musical traditions of the Turks who embraced Islam, until the adoption of the western musical notation at the end of the nineteenth century, when the Ottomans' interest in music and the number of works written in this field increased rapidly.

The study starts with a general survey of the topic under the title "Introduction to the History of Musical Literature in the Ottoman Period" (pp. XXXI-LXXVII), which includes a number of tables, presenting summaries and statistics, and a list of the collections where the works are kept.

This is followed by a concise presentation of Ottoman music 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 1299 and 1922.

The first part of the study (pp. 1-284) is devoted to authors, arranged in chronological order according to their date of death. Pages 278-284 give information on authors whose dates are unknown, and pages 285-382 include works whose authors are unknown, classified in alphabetical order. In total, 713 works are mentioned in the study. Most of them deal with the theory and practice of music, some give information about musical instruments, some deal with the general subjects of music, on the history of music, its treatment and influence, or on musical education, and so on.

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 Persian or French) 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 volume ends with an exhaustive bibliography of reference works (pp. 383-414) most of it in Turkish, and of catalogues of manuscripts (pp. 414-417), and a series of very useful indexes (pp. 4 19-479) on a range of subjects such as names of persons (pp. 421-439), book titles (pp. 440-455) catalogs, names of persons, place names, book titles in Arabic characters (pp.456-468), place names (pp. 469-472) names of institutions (pp. 473-476), places and institutions mentioned in the colophons, copyists and copy owners (pp. 477-479).

The study also includes 29 reproductions of pages of musical works in the history of music in the Ottoman period.

As regards the languages used, we find works in Turkish (538), Arabic (112), Persian (15), Greek (16) French (8), Turkish- Persian (12), Turkish -Arabic (7), Turkish-Arabic-Persian (3), Arabic-Persian (1) and Latin (1). Since Istanbul was the center of musical activities in the Ottoman Empire it is natural that the majority of works were in Turkish.

The authors have examined studies including articles and books on music located in libraries in 15 countries. They established manuscripts and printed works on Ottoman classical music in 141 collections, 101 of them are located in

Turkey and 40 abroad. It is however a pity that such a comprehensive study cannot include information about works kept at the Istanbul University Library; due to the damage caused by the 1999 earthquake, the Library was still being restored when the present work was compiled. The editors were not able to examine manuscripts and printed copies or to present sufficient information about certain works or their copies.

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 in Ottoman music and in Arabic music in general.

This work follows the tradition of previous reference books such as Suter (1900), Sarton (1927-48), Storey (1927), Brockelmann (1937-49), King (1981-1987), Sezgin (1978-2000) among others and continues the excellent series of reference books which identify the sources to be explored in an assessment of the Ottoman contribution to almost five centuries of the history of science.

Emilia Calvo

Abattouy, Mohammed; Renn, Hürgen and Weinig, Paul (Eds.): *Intercultural Transmission of Scientific Knowledge in the Middle Ages: Graeco-Arabic-Latin, Science in Context*, 14 (1/2): 2001, Cambridge University Press. 331 pp.

As the editors explain in the Introduction (pp. 1-12), a workshop dedicated to "Experience and Knowledge Structures in Arabic and Latin Sciences" was held at the Max Planck Institute for the History of Science in 1996 with the participation of specialists from many countries: Menso Folkerts, Sonja Brentjes, Jens Hoyrup, Wilbur Knorr, F. Jamil Ragep, Julio Samsó, Mohammed Abattouy, Charles Burnett, Mathias Schramm and Richard Lorch. The results were published in 2001 in a double issue of *Science in Context*, a journal published four times a year by Cambridge University Press.

The volume begins with an introduction to the translation movements between the East and the West in the Middle Ages. The book deals with transmission from the Greek to the Arabic world in the ninth century as well as from Arabic to the Latin world (from the eleventh to the thirteenth centuries) and it seeks to find answers to questions such as who supported translation, and why. Patronage of the translation movement served to legitimize the Abbāsid dynasty by creating an intellectual continuity with the great empires and cohesion within the various ethnic and cultural factions. The set of articles follow this introduction and are grouped according to subject. The reader will first find articles on the transmission and translation of mathematical texts, then on astronomy, mechanics, and the work programs at the main centres of translation such as Toledo and Sicily. The volume closes with an article by Richard Lorch, who offers several lists of translated works (into Arabic and Latin), and a complete modern bibliography specific to mathematics.

Menso Folkerts begins with "Early Texts on Hindu-Arabic Calculation" (pp. 13-38) in which he gives a description of some mathematical items (i.e. the decimal value system) transmitted from India to the West by the Arabs. The article is of interest because it describes a new manuscript (New York, Hispanic Society of America, HC 397/726) which transmits the complete Latin translation of the arithmetical work of al-Khwārizmī. Since the Arabic original has been lost, the book was known until now only through a fragmentary Latin version.

The article by Sonja Brentjes, "Observations on Hermann of Carinthia's Version of the Elements and its Relation to the Arabic

Transmission" (pp. 39-84), presents a detailed analysis of Book I of the *Elements*, and offers some methodological reflections on the study of textual transmission from Arabic to Latin.

Jens Hoyrup, "On a Collection of Geometrical Riddles and their Role in the Shaping of Four to Six Algebras" (pp. 85-131), approaches the old problem of whether the roots of medieval Arabic *al-jabr* derive from Indian or Greek mathematics. He discusses the role of practical geometrical knowledge and concludes that there is no evidence in support of the theory of transmission.

Wilbur Knorr was unable to present his communication because of his poor state of health. Sadly he died soon afterwards, but the editors decided to publish his study, one of his last works, as a tribute to him. In "On Heiberg's Euclid" (pp. 133-143) he states that the text of Johan Ludwig Heiberg's edition on Euclid's *Elements*, based on the Greek tradition, was less faithful to the original than the Arabic one.

In "Ṭūsī and Copernicus: The Earth's Motion in Context" (pp. 145-163) F. Jamil Ragep considers whether the debate among Arabic astronomers may have been a precedent of Copernicus. The lack of transmission, however, makes this suggestive idea relatively unlikely.

In "Astronomical Observations in the Maghrib in the Fourthteenth and Fifteenth Centuries" (pp. 165-178) Julio Samsó offers a picture of astronomical knowledge in the Maghrib in the Middle Ages. In fact, he shows that several Maghribi astronomers made observations in order to correct the values given by Ibn Isḥāq about trepidation, the obliquity of the ecliptic and the determination of the beginning of dawn and twilight.

The subject of Mohammed Abattouy's long article, "Greek Mechanics in Arabic Context: Thābit ibn Qurra, al-Isfizārī and the Arabic Traditions of Aristotelian and Euclidean Mechanics" (pp. 179-247), is the fate of Greek theoretical texts on mechanics in the Arabic medieval world.

Charles Burnett discusses "The Coherence of the Arabic-Latin Translation Program in Toledo in Twelfth Century" (pp.249-288). To be exact, the program was scheduled by Gerard of Cremona and Gundissalinus, who worked on non-translated books included in al-Farābī's classification.

The last two contributions are aimed at non-expert readers. Mathias Schramm centres his analysis on the court of "Frederick II of Hohenstaufen and Arabic Science" (pp. 289-312). During the twelfth century, Sicily was the site of scientific exchange and collaboration between Arabic and Latin scholars.

In "Greek-Arabic-Latin: The Transmission of Mathematical Texts in the Middle Ages" (pp. 313-331), Richard Lorch lists all the Greek mathematical works translated into Arabic, Arabic works translated into Latin, and Greek mathematical works translated directly into Latin as well as the name of their authors and translators. Finally, he offers a complete modern bibliography of this area.

