Theodosius of Bithynia was a Greek astronomer and mathematician who lived ca. 100 BC. He wrote three important works on a primitive form of spherical astronomy: *Sphaerica*, *De diebus et noctibus*, and *De habitationibus*. *De habitationibus* treats, in a geometrical way, the variations in the visibility of the sky depending on latitude. The text is usually considered to belong to a collection called “little astronomy” by the Greeks and “jumlat al-mutawassitāt” by the Arabs: the “middle books” that should be read between Euclid and Ptolemy, whose *Almagest* is one of the pieces of the *Great Collection* of astronomy.

The printed version of the Greek text of *De habitationibus* has been available since Fecht’s edition published in Berlin in 1927 (*Theodosii de habitationibus liber, de diebus et noctibus libri duo*, Abhandlungen der Gesellschaft der Wissenschaften zu Göttingen, Phil.-hist. Kl., N.F. XIX, 4; repr. Nendeln: Kraus, 1970). In this 95-page book, with a handy format of 14 x 22 cm, Kunitzsch and Lorch present a parallel critical edition of the Arabic and Medieval Latin translations. They also offer a non-literal English translation with comments at the end of the book.

The Arabic translation is based on three different manuscripts preserved in Istanbul (A), and in two private libraries in Lahore (N) and New York (K) which all have as their reference Fecht’s edition mentioned above. In A and K the translation from Greek to Arabic is attributed to Qusṭā ibn Lūqā (died ca. 300/912-13). This attribution does not appear in N where the text is described in the colophon as a revision of Thābit ibn Qurra al-Ḥarrānī (died 901). The Arabic edition preserves only the name Qustā ibn Lūqā. Both names are omitted in the appended English translation, as they are in the Latin version.

The Latin text was established from two manuscripts: Paris (P) and Berlin (B). The translator into Latin was Gerard of Cremona (ca. 1114-
The variant readings introduced by Kunitzsch and Lorch were decided by reference to the Arabic version. They also followed Gerard’s lettering of the diagrams.

Theodosius’ De habitatio nibus consists of 12 propositions, each of them structured as follows: statement, diagram, example, mathematical proof, and, although not always, the author’s commentary introduced by lat. Dico (Ar. fā-aqūlū). The content deals in particular with the astronomical phenomena observed in places of habitation, that is, locis in quibus morantur homines or masākin, at extreme latitudes.

The critical edition is masterfully executed and the translation, with a wealth of footnotes, is excellent, as one would expect from these authors. We strongly recommend this book to readers.

Roser Puig


In the last few years, Paul Kunitzsch and Richard Lorch have been working on the enormous task of publishing critical editions of the works of Theodosius in their Arabic and Latin translations. In this issue of Suhayl, readers will find a paper by these two scholars on the De diebus et noctibus as well as a review of their edition of De habitatio nibus (München, 2011). Here I concentrate on the most important of these publications, the edition of the Sphaerica.

The volume contains, on facing pages, the Arabic text and the Latin translation by Gerard of Cremona (pp. 11-311), with an introduction (pp. 1-10), an edition and translation of the notes (marginal, in the text and in a half page) by Abû l-Hasan b. Sa’îd in a manuscript from a private library in Lahore (pp. 313-315), an edition and translation of a series of lemmas (extant in mss. Istanbul, Seray, Ahmet III 3464, Paris BnF hebr. 1101 and several Latin mss., among them Paris BnF lat. 9335), related to an inequality stated by Theodosius, without proof, in proposition 11 of the third book, as well as notes added in the Latin translation to proposition 11 of the second book (pp. 316-327), and a careful collection of notes on the manuscript tradition of the geometrical diagrams (pp. 328-341). The volume ends with a “Mathematical summary” (pp. 343-427), which is, in fact, almost an English translation of the book in which the propositions are translated in full and the proofs are formulated in modern notation with notes that compare the Arabic and Latin translations with the Greek original. At the end of the volume there is a complete bibliography (pp. 429-431).