As a whole, this volume is an extremely valuable contribution to the history of scientific transmission and offers a full appraisal of our current understanding of the question. The authors underline several times the role of the oral and practical transmission of science, which could explain some of the similarities between the works in spite of the huge differences in terms of time and space. In this connection, Jens Hoyrup stresses that knowledge should not be limited to theory, since it has often been related with practice; as a result, a distinction can be made between different philosophies of learning. Another repeated idea is the difficulty of establishing lines of transmission on the strength of the extant texts.

The only negative remark is that the historians of science should try to avoid old-fashioned and erroneous concepts as "Toledo was reconquered from the Arabs"

(repeated on page 6 and 292), since it was not really a "reconquest" – an idea rejected by historians long ago – but a conquest.

Mònica Rius

Emilie Savage-Smith (ed.), *Magic and Divination in Early Islam*. The Formation of the Classical Islamic World, volume 42. Ashgate-Variorum. Aldershot, 2004. LI + 394 pp.

The Formation of the Classical Islamic World is a Variorum collection in which, unlike what is characteristic of the well known Variorum Reprints, the unity of the volume is given by the subject, not by the author. Each volume contains a set of papers, reprinted as they appeared in the original publication in case English was the language used, or retyped if they are English translations of papers previously published in another language. Each paper preserves its own original pagination if it was originally published in English, but the volumes have also been paginated continuously which, in my opinion, is an improvement in relation to the lack of such pagination in the Variorum Collected Studies series. Early Islam usually means from the beginning to the middle of the eleventh century, although some volumes go occasionally further. The editor is responsible for the selection of the materials and writes an introductory chapter including a bibliography. Indices of names and subjects are added at the end. Several volumes of this collection are relevant to the history of Arabic and Islamic science: such is the case of volume 40 (*The Rise of Arab-Islamic Medicine*, edited by Lawrence I. Conrad, who is also the general editor of the collection), volume 41 (*The Exact Sciences in Early Islam*, edited by Jamil Ragep) and volume 47 (*The Formation of al-Andalus. Part 2: Language, Religion, Culture and the Sciences*, edited by M. Fierro and J. Samsó).

Magic and Divination in Early Islam is a welcome addition to the series. Edited by a highly competent scholar like Emilie Savage-Smith, it deals with a subject narrowly related to science and it is a useful complement to Charles Burnett's *Magic and Divination in the Middle Ages* (Variorum, 1996), centred in materials which circulated, in Arabic and Latin in the Iberian Peninsula. The main problem Savage-Smith had to face was the dispersion of the subject: there are too many different kinds of Magic as well as a multitude of different techniques for divination. Her excellent introduction presents an updated state of the art of the main topics related to Magic (precedents in Arabic and other cultures, amulets, talismans, magic squares) and to Divination (Geomancy, letter-number interpretation, Astrology and Phisiognomy). The criterium used, both in the introduction and in the selection of the reprinted papers, seems to have been avoiding highly technical matters and tending towards historical, sociological or ethnological approaches. Thus, the importance of astrological criteria in order to select the propitious moment for making a talisman - a topic underlined by Ibn Khaldūn in the *Muqaddima* as well as by the *Ghāyat al-ḥakīm/ Picatrix* - is left aside and the same can be said about the development of mathematical astrology, a branch of applied mathematics highly improved in Islamic civilisation and which is the only part of the subject that can be considered scientific. This is why we will not find anywhere a single reference to John North's important book *Horoscopes and History* (London, 1986) or to the many papers related to this subject by, for example, E.S. Kennedy. This is merely a remark and not a criticism: with a subject as large as this, the editor had a right to make her own choices and she has done it in a coherent way. Incidentally, Savage-Smith's introduction as well as many of the papers contain obvious references to the aforementioned *Ghāyat al-ḥakīm/ Picatrix*, unduely attributed to Maslama al-Majrīṭī and usually considered to have been written - together with the alchemical *Rutbat al-ḥakīm* - towards the middle of the 11th c.: I think

one should take into account the publication by Maribel Fierro of an important paper ("Bāṭinism in al-Andalus. Maslama b. Qāsim al-Qurṭubī (d. 353/ 964), author of the *Rutbat al-ḥakīm* and the *Ghāyat al-ḥakīm (Picatrix)*", *Studia Islamica* 84 (1996), 87-112) in which she argues convincingly that the author of both works could have been Maslama b. Qāsim al-Qurṭubī, an author of the first half of the 10th c.

The papers included in the selection are: 1) J. Henninger, *Beliefs in Spirits among the Pre-Islamic Arabs* (translated from the German) dealing mainly with the belief in *jinns* (pp. 1-53); 2) F.E. Peters, *Hermes and Harran: the Roots of Arabic-Islamic Occultism* (pp. 55-85) which raises the most interesting hypothesis about a very early introduction of Greek materials in Islam which might have passed by the Sabians of Ḥarrān to the early Ismā'īlīs; 3) M.W. Dols, *The Theory of Magic in Healing* (pp. 87-101) deals very little, in spite of its title, with the application of Magic to Medicine, but it is rather a useful commentary on the information on Magic that can be found in Ibn al-Nadīm's *Fihrist* and in Ibn Khaldūn's *Muqaddima*.

Chapters 4, 5 and 6 deal with talismans: 4) A. Fodor, *The Rod of Moses in Arabic Magic* (pp. 103-123) is a convincing essay on Jewish influence on Arabic Magic; 5) Tewfiq Canaan, *The Decipherment of Arabic Talismans* (pp. 125-177) is a reprint of two old papers, first published in 1937 and 1938, which maintains all its exceptional value: it is a deep analysis of talismans and amulets of different kinds, most of them belonging to the author's personal collection, and it is full of useful information, related, for example, to some clues for the interpretation of a few of the so-called "lunette" signs. It has been a surprise for me to discover the existence of signs of this type with numerical value which use a system that reminds me of the one analysed by D.A. King in *The Ciphers of the Monks* (Stuttgart, 2001); 6) Venetia Porter, *Islamic Seals: Magical or Practical* (pp. 179-200) discusses the total or partial amuletic value of seals, some of which have a personal or administrative character.

Chapter 8, Emilie Savage-Smith and Marion B. Smith, *Islamic Geomancy and a Thirteenth-Century Divinatory Device: Another Look* (pp. 211-276), is the result of rewriting a previous paper published by the two authors in 1980, and it is another impressing essay which begins with a thorough survey of Arabic geomantical literature, which underlines the more or less mythical origins of this kind of written sources, apparently related, on the one side, to Indian (Ṭumṭum al-Hindī), and, on the other, to Maghribī (Berber) authors. The analysis of the written literature is followed by a most detailed description of a 13th century instrument, extant at the British Museum, the purpose of which is to produce, mechanically, the random figures of the geomantic tableau and furnish other kind of information (lunar mansions) useful for the prediction.

Chapters 7, 9, 10 deal with Astrology. 7) is Charles Burnett, *Weather Forecasting in the Arabic World* (pp. 201-210), a first publication presenting the main results of the author's recent research on astrometeorology, based on Arabic sources and their Latin translations. Here we find an analysis of the *anwā'* system, which, being related to the solar calendar, cannot, in principle, be considered astrological but is a result of the fact that rains take place predominantly in certain periods of the solar year. Burnett also studies the works of al-Kindī, which present a mixture of Aristotelian materials and astrological techniques. Thirdly he turns to the astrological-meteorological predictions based on the lunar mansions (also used in the geomantical device of chapter 8) in a series of Latin texts ascribed to a certain "Jafar Indus". 10) is George Saliba, *The Role of the Astrologer in Medieval Islamic Society* (pp. 341-370), one of the two essential essays on the social history of astronomy and astrology in the Islamic Middle Ages: the second is David King, "On the role of the muezzin and the muwaqqit in medieval Islamic societies"

in his gigantic book, *In Synchrony with the Heavens. Studies in Astronomical Timekeeping and Instrumentation in Medieval Islamic Civilization* (Leiden-Boston, 2004), pp. 623-677. Both deal with the professional activities of medieval astronomers who could only earn their living by becoming astrologers or, after the 13th c., *muwaqqits*, that is to say, astronomers in the service of a mosque. Saliba gives, in pp. 342-342, a list of Arabic writers who discussed the validity of astrology and attacked this discipline. Yahya J. Michot, in chapter 9 (*Ibn Taymiyya on Astrology; Annotated Translation of Three Fatwas*, pp. 277-340) adds the name of Ibn Taymiyya (1263-1318) to the list of antiastrological polemists and offers a very careful annotated translation of three *fatwās* by this author related to the subject.