As explained in the introduction, Theodosius’ Sphaerica is one of the middle books (al-mutawassit) that
should be read between Euclid’s *Elements* and Ptolemy’s *Almagest*. As for the author of the Arabic translation, the manuscripts propose different names: Thābit b. Qurra, Ḥunayn b. Ishāq and Qustā b. Lūqā. A more detailed description of the process of translation is to be found in the recension of the *Sphaerica* (1253) by Naṣīr al-Dīn al-Ṭūsī, who states that Caliph al-Musta’in (862-866) commissioned the translation of the book to Qustā b. Lūqā, who reached proposition five of the third book. The task was finished by another scholar and Thābit b. Qurra revised the translation. The edition of the Arabic text is based on three manuscripts of which one (the aforementioned Lahore ms.) was copied in 1158, in Mosul from another copy belonging to a direct descendant of Thābit b. Qurra. The colophon of the same manuscript states that al-Ḥasan b. Saʿīd (the author of the notes edited on pp. 313-315) thoroughly revised all the figures in the treatise, in 1030, because they were corrupt in the manuscript he was copying (see pp. 3-4 and 310-312). In the same colophon, the copyist says that the three books of the *Sphaerica* contain 59 propositions (*ashkāl*): but in the edited text there are 11 definitions and 22 propositions in Book I, one definition and 22 propositions in Book II and, finally, 14 propositions in Book III: the total number of propositions should, therefore, be 58, instead of 59.

The Latin translation has been edited using 11 manuscripts and it seems entirely accurate and faithful to the Arabic original. I have only been able to find the use of one Arabic word in the Latin text: *meguar for miḥwar* (axis) on p. 13. This implies that the technical Latin vocabulary had reached a standard level by the time of Gerard of Cremona. The only peculiar characteristic of the Latin text is the systematic use of *equidistantes* and related terms to translate “parallel” (*muwāżin*): see pp. 87, 99, 103,105 etc.

To summarize: both the Arabic and the Latin critical editions of Theodosius’ work are excellent examples of good scholarship. The texts are very well edited and printed and are a pleasure to read. During the last few years a number of Arabic scientific texts have been edited with their corresponding Latin translation: this is precisely the kind of materials we need in order to have a clear picture of the techniques used by medieval translators.

Julio Samsó

Several years ago, Jafar Abhayani-Chavoshi’s *Taḥrīr-e Mutawasiṭāt*, a facsimile edition of the collection of redactions of Greek mathematical works by Naṣīr al-Dīn al-Ṭūsī (Tehran: Institute for Humanities and Cultural Studies, 2005), made available in one volume the entire corpus of important treatises. Now Aghayani-Chavoshi has published a second substantial contribution to the history of mathematics and to our understanding of geometry in Islamic cultures. The work provides an edition of a previously unstudied Persian translation of the *Kitāb al-Nijāra* of Abū’l-Wafā’ al-Buzjānī (328-388 / 940-998), together with a French translation of the text. Although various features of al-Buzjānī’s treatise have been discussed by several scholars since the middle of the nineteenth century, but now for the first time Western historians have the entire treatise available to them in an easily accessible form.

Abū’l-Wafā’ originally composed his treatise *Kitāb al-Nijāra* (also known under the title *That Which it is essential for Artisans to Know concerning the Construction of Geometric Figures*) in Arabic. Two Persian translations were made of this Arabic treatise. The first and apparently older (judging from its technical vocabulary and rhetorical features) is preserved in an anonymous unique manuscript in Tehran University Library (manuscript 2876). It is this version that Aghayani-Chavoshi has now edited and translated into French. The second, by Abū Ishāq al-Kuhbanānī al-Yazdī (fl. 9th century AH), is preserved in a unique manuscript in the Bibliothèque Nationale de France (Persan 169). Both these manuscripts are now incomplete. Two commentaries on the treatise of Abū’l-Wafā’ are also known – one in Arabic by Kamāl al-Dīn ibn Yūnus (fl. 12. century AD), extant in Mashhad 5357, and one in Persian by Moḥamad Bāqir al-Yazdī (fl. 17th century AD), preserved in Mashhad 5371.