Julio Samsó

Rosenfeld, B. and Ihsanoğlu, E. *Mathematicians, Astronomers and Other Scholars of Islamic Civilisation and their Works (7th -19th c.)*, Istanbul: IRCICA, 2003. 833 pp.

I have often heard Prof. E.S. Kennedy talk about the importance of G.P. Matviyevskaya and B.A. Rosenfeld's *Matematiki i astronomy musul'manskogo srednevekov'ya i ikh trudy* (Moscow, 1983) which he calls "the Russki Suter". Unlike him, I have not been able to look at the original publication in Russian, mainly because of my incapacity to read this language. This is why I can only welcome the publication of this updated English translation, coauthored by Boris A. Rosenfeld and Ekmeleddin Ihsanoğlu, the latter being a scholar who has contributed so much to the elaboration of a series of biobibliographical surveys related to the history of Ottoman science which have become a standard part of the bibliographical equipment historians of Islamic science need now to have at hand's reach. Among them Rosenfeld and Ihsanoğlu's *Mathematicians, astronomers...* constitute the most general and comprehensive tool.

The volume here reviewed is structured following the model of H. Suter's *Mathematiker und Astronomen der Araber und ihre Werke* (Leipzig, 1900; *Nachträge*, Leipzig, 1902): a biobibliographical survey of Arabic mathematicians and astronomers, although here the scope of interest is extended to other scholars, mainly geographers and cartographers. 1423 scientists of known date are studied, the earliest being the Caliph ʿAlī ibn Abī Ṭālib (d. 661) and the latest Mushīr al-Dawla Muhandis Bāshī (d. 1862) (pp. 13-420). On each author we have a short biographical note, followed by a general bibliography and a list of works, both extant and not extant. When these works are available, the authors provide titles, list of manuscripts, editions, translations and scholarly works on them. These works are classified under a system of letters (M = mathematics, A = astronomy, Me = mechanics, Ph = physics, Mu = music etc.) followed by a consecutive number within each category. Translitteration of Arabic names and titles of works is usually careful (within each biographical note, but not in its heading written in small capitals or in the final index), but the translation of titles is not always accurate. Several appendices include 1) the name and works of 288 authors whose time of life is unknown (pp. 423-449), 2) a list of anonymous works in libraries, in alphabetical order of the countries and cities to which the libraries belong (pp. 451-497), 3) a list of libraries (including manuscript catalogues) in which relevant manuscripts are extant (pp. 499-512) and 4) a list of surveys which can be very general (e.g. "Arabic science") or deal with specialized subjects (e.g. "magic squares") (pp. 513-516). The bibliographical references in the main part and in the surveys are given in an abbreviated way (i.e. the name of the author followed by a number). The key to these abbreviations is to be found in pp. 517-739 where we have an enormous bibliography in alphabetical order of the authors. The volume ends with a

detailed alphabetical index of Arabic and Islamic scientists (pp. 741-758) and with another alphabetical index of titles (pp. 759-833).

On the whole, a most welcome encyclopedic work which gives us access to information that is not always common in our latitudes, for it includes, for example, a great number of books and papers published in Russian or references to manuscripts extant in Turkish libraries. Its shortcomings derive from the fact that the work is too ambitious: the history of Islamic exact sciences has reached a remarkable development since the nineteen fifties and I do not believe that any scholar is able, nowadays, to control the whole field as it happened in the time of H. Suter. Rosenfeld himself is perfectly aware of this fact and the readers of *Suhayl* 4 (2004) will find a long list of additions and corrections which he has prepared and which overcome many of the deficiencies of the volume: editing Rosenfeld's bibliographical paper has made me aware of the mass of information he is dealing with, the difficulties of the work he has undertaken with the collaboration of E. Ihsanoğlu and his very serious attempt to give an updated summary of the relevant scholarship. I should also say that the authors have sometimes followed the opinion of the latest publication on a given author and established as facts things that are mere hypotheses: see for example their acceptance, without discussion, of the existence of two Ibn al-Haytham-s, Muḥammad and al-Ḥasan (pp. 130-138), among whom they divide the works traditionally attributed to one of them. This is, obviously, a possibility, but there is not a general agreement in the scholarly community on this topic. In other instances the Arabic/ Islamic authors are introduced under a name which is not their *shuhra* and the fact that the authors' index does not always include the adequate cross-reference makes the discovery of the place in which the author is dealt with slightly more laborious. Last I should say that having all this information available in English is something for which we can only express our gratitude but that the English used is not always fluent and that it requires, sometimes, some polishing.

All these are only minor deficiencies when one compares them to the importance of the work done by Rosenfeld, Ihsanoğlu and the team of scholars in the IRCICA. No single or double scholar in the world could produce anything better and if a work such as this is ever going to be improved, it will be so as a result of the collaboration of an international team of experts in the different branches of the subject.

Julio Samsó

Charette, François: *Mathematical Instrumentation in Fourteenth-Century Egypt and Syria. The illustrated Treatise of Najm al-Dīn al-Miṣrī*. Brill, Leiden-Boston, 2003, (xxii, 422 + 136 pp., 18 illus.). (Islamic Philosophy, Theology, and Science; vol. LI. Texts and Studies edited by H. Daiber and D. Pingree).

The book (originally the author's doctoral dissertation) contains the critical edition with English translation and commentary of a Mamluk (1250-1517) Arabic treatise, of 120 chapters, on the construction of a great variety of astronomical instruments.

The critical edition is made on the basis of two manuscripts. The first one, preserved at the Chester Beatty Library in Dublin, consists of two parts. In the first part, there is an anonymous commentary on the use of a huge set of tables compiled by Najm al-Dīn al-Miṣrī, a fourteenth-century specialist in *mīqāt*, explaining how to use them as universal auxiliary tables to solve all problems of spherical astronomy for all terrestrial latitudes. This part of the manuscript has been analysed in detail by Charette in a previous publication ("A Monumental Medieval Table for Solving the Problems of Spherical Astronomy fo All Latitudes", *Archives Internationales d'Histoire des Sciences* 48, 1998, 11-64), in

which he showed that the commentary on the universal tables is by Najm al-Dīn himself. The second part is the main object of the present book and it contains the treatise on the instruments.

The second manuscript contains an incomplete copy of the same treatise and it belongs to a private collection.

Between the first and second parts of the Dublin manuscript there is a colophon (spurious according to Charette), which attributes the composition of the instrument treatise to Abū-l-Ḥasan al-Nishāpurī in *rajab* 522 [= July 1128 AD]. On the basis of internal references (the design of the instruments for the latitude of Aleppo, references to the city of Cairo and to the tables in the first part of the manuscript) Charette attributes authorship of the treatise to the same Najm al-Dīn and dates it in Cairo *ca.* 1330.

The treatise, in Charette's words, is remarkable for two reasons. First, because it gives "construction procedures for over one hundred different instruments (mostly astrolabes, quadrants and sundials), a great number of which were previously unknown" or "insufficiently documented". Second, because "these procedures are accompanied by large diagrams of each instrument accurately drawn to scale". Charette estimates that of the 140 pages of the complete manuscript only 42 are equivalent to effective text, the rest being occupied by tables and illustrations. Unfortunately, the edition only shows a selection of 18 illustrations out of 139 included in the original [and the drawing of some of them is less accurate than is claimed]. The edition and the translation indicate the exact place of each diagram in the page and describe its text. The interested reader will have to wait for the facsimile edition of both manuscripts which is currently in preparation at the *Institut für Geschichte der arabisch- islamischen Wissenschaften* in Frankfurt.

In general, the medieval literature on astronomical instruments contains:

a) treatises on the use of a single instrument, sometimes including the construction treatise, and b) compilations of all instruments known by an astronomer who often adds his own contribution.

Hundreds of texts corresponding to the first case survive, many of which are still awaiting edition or translation. Two good examples of the second case (though they differ from each other in many aspects) are the compendium *Kitāb fī istiᶜāb al-wujūh al-mumkina fī ṣanᶜat al-asṭurlāb* of al-Bīrūnī (11C) (now available in the edition of M. A. Jawādī al-Ḥusanī, Mashhad 2001) and the encyclopaedic *summa* of al-Marrākushī (13C), *Jāmiᶜ al-mabādī' wa-l-ghayāt fī ᶜilm al-mīqāt*, which includes treatises on the use of selected instruments. Najm al-Dīn's treatise belongs to this second group; he mentions al-Bīrūnī and particularly al-Marrākushī as predecessors. Unlike *Jāmiᶜ al-mabādī'*, however, Najm al-Dīn's text does not explain how to use any of the instruments described; nor does it contain any discussion on the theory of the stereographic projection or gnomonics, both topics that underlie the design of the large variety of instruments compiled. The purpose of the work is essentially practical and it only gives technical instructions on how to construct the instruments by ruler and compass, and very often using "unusual methods that are unique to the author."

Charette's book is divided into five parts. Part I (pp.3-45) opens with a wide-ranging introduction to the *mīqāt* science in the context of Mamluk society, including a description of al-Marrākushī's work *Jāmiᶜ al-mabādī'* as well as a presentation of the most important fourteenth-century writers on instrumentation, among them Ibn al-Sarrāj, Ibn al-Shāṭir and Ibn al-Ghuzūlī, contemporaries of Najm al-Dīn; curiously, Najm al-Dīn says nothing on their important contribution in the field of astronomical instruments. A detailed overview on the main subjects in *mīqāt* literature follows: the interaction of folk

and mathematical astronomies, exact *versus* approximate methods, universality in timekeeping and instrumentation, and the use of auxiliary tables and lists of formulae are discussed, and their didactical concerns stressed. There follows a discussion of the authorship of the instrument treatise, the codicological description of both manuscripts, and a general appreciation, technical and linguistic, of Najm al-Dīn's treatise. Part I ends with editorial remarks and the list of conventions and mathematical symbols used in the commentary.

Part II (pp. 47-226), the commentary, is structured in five chapters: astrolabes and related instruments (Chap. 2), horary quadrants and portable dials (Chap. 3), fixed sundials (Chap. 4), trigonometric instruments (Chap. 5), and a last chapter on miscellaneous instruments (Chap. 6) including observational instruments and others.

It is here that the author displays his great capacity for tracking down information and then piecing it together. In contrast with the scant historical information provided by the original treatise, each chapter starts with an exhaustive account of historical, theoretical and technical aspects in which the author displays the breadth of his reading of the instruments under discussion, giving a critical, sometimes hypercritical, analysis of sources and secondary bibliography.

When appropriate, Charette details the variant to the instrument or the alternative method for drawing it proposed by Najm al-Dīn. Throughout the commentary, adjectives and locutions like "repetitive, astonishingly naive, chaotic, incomplete, hardly intelligible, quite puzzling, unclear, foolish instructions, obscure, erroneous," etc., describing either the text or Najm al-Dīn himself, are frequent. The effect is rather disconcerting and a few words qualifying these adjectives might have been in order.

The book is not always easy to read for a non-specialist on instruments or for a reader without sufficient mathematical training. And in fact the lack of the original diagrams makes the task more difficult. Charette says that "in most cases the text hardly makes sense alone, and the accurate illustrations of the instruments are indispensable to its understanding". This is certainly true and when the reader feels that the illustration should be consulted it is very frustrating not to be able to do so. It should be noted, however, that the commentary is complemented by a large number of figures [sometimes in need of a text to make them clearer], many of which reproduce the instruments described by Najm al-Din.

The footnotes contain a great many titles of manuscripts and bibliographical references. There are, however, some notable omissions. For instance, despite Charette's keenness to quote the publications of Barcelona scholars, he neglects *Las ciencias de los antiguos en al-Andalus* (Madrid, 1992) in which Julio Samsó argues *in extenso* his hypothesis about the chronology of the three Toledan universal instruments (pp. 196-199) with which Charette disagrees (cf. p. 99, n. 162). The footnotes are also full of suggestions for further studies.

Chapter 2 of the commentary comprises instruments which depend on stereographic projection, such as the planispheric astrolabe and variations thereof, as well as astrolabic quadrants. It also includes the spherical and linear astrolabes, following Charette's own classification based on morphological and historical criteria. The number of instruments discussed in this chapter is about a third of the total of instruments of the treatise, and, among them, the Andalusian universal instruments bear witness to the influence in the Mashriq of the Western tradition of design of astronomical instruments. In the technical domain, Charette restricts his attention to the more unusual peculiarities of Najm al-Dīn's presentation: his numerical method for constructing astrolabe markings and his

practical one, "unique in the medieval literature", consisting of drawing, by successive approximations, each of altitude or azimuth circles on the plate by knowing three points of their circumference, or two points as well as a line passing through its centre, instead of finding the centres and radii of these circles according to the standard numerical and geometrical procedures. The positions of these points can be found from the data contained in a timekeeping table compiled for a specific latitude. Charette says that even if Najm al-Dīn's method seems cumbersome [and it is] at first sight, it works quite well in practice, and with it "the construction of astrolabic plates has left the domain of applied geometry and has attained the level of 'tricks' for practitioners of *'ilm al-mīqāt* and instrument-making."

Regarding the rest of chapters in Part II, in Chapter 3 Charette emphasizes the number and the originality of the various horary quadrants and portable dials that Najm al-Dīn describes, most of which are not recorded by other early sources. The most relevant horary quadrants in Najm al-Dīn's treatise designed for specific latitudes have been surveyed in recent times by Mercè Viladrich ("Medieval Islamic Horary Quadrants for Specific Latitudes and their Influence on the European Tradition", *Suhayl* 1, 2000, 273-355). In Chapter 4, there is a discussion on Najm al-Dīn's approach to gnomonics and his description of horizontal, vertical and inclined fixed sundials, and this method of construction is compared with the procedures of Najm al-Dīn's predecessors, namely al-Marrākushī. Chapter 5 is devoted to trigonometric instruments: Najm al-Dīn's versions of the sine quadrant, the *dastūr*, two versions of the universal horary quadrant and the *mujannak* quadrant are discussed and compared with al-Marrākushī's descriptions; Charette concludes that Najm al-Dīn's treatment of trigonometric instruments is rather thin and does not reflect the multiplicity and ingenuity of all kinds of trigonometric quadrants and grids invented by his contemporaries. There is also a last remark on the classification of the *shakkāzī* quadrant by Mamluk astronomers among the trigonometric instruments. Finally, in Chapter 6, Charette qualifies Najm al-Dīn's description of three purely observational instruments as "incomplete" and "hardly intelligible": the armillary sphere, the parallactic rulers and the *fazārī* balance. In contrast, he praises Najm al-Dīn's description of a method for properly aligning a *badahanj* (i.e., a ventilator or "wind-catcher") in the city of Cairo which he describes as one of the most curious features of the treatise, and the description of a mysterious instrument with a curious name, the *mubakkash*, which serves as a graphical device for converting between equal and seasonal hours. This instrument seems unique in the medieval literature, as it does not feature either in manuscripts or in extant instruments.