The short introduction by Bernard Vitrac discusses the relation of Abū’l-Wafā’ to the philosophy of geometry in the ancient world, and especially the role of construction in the science of geometry, the distinction between problem and theorem. For example, questions about the comparison of figures in terms of magnitude reveal two basic approaches. One is “algorithmic” and embodies specific instructions and operations which are propounded without explicit justification. This approach developed into the practical geometry of the Roman agrimensores tradition. The other approach utilized proportion theory of Eudoxus as developed in the geometry of Euclid and Archimedes. This approach carried an implicit if not explicit demonstrative component and can be said to complement or complete the algorithmic approach. The *Kitāb al-Nijāra* of Abū’l-Wafā’ can be seen as representing the algorithmic part of the Greek tradition.
Aghayani-Chavoshi’s lengthy preface or introductory essay helps to put al-Buzjānī’s work in its historical and intellectual context. (The French version of this introduction follows the Persian although the ordering of some topics has been rearranged.) The introduction begins with a brief biobibliographical introduction to al-Buzjānī and his oeuvre. It is followed by a description of the manuscript resources available for the study of Kitāb al-Nijāra, including commentaries on the text and Persian translations from the Arabic. The identification of the two Arabic manuscripts preserved in Cairo seems to have been based on an outdated source. The current classification of these manuscripts is Dār al-Kutub, riyāţa 260/1 and riyāţa 366. The only edition of the Arabic text is by ¼āla¬ A¬mad al¬‘Alī (Baghdad, 1979), whose work is unavailable to me. Since the only known manuscript of the Persian translation being edited by Aghayani-Chavoshi is incomplete and undated, he next undertakes a linguistic analysis comparing elements of syntax and vocabulary found in the Persian translations to other Persian texts that can be firmly dated. Based on this evidence, he concludes that the translation of this anonymous commentary dates from the 4th or 5th centuries of the Islamic era. Like many other Persian translations in the mathematical sciences, its technical mathematical vocabulary remains largely Arabic.

The second Persian translation, by Abū Ishāq al-Kuhbanānī (fl. 845-875 AH), was the version studied by Woepcke in the mid-nineteenth century. Aghayani-Chavoshi subjects this translation to a similar linguistic analysis, showing that al-Kuhbanānī tends to replace the Arabic linguistic constructions of al-Buzjānī with Persian equivalents, often derived from the literary tradition. The results of this analysis also support the general conclusion of Aghayani-Chavoshi concerning dating of the anonymous commentary.

Woepcke had raised a question concerning the authenticity of the Kitāb al-Nijāra. There exists in Uppsala University Library (ms. 324) a treatise on practical geometry ascribed to Abū Naṣr al-Fārābī (died ca. 339 / 950) with the title Kitāb al¬hiyal al¬ru¬haniyya. Its content and logical structure shares many parallels with the Kitāb al-Nijāra. Based on rhetorical features of al-Kuhbanānī’s Persian translation of al-Buzjānī’s treatise and the observation that the treatise contained some technical mathematical errors not expected in the work of a mature geometer, Woepcke wondered whether the Kitāb al-Nijāra was really composed by Abū’l-Wafā’. Aghayani-Chavoshi considers the issue and concludes that (1) the attribution of Kitāb al-Hiyal to al-Fārābī is probably a later forgery and (2) since the writings of other geometers of high repute also exhibit some egregious errors, the existence of such errors cannot in itself militate against the authorship
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of al-Buzjānī. Moreover the preponderance of manuscript and bibliographical evidence supports the conclusion that the Kitāb al-Nījārah is indeed a genuine work of Abū’l-Wafā’.