Parts III and V comprise, respectively, the translation and the critical edition of the Arabic text. Charette warns the reader of the author's very colloquial Arabic and of the large amount of explanatory additions between brackets inserted by him in order to render the elliptic and frequently confused original text into comprehensible modern English. The reading of both the English translation and the Arabic text ensemble is recommended. I have alternative suggestions for the translation of some passages, but I cannot forward them with total confidence without seeing the illustrations lacking in the book.

Part IV includes, first, three Appendices: the Table of 'Declinations and Equations' (Appendix A) and the Table of Proportions (Appendix B), both used in some chapters of the treatise, and a third Star Table (Appendix C.1) complemented by a list by chapters of the stars featured on illustrations of retes (Appendix C.2). A wide bibliography follows, as well as a very useful set of indexes: an index of manuscripts quoted, a general index of

terms and names, and a last index of titles mentioned in the study. Finally, the book reproduces a selection of 18 original plates courtesy of the Chester Beatty Library in Dublin and the Institut für Geschichte der Naturwissenschaften in Frankfurt am Main.

Charette's book, aimed at historians of science and specialists in scientific instruments, is an ambitious research project that uses the edition of a practical treatise of instruments as the basis for an enormous historiographical work. The instruments cited are so numerous and so varied, and the information provided by the text is so limited, that it is quite understandable that the profundity of the analysis varies widely. The specialist reader will be encouraged to pursue the study of several of the instruments described here.

Roser Puig

Ekmeleddin İhsanoğlu, *Science, Technology and Learning in the Ottoman Empire. Western Influence, Local Institutions and the Transfer of Knowledge.* Variorum Collected Studies Series: CS773. Ashgate, Aldershot, 2003. XI + 352 pp.

The volume reprints twelve papers by Ekmeleddin İhsanoğlu, previously published in different Journals, Proceedings and Collective Books between 1987 and 2002. The author has added a short introduction (5 pp.) as well as a complete index (17 pp.). The bulk of the papers, as the author states, deal with cultural, intellectual and scientific aspects of the Ottoman Empire history (1299-1923), subjects which until now have been somehow neglected or studied under a "negative" outlook, in the author's own words. The book shows the relationship between Ottoman and Arabic and European science and culture. In fact, it is clear all around the book that many of the features of Ottoman Science are strongly related to the characteristics of other parts of the Muslim World, where science and culture were at their higher level at the end of the 13th century, although there are also some important differences. It is also evident the active relationship that from the 16th century the Ottomans have with the European countries, where modern science developed taking the torch of the Arabic Science.

Broadly speaking, the topics can be grouped into three main subjects, which are Western and Eastern tradition, Learning, and Modern Science. The first group contains 3 papers (I, II, III). The second, 4 papers (VI, VII, VIII, IX). And the third group, 5 papers (IV, V, X, XI, XII).

In conclusion, the book presents a new viewpoint in the field of Ottoman science and deserves to be read by scholars and people interested not only in Ottoman Science, who can also consult the *History of Ottoman State, Society and Civilization* (Istanbul, 2202), but also in Arabic and European Science.

Mercè Comes

Lorch, Richard: *Thābit ibn Qurra On the Sector-Figure and Related Texts Edited with Translation and Commentary by ...* "Islamic Mathematics and Astronomy", 108. Institute for the History of Arabic-Islamic Science, Frankfurt 2001. 461 pp.

The calculation of the sizes of circular arcs on the surface of a sphere (the celestial sphere or the earth) involves the use of spherics. It was the Greeks who first investigated the geometry of the surface of the sphere; among others, Autolykos and Menelaus wrote treatises on the subject. In Menelaus' work *Sphaerica*, a spherical triangle is defined as the area enclosed by the arcs of (three) great circles on a sphere, each arc being smaller than a semicircle. In Book III of the *Sphaerica* we find the first theorem of spherical trigonometry, known

as Menelaus' theorem. This was the only theorem in that science known to the Greek writers. Often a certain amount of ingenuity is required to complete a few given arcs so as to obtain a configuration to which the theorem can be applied; a single triangle would be much easier to find.

This theorem was considered difficult, partly because it involved the composition of ratios. It was the object of numerous explanations and discussions in the ancient and medieval world. In the Almagest, Ptolemy used Menelaus' theorem to determine the various celestial arcs and angles and until about 1000 AD it was regularly demonstrated and applied in Arabic spherical astronomy, where it was also known as the "sector-figure" (*shakl al-qaṭṭāʿ*). From there it passed into the Latin world, where it was known as "figura cata".

Although the Arab-Islamic mathematicians devised new theorems to deal with spherical arcs of the sphere, Menelaus' theorem remained one of the favorit topics in theoretical mathematics until a much later date: indeed, in the 13th century al-Ṭūsī wrote a study of it, entitled the *Taḥrīr* of Menelaus' *Sphaerica*. This interest was also reflected by Thābit ibn Qurra who, at the beginning of his treatise on the sector-figure, notes the intense activity occasioned by this theorem due to its usefulness in spherics. But, despite this interest, historians have not as yet attempted to deal with it in a comprehensive way. This situation began to change with the publication of Richard Lorch's book in 2001, and some other papers on this topic published since then, among them "Le traité de Thābit ibn Qurra sur la figure secteur" in *Arabic Sciences and Philosophy*, vol. 14 (2004) pp. 145-168, by Hélène Bellosta, and "Thābit ibn Qurra et la composition des rapports" also in *Arabic Sciences and Philosophy*, vol. 14 (2004) pp. 175-211, by Pascal Crozet.

Lorch's book is devoted in the first place to the study of these two texts by Thābit b. Qurra, the first of them on the sector-figure and the second on the composition of ratios, which is also used in the sector-figure. But the book contains considerably more than this, and provides a comprehensive study of a variety of texts dealing with these two matters throughout the Middle Ages.

The book is divided into three parts. The first part outlines Thābit's life and stresses his decisive role in the transmission of Hellenistic sciences to Arabic, especially mathematics and astronomy, and also as a transmitter of Arabic science into Latin Europe through the translations of his works into Latin. Next, there is an exhaustive description of the Menelaus' theorem, or sector-figure, the description of Thābit's concept of ratio, which appears in the first chapter of his text on the composition of ratios, and a comparison of this concept with Euclid's definition in the Elements in the translation revised by Thābit himself. From this comparison it is clear that Thābit's concept has the same import but is expressed in a different way. There are no indications of the circumstances in which the text on the composition of ratios was produced but Lorch suggests that it was written after the sector-figure. Furthermore, the detailed analysis of this definition in a variety of texts leads Lorch to the conclusion that the transmission of mathematical texts was more uneven than was previously supposed. The remaining chapters centre on the contents of the manuscripts used in the edition of Thābit's texts which have not been previously described, and on the manuscripts containing the Latin translation of Thābit's text.

The second part of the book is devoted to the edition of these Arabic and Latin texts, together with their English translations. The first is the edition of the Arabic text of Thābit's treatise on the sector-figure (pp. 41-123) which is based on nine manuscripts now preserved in Paris, Istanbul, Damascus, Cairo, El Escorial, Algiers and also a private manuscript

formerly in the H. P. Kraus collection. The Arabic edition and English translation are given on facing pages, allowing easy comparison of the two versions. Appendices are added in some of these manuscripts; in the Escorial ms, for instance, we find Maslama's proof of Ptolemy's treatment of the sector-figure, which Lorch includes as an appendix in the edition.

Next we find the edition of what is considered a *Grecisicing* Latin translation from four manuscripts in Paris, London, Vatican, Oxford. This translation does not include Maslama's proof. It follows a Latin translation beginning: "Inter universas geometrice speculationis..." from a manuscript preserved in London which contains a translation of Maslama's note. After these editions there is a mathematical summary in which the mathematical contents of Thābit's text are discussed with reference to the corresponding paragraph in the Arabic text.

There is also a description of the edition of a Latin translation, preserved in four manuscripts, in Paris (2), Naples, and Erfurt, published in 1924 together with a German translation. Although the name of the translator does not appear, the author was probably Gerard of Cremona. Lorch gives several reasons for this assumption. The Maslama appendix is included in this edition.

On Thābit's *Composition of ratios* we find the edition of the Arabic text with an English translation (pp.167-307) based on three manuscripts preserved in Paris and Istanbul (2) and followed by a mathematical summary, as in the case of the text on the sector-figure. Here the concept of ratio is given and the different kinds of ratios are described, analysed and classified depending on the number of quantities involved and the number of them that are equal.

Finally, the last section of the book is devoted to what Lorch calls "Towards a history of the Sector-Figure" from the earlier versions of Menelaus' *Sphaerica,* in which the sector-figure first appeared, to the practical applications in Arabic as well as in Latin. Since Menelaus's *Sphaerica* is lost in Greek, versions of Arabic translations and derivative Latin and Hebrew texts are the primary sources for this study. The first texts described and discussed in this part are al-Harawī's edition of al-Māhānī's version of an unknown translation as well as the "improvement" (*islāḥ)* of Menelaus' text, by Abū Naṣr Manṣūr ibn 'Alī ibn 'Irāq, which is the most complete.

Lorch also considers the treatment of the theorem in the commentaries on Ptolemy's Almagest, such as the one by Theon of Alexandria (4^{th} c.) which was translated into Arabic. The author points to the many similarities between Theon's commentary on the Almagest and al-Kindī's. The study also examines several historical passages from Arabic writings on the theorem and gives a list of other commentaries and writings on the sector-figure, as explained by Ptolemy, in Arabic authors such as Ibn al-Haytham, Ibn Sīnā, al-Nasawī and Ibn Rushd. Next comes the edition of the text on the sector-figure in al-Nasawī's *al-Ishbā' fī sharḥ al-shakl al-qaṭṭā'*, as well as an extract from the *Almagestum parvum* in MS Toledo 98-22 and the description of the treatment of the sector-figure in Aḥmad ibn Yūsuf (9^{th} c.), al-Sijzī (10^{th} c.) and Jābir ibn Aflaḥ (12^{th} c.). The history of this theorem is followed until the 13^{th} century with an analysis of the works on this topic of two contemporaries which are dependent on Thābit's text, namely Naṣīr al-Dīn al-Ṭūsī's *Taḥrīr* and Campanus of Novara's *De figura sectore.* The edition of Campanus' text ends this third part.

The book is dedicated to P. Kunitzsch, with whom Lorch co-authored many very interesting studies in the past, such as the analysis of the melon-shaped astrolabe, published in 2001. It ends with an extensive bibliography, an index of names and an index of Arabic, Hebrew, Latin and Greek manuscripts.

There is one slight inaccuracy on page 29: although the study and Catalan translation of Ibn al-Samḥ's treatise on the astrolabe was published in 1986, the edition of the Arabic text is still unpublished. Evidently this is trifling point in such an impressive, wide-ranging study.

Emilia Calvo

Luis García Ballester, *Galen and Galenism. Theory and Medical Practice from Antiquity to the European Renaissance*. Ed. by J. Arrizabalaga, M. Cabré, L. Cifuentes, F. Salmón. Aldershot: Ashgate, 2002 (Variorum Collected Studies Series, CS710).

Little can be added to what has already been written about Luis García Ballester (1936-2000), either in obituaries or book-reviews concerning other posthumous publications, such as *Medicine in a Multicultural Society*, also edited by Variorum and reviewed by M. Forcada in the second issue of this journal. In the context of Spanish scholarship, perhaps it is worth noting that, for a long time before his disciples began to put into practice his teachings, Luis García Ballester was our most international scholar in the field of history of medicine. More importantly, as far as Islamic medicine is concerned, he was –and still is– the sole Spanish historian of medicine who has approached with scientific rigor a field of research primarily cultivated by philologists, physicians and native Arabic-speakers. In this particular area, he devoted himself to fill in the gap regarding Muslim and Jewish minorities in Spain, but his works on ancient and medieval medicine also contain a wealth of learned references to Islamic medicine, with which he always interacted when studying the Western medical tradition. Therefore, while regretting the loss of a scholar who constitutes a model for emulation, historians of medicine in general –and historians of medieval Islamic medicine in particular– must celebrate the publication of this collection of essays on Galen and Galenism. Luis García Ballester pioneered research regarding subjects that had not been formerly studied in Spain, such as Galen, a medical author who attracted his attention for more than thirty years. Likewise, in tune with what was going on beyond our frontiers, he incorporated new approaches to, and new questions in, the history of medicine, which in the case of Galen mainly became a twofold aim: firstly, the effort to place the physician (and his scientific contributions) in historical context, and secondly, the purpose to explore his influence (the so-called Galenism) throughout time. This is what makes the book under review a particularly valuable reading for many historians of medieval Islamic medicine. On the one hand, it is an authoritative bibliography on Galen (the master-key for understanding Islamic medical theory and practice) and on Galenism (which cannot be understood without the role played by the Islamic medical tradition); on the other, it is also a source of inspiration, for our knowledge of medieval Islamic medicine would greatly benefit from an attempt to apply García Ballester's methodology and historiographic approaches.

The collection of essays is divided into two sections, devoted to Galen and Galenism respectively. The first work, *Galen's Medical Works in the Context of his Biography*, is a comprehensive chronological reconstruction of Galen's biography and literary production which comes out of –and summarizes– a lifetime of study. Starting with a well-reasoned synthesis about Galen's relevance and a description of his family background and beliefs, García Ballester offers a detailed survey of how Galen's ideas, discoveries and knowledge developed throughout his long life, and how the teachers he studied with, the medical schools of the time, the intellectual and professional context he met

at the places in which he lived, conditioned his subsequent research. The author's admiration towards Galen does not prevent him from mentioning, at least in passing, some less positive aspects of his personality, such as presenting some of his ideas as having been inspired by Aesculapius in a dream (in order to make his theories sacred and protected against criticism), or his arrogance, the latter often represented in quotations selected from Galen's works to illustrate his biography. In this respect, the present author only misses some reference to Galen's persuasive strategies embodied in his theoretical writings and case histories, as well as to the fact that many of Galen's claims regarding his superiority as a physician –however well founded and deserved– were also a means for the construction of his authority and for self-promotion, all of which passed on to the Islamic tradition.

The following work, *Galen as a Clinician: His Methods of Diagnosis*, provides a detailed analysis of Galen's work as a practising physician. García Ballester emphasizes how Galen developed Hippocratic doctrines, giving them a character decisive for the latter evolution of medicine. This is particularly important as regards diagnosis, since the major contribution of Galen to medicine consisted not only in applying the use of reason, but also in pointing to the site of the disease (regional diagnosis). Likewise, the typification of disease allowed him to practice the so-called "differential diagnosis", which is fundamental to therapy. The sections devoted to the concept of diagnosis and prognosis in Ancient medicine, the manner in which Galen resolved the tension between scientific knowledge and clinical experience, and the role which case histories played in his medical work, are followed by a description of Galen's methods of diagnosis through the senses (particularly the use of sight, touch and hearing), the word (namely, interrogation of the patient), analogy, and, more importantly, the combination of the use of reason, conjecture and experience. In this manner, García Ballester demonstrates that Galen's recognition of bodily symptoms in daily practice was much richer and subtle than the image of a doctor who only took the pulse and looked at the urine against the light, highlighting that this is a "platitudinous image of later Galenism".