The last third of the introduction discusses Abū’l-Wafā’ and the mathematical content of his Kitāb al-Nījārah. In this section, Aghayani-Chavoshi summarizes the important contributions that the work makes to practical geometry (Euclidean constructions, non-Euclidean constructions, regular polygons, and regular polyhedra) and to theory of numbers, concluding with a few remarks on the epistemology underlying the treatise.

The Persian edition fills 135 pages and the French translation occupies almost the same amount of space. The text is edited from a unique manuscript, so Aghayani-Chavoshi limits his intrusion into the text to correcting obvious errors or explicating obscure statements. He has also added copious footnotes explaining the geometrical underpinning of the constructions described. The French translation is a faithful reproduction of the Persian edition, including its explanatory notes. The text is divided into 11 chapters (bāb). The first chapter deals with basic construction tools and their use. The remaining ten chapters detail various construction techniques. The 160 constructions (some include also one or more alternative construction methods) are numbered consecutively through the text. In the Persian section, the running header identifies what chapter we are currently reading. The French translation section does not have this feature, so the only way to find which chapter one is looking at is to page forward or backward. Fortunately, both Persian and French sections include the construction numbers, so it is not difficult to find corresponding sections should one wish to compare the French and Persian text.

Tehran University Library, ms. 2876, from which the text is edited, is now incomplete. Aghayani-Chavoshi uses the commentary of al-Yazdī to complete the missing lacuna. In chapter 10, because the text has become too corrupt to reconstruct, the editor has recourse to the Persian translation of al-Kuhbanānī to reconstitute its meaning. Following accepted editorial practices, he has clearly indicated these procedures in his footnotes, so that his edition does not contain hidden problems or assumptions. These editorial notes, of course, are repeated in the French translation.

There are two points that might have made Aghayani-Chavoshi’s work more useful to readers. First, the diagrams that accompany the manuscript have obviously been redrawn in this edition and translation. Although such re-drawing of the diagrams is sometimes useful to make the figures more accessible to modern readers (and I must add that the drawings used in this edition / translation are very well done and the use of shading and dashed lines – neither being found in traditional
manuscripts – makes them even easier for modern students to read and understand), presenting a “sanitized” diagram also serves to distance the reader from the complexities of the sources. Within this treatise of Abū’l-Wafā’, for example, there can sometimes be considerable variation from one Arabic manuscript to another for the same diagram. How do these Arabic diagrams compare to those in the Persian translation? I would have preferred at least an explicit discussion of the diagrams in the original Persian manuscript, similar to the discussion of parallel passages in Arabic and Persian translations. Such a discussion should provide at least some examples taken from the manuscripts to illustrate the style of the diagrams. I believe that such examples would increase the transparency of the editing / translating process and allow readers to reach more informed conclusions about the text, its diagrams, and their historical significance.

Second, anyone who tries to compare the French translation with the Persian edition is likely to be frustrated that the labels for the geometrical points used in the French translation and its diagrams do not always match the labels used in the Persian edition and its diagrams. These inconsistencies between French and Persian labels occur despite the inclusion of a table of transliteration at the beginning of the introduction. The Persian translation, following the patterns of the Arabic Euclidean tradition, usually assigns labels to the diagram points following the conventional Arabic abjad ordering, although sometimes “waw” and “yā” are used and sometimes letters are simply skipped. The French translation follows (sometimes) the order of the Latin alphabet and routinely transliterates the letter “jīm” with C. G is often omitted from the French labels, but in construction 18 it appears as the equivalent of “rā” while in construction 28 it appears as the equivalent of “hā”. At the same time, in the Persian diagrams what would typically be “zay” in Arabic is routinely written as “rā”. (The difference is only a dot, and manuscript copyists are notoriously inconsistent about inserting dots.)

Moreover, in some cases we find that the diagrams given in the Persian edition appear very different from those in the French translation (for example, the diagrams of chapter II, construction 1). And the differences in labeling between the Persian and French diagrams for this construction only add to the confusion of the reader. Although on close reading, the logic of the construction turns out to be the same in both Persian and French, the use of differing diagrams may confuse and frustrate readers unfamiliar with the intricacies of medieval geometry manuscript sources.