In the third article, *Soul and Body, Disease of the Soul and Disease of the Body in Galen's Medical Thought*, García Ballester discusses the role of the psychic aspects of human nature in the medical system of Galen. This too is a particularly interesting work, not only because of the novelty of the subject and his approach, but also because he deconstructs another topos traditionally linked to Galen: while he is (like Avicenna) often associated with brilliant psychotherapeutic procedures to identify mysterious complaints –which he then diagnoses, for example, as lovesickness or anxiety– García Ballester maintains that Galen did not use that therapeutic technique and was never interested in formulating a doctrine on the soul-body relationship on which he might have based a stricly psycotherapeutic action. Morover, Galen left rather vague the answer as to what kind of connection existed between soul and body. Leaving aside the fact that accepting the absence of a given feature in a particular physician or time-period is as historical as studying its presence, the apparent contradiction between Galen's case histories describing his own clinical experience with mental disorders and García Ballester's statement is resolved by means of a discussion of the notions and nature of the soul and disease in Galen. The answer seems to be that Galen's thought in this point worked at a purely medical –even pragmatic– level rather than at a philosophical one. The fact that he did not consider speculation on the soul, its substance and features, worthy of interest for the solution of the medical problems he encountered as a clinician, did not prevent

him from admitting connections between the psychic and moral life of man, whose alteration brings about disease of the soul, and bodily health, which depends on the good functioning and balance of what, in Galenic terms, constitutes the *physis* (elements, qualities, humours, faculties...). Although Galen did not state what these connections actually consist of, he nevertheless formulated basic therapeutic principles to treat illnesses of psychic origin. More importantly, as García Ballester mentions in passing, Galen made medicine the foundation of the physical, psychic and ethical life of man, therefore placing the physician and his activity at the top of all professional activities.

The fourth and last essay devoted to Galen, *On the origin of the "six non-natural things" in Galen*, deals with the origins of the concept that came to form one of the principal aspects of Galenism, for it constituted a substantial part of the causal and therapeutic system of Galenic pathology, while at the same time, all the preventive doctrine for the preservation of health was also built on it. The sixfold classification found by L.J. Rather in the work *Ars medica* was the basis for the first consideration of that doctrine in the historiography of Galenism. The contrast between the elaborate and over-refined concept in that treatise with its unsystematic presentation and lack of rigor when it occurs in Galenic works of undoubted authenticity led J. Kollesch to question the authorship of *Ars medica*, at least in the form in which it has come down to us. From this standpoint, García Ballester addresses two interesting issues: on the one hand, whether the concept of the "six non-natural things" is to be found in the works of Galen or was a subsequent elaboration of Galenism (Alexandrian, Arabic, and Latin Galenism); on the other, since Galen's thought changed during his life, and Galenism was not something static and defined from its very beginnings, at what moment in Galen's biography and at what stage in Galenism such a precise doctrine developed. In order to answer those questions, García Ballester traces back Galen's passages in a number of works (including those preserved only in Arabic) to conclude that throughout his scientific career he appealed over and over to concepts which were subsequently systematized as "six non-natural things" by Alexandrian Galenism, and which were then taken over by Islamic authors.

The section devoted to Galenism is made up of a selection of seven essays, all of which, to a greater or lesser degree, convey a good deal of information regarding the impact that medieval Islamic medicine exerted on the Western medical tradition. The first article is entitled *The New Galen: A Challenge to Latin Galenism in Thirteenth-Century Montpellier*. In this essay, García Ballester analyses how the assimilation and eventual introduction of new texts in the traditional medical curriculum known as *Articella* —a collection of works of schematic and aphoristic nature and their commentaries— resulted in what he identifies with the "new Galen", an impressive *Corpus Galenicum* which provided university physicians with a better and deeper knowledge of Galenic physiology, clinical medicine and therapeutics. Focusing on the great European centre of Montpellier, he also examines how that movement began among university physicians in the middle of the thirteenth century, accelerated in the second half, and culminated with Arnald of Vilanova (ca. 1240-1311), whose singular role in the process is described by García Ballester in five sections: Arnald's extensive knowledge of Galen's works (attested by a detailed analysis of his private library and medical writings); his work in the university as commentator on Galen's most important new treatises; his contribution to the task of transmitting a new version of Galen; his direct knowledge of Arabic sources; and his personal involvement in drawing up the academic

regulations which governed medical studies at Montpellier from 1309 onwards.

The following article, *Artifex factivus sanitatis: health and medical care in medieval Latin Galenism*, focuses on the manner in which medieval Islamic medical treatises transformed the concept of health and disease in the Latin medical tradition, but it also addresses the question of how a medical model based on new medical concepts and a new conception of medical training became socially accepted after a lengthy process from the twelfth century onwards. Although universities played an important role, García Ballester shows that it was the introduction of Aristotelism through Arabic texts –in which Aristotelian doctrines had already been developed and integrated into a doctrinal system with practical medical implications—that allowed the influence of the physician trained in natural philosophy to increase in society and the most developed form of Galenism to enter the Latin West. According to García Ballester, the Latin translation of works such as al-Majūsī's *Pantegni* or Avicenna's *Canon* not only transformed the concept of health, but also endowed medicine with intellectual respectability, and in combination with university institutions, promoted the social demand of physicians as *artifex factivus sanitatis* or "makers of health".

In *The Construction of a New Form of Learning and Practicing Medicine in Medieval Latin Europe*, García Ballester builds on and expands subjects discussed in previous papers collected in this volume. Focusing on the southern parts of Latin Europe (namely, Salerno), he brings together nine factors which, in his opinion, intervened in the construction of a new medical paradigm throughout the thirteenth and fourteenth centuries. These factors range from translations –or commentaries– of particular groups of works progressively incorporated into the medical curriculum, up to the existence of universities and academic physicians shaping –and marketing– a new form of understanding and practicing medicine. Put in a different way, García Ballester dissects the interaction of conceptual, intellectual, and social features involved in that process (a number of which were filtered through the translations of Arabic medical works), and his essay provides a rich insight of medicine in the Latin West.

By analysing the views propounded by Arnald of Vilanova and Bernard de Gordon, in L*a recepción del Colliget de Averroes en Montpellier (c. 1285) y su influencia en las polémicas sobre la naturaleza de las fiebres*, García Ballester tries to show that Averroes's rational understanding of fever served as a starting-point for the reflexions which, on that particular topic, followed the *Colliget*'s reception in the medical-scholastic circles of thirteenth-century Montpellier. The next article, *La fiebre y las doctrinas de las cualidades y de los grados, según Arnau*, analyses Vilanova's concept of fever throughout his works (*Aphorismi de gradibus*, *Commentum*, and *Speculum*). Since Arnald of Vilanova's doctrine of degrees of compound drugs was a revolutionary novelty in the medical environment of his time, García Ballester's purpose is also to find out whether a parallel doctrine is to be found in his works as regards the mathematical quantification of fever.

Galenism and Medical Teaching at the University of Salamanca in the Fifteenth Century fills in an historiographical gap. In this article, García Ballester examines recently discovered documents to attempt a reconstruction of medical theory, practice and academic teaching programmes at the university of Salamanca, a matter scarcely explored until then. Two students' notebooks and a collection of texts copied by a Salamanca medical graduate (preserved at the Biblioteca Nacional of Madrid and the Real Academia de la Historia) allow him to gain an insight into the intellectual environment of that Castillian institution.

Nevertheless, the study is not a simple description of the manuscripts's contents meant merely to show the questions that concerned the medical community of Salamanca, but an analysis of the intellectual tools with which those questions were approached. For that purpose, García Ballester focuses on three particular issues: al-Kindī's (d. 870) doctrine of degrees transmitted to the West by Arnald de Vilanova; new diseases, as reflected in the students' notebooks; and the intellectual stimuli exerted by Avicenna's *Canon*, whose commentary opened up the possibility of expounding personal opinions and experience or of reconsidering medical problems in the light of the intellectual developments of the moment.

The title of the last essay included in the volume will be particularly appealing to historians of Islamic medicine: *The Circulation and Use of Medical Manuscripts in Arabic in 16th Century Spain*. This article complements the author's discussion of the reasons for the survival of medical manuscripts in Arabic during the 14th and 15th centuries in the Christian zones of Spain, included in García Ballester's *Historia social de la medicina en la España de los siglos XIII al XVI*. It is divided into three sections, the first of which examines three broad topics in connection with the complex relationship between Arabic medical literature and medical humanism: the knowledge of Arabic language as a determinant condition for gaining direct access to the writings of classical Islamic authors; the confrontation of Humanistic Galenism with Arabized Galenism through the prism of Avicenna's *Canon*; and the potential recovery of Greek medical sources through Arabic medical manuscripts. The second section deals with the use of Arabic medical manuscripts as a source of medical knowledge within the Morisco community. The third part explores the factors that slowed down and interrupted the circulation of Arabic medical manuscripts in 16th century Spain.

The scholars responsible for the selection of essays in this volume have achieved a sound and useful choice of Garcia Ballester's works, some of them being his own revised versions of articles formerly published in Spanish. As a whole, the studies assembled here provide a representative sample of his research on the history of Galen and Galenism, down to its death throes within the Morisco minority in 16th century Spain. The interest and usefulness of the collection is enhanced by the incorporation of the author's impressive list of publications, which –with an index of persons, writings, places and institutions– brings the volume to a close, and will lead the reader on to discover Garcia Ballester's other historical contributions. Anyone seriously interested in the broad question of what Europe owes to medieval Islamic civilization, particularly as regards medicine and science, will find much of the answer in his writings, here and elsewhere but that is not all: they will also find new questions raised for future historians of Islamic medicine to pursue.

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Folkerts, Menso *Essays on Early Medieval Mathematics: the Latin Tradition.* Aldershot etc., Variorum, Variorum Collected Studies Series 751. IX + 353 pp.

This book consists mostly of reprints of articles that had been published previously. Some of these articles were originally written in German but appear in English translation in this volume. Folkerts added a name index and an index of manuscripts for all the articles which are contained in this book.

Most of the book is devoted to the development of mathematics in medieval Europe before the twelfth century, that is to say, before the massive transmission of science from the Islamic world to Christian Europe really began. At first sight, the book

may therefore appear to be rather uninteresting for the history of Islamic science. I will show that this impression is incorrect by discussing the various articles from the standpoint of a historian of Islamic science. The articles are of course interesting for many other reasons as well, and this review does not do justice to the richness of the book.

Folkerts begins with an introduction in which he summarizes the development of mathematics in the European middle ages from the fifth through the fifteenth century A.D. Folkerts excludes trigonometry and astronomy, and he does not pay much attention to the important mathematicians Jordanus Nemorarius and Leonardo Fibonacci, who were influenced by the Islamic tradition, so the Islamic influence is somewhat less prominent than it might otherwise have been. The second, very interesting, article is a German description of the mathematical contents of the so-called *Corpus Agrimensorum*, a collection of Latin texts written in the Roman Empire. Some of the problems, e.g., the approximative relationships between sides and areas of polygons, also occur in the Islamic tradition. This can be explained by the presence of these relationships in writings of Heron of Alexandria (first century A.D.) which were transmitted into Arabic.

In the third article, Folkerts presents an edition (based on 19 Latin manuscripts) of four arithmetical propositions attributed to Beda Venerabilis (d. 735). The propositions are recreational problems, not written by Beda, but in any case compiled before the tenth century. The occurrence of similar problems in the Islamic tradition can again be explained by a common origin in ancient times. The fourth and fifth articles concern the 56 *Propositiones ad acuendos iuvenes* (propositions for sharpening the young) attributed to Alcuin (d. 804). Problems no. 39 and 52 involve camels, and so they may have been transmitted from the Middle East to Europe in Carolingian times. The fifth article includes an edition of the *Propositiones* based on 12 Latin manuscripts.

In the sixth article, Folkerts discusses the earliest forms of the Hindu-Arabic number symbols in Europe. In 967, Gerbert of Aurillac travelled to what is now Spain, where he learned the Hindu-Arabic decimal position system for integers. Back in Northern France, he introduced a new form of the abacus. In the traditional abacus only pebbels with value 1 were used, but Gerbert made the instrument more complicated than necessary by introducing counters (pieces of horn) with different values 1 through 9. Each counter displayed its value by means of an engraving of the corresponding Hindu-Arabic symbol. Folkerts lists descriptions of the counters in medieval Latin manuscripts. Some of the names of the counters (4: *arbas*, 8: *temenias*) were obviously derived from Arabic, but the origin of many of the other names is not known.

The seventh, eighth and ninth articles concern the influence of two text-books on geometry which were in the middle ages misattributed to Boethius (born ca. 480). Modern historians have called these texts the *Geometria I* and the *Geometria II*. The *Geometria I* was probably compiled in the monastery of Corbie near Amiens in Northern France, from the *Corpus Agrimensorum* as well as from Boethian fragments, including passages of Boethius' lost Latin translation of Euclid's *Elements*. The *Geometria I* was used as a school-book for teaching the *quadrivium*. The *Geometria II* was put together in the first half of the eleventh century in Lorraine. To a historian of Islamic science these articles are interesting because they show the abysmal level of geometrical teaching in Western Europe before the Latin translations of the Arabic versions of Euclid's *Elements* were made in the twelfth century.

The tenth article concerns what is probably the high point of "native" Western European geometry, namely a treatise on the squaring of the circle by Franco of Liège of about 1050. Folkerts provides a Latin edition of the text, with summary and commentary.

Franco determines π "experimentally" by drawing a circle with two perpendicular diameters. He then subdivides each diameter into 14 equal segments, and then he draws lines parallel to the two diameters through the division points. Thus the circle is subdivided into small squares by a rectangular grid, and it can be seen in the resulting figure that the area of the circle is approximately $154 = 11 \cdot 14$ small squares. The figure on X, p. 72, shows that Franco had the intuitive insight that the circle is equal in area to a rectangle whose sides are equal to the radius and half the circumference. Hence in modern terms $\pi = 22/7$. In order to solve the quadrature of the circle, Franco then wanted to find a square equal in area to the circle. The length of the side of the desired square is the side of a small square times the mean proportional between 11 and 14, that is in modern terms $\sqrt{(11 \cdot 14)}$. Franco proposed $11 + \sqrt{2}$ as a good approximation of this mean proportional, and continued with an interesting discussion on square roots. Just as his European predecessors, Franco had no idea about geometry as a deductive science, and he did not give proofs in the style of Euclid. Folkerts only presented a Latin text of the treatise by Franco, but because of the historical interest of the treatise, the publication of an English translation is a *desideratum*.

The final article of the volume is on Rythmomachia, a game invented around 1030 by a monk Asilo from Würzburg in Germany, and popular until the 17th century. This game seems to have had no relation to Islamic culture.

Folkerts' book shows, implicitly, the enormous impact of the Islamic scientific transmission in the twelfth century on the development of the history of mathematics in Europe. The concept of mathematical proof was developed in ancient Greece, but the medieval European mathematicians learned deductive mathematics from Islamic teachers.

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