A bibliography follows the French translation. I found this section to be somewhat unsatisfying. The bibliography is explicitly limited to works discussing the career and mathematics of al-Buzjānī.
Thus some material cited in footnotes, such as discussions of regular and semi-regular solids or sources on the intellectual and political context are not included. Even within this limited framework, the choice of materials to include in the bibliography is sometimes puzzling. Although older bio-bibliographical sources such as Brockelmann and Sezgin are cited in the bibliography, the more recent and more comprehensive work of Rosenfeld and Ihsanoglu is not listed. (Rosenfeld and Ihsanoglu assert the existence of another Arabic manuscript of Kitāb al-Nijāra (Mashhad 5357) which Aghayani-Chavoshi has identified (p. 35) as an Arabic commentary composed by Kamāl al-Dīn ibn Yunus.) Equally puzzling is why the brief survey of the scientific work of Abū’l-Wafā’ in George Sarton’s old History of Science is cited in the bibliography. In addition to these limitations, it is also confusing that sources written in Arabic and Persian are cited in Arabic script in the footnotes, but appear in the bibliography only in transliteration.

Moreover, there exists a considerable secondary literature studying Arabic investigations of regular polygons, Archimedean solids, and various semi-regular polyhedra. Several of these secondary works appear in the footnotes, but others have been omitted. Such omissions limit the usefulness of both the footnotes and the bibliography for anyone who might wish a broader understanding Abū’l-Wafā’ and the intellectual and craft context of his work on practical geometry.

The bibliography is followed by indices of personal names and topographic names. These indices seem to me to be of limited usefulness. The indices appear intended to include every person or place named in the introduction (but not in the footnotes). In practice, there are omissions. An occurrence of the name al-Quhi (p. 19) is not included in the index (and the accompanying mention of the Observatory at Baghdad is similarly missing from the topographical index) nor does the name Sa’adi (p. 61) appear. Leonardo da Vince, Albert [sic] Dürer and Tartaglia are mentioned in the same sentence (p. 102). Leonardo does not appear in the index, although both Dürer and Tartaglia are present. Ibn Sahl (p. 104) is in the index, but al-Kindi, mentioned in the same sentence, is not. There are similar omissions in the Topographic Index. “Damas”, mentioned as the site of the Zaheriya Library (p. 25), is not in the index, but “Massachusetts”, mentioned as the location of Harvard University (p. 117), is included. “Turquie” (p. 27) is included in the index, but Iran (p. 31) is not. It is also unclear why nearly all diacritics have been omitted in these indices although they are generally present in the text and footnotes.

Inconsistencies in transliteration of names could also prove confusing: “Ali Qushehi” (p. 27) becomes Ali Qoushchi in the index and similarly “Ulug Beg” (p. 27) becomes
Ouloug Beg. Topographic names sometimes also shift spelling: “Samarcande” (p. 27) becomes Samarkand and “Istanbul” (p. 28) becomes Istanbul in the index.

More frustrating is the inconsistency of presentation in the Personal Names Index. For example, we find “al-Farabi, Abu Nasr” but “Abu Bakr al-Razi”. Similarly, we find “Ahmad Jam” but “Aram Ahmad” (the comma has been omitted here, adding to the confusing situation). Nor is this inconsistency limited to Arabic names: we find “Kennedy, E. S.” but “Matila D. Ghyka” and “Albert Durer” (Albrecht has been changed to Albert and the umlaut is missing as are most other diacritics). In the text, we find “M. Mustafa” (p. 23) but in the index his name is given as “Mawaridi, Mustafa”. Although such inconsistencies do not necessarily imply that the indices are completely useless, in general I do not think that the indices add significantly to the introduction.

The introduction is concluded with a Persian / French glossary or “Lexique” which, we are told, includes the important ideas and technical terms used in the two Persian versions of Kitāb al-Nijāra. The terms are arranged alphabetically according to the Persian terms. I think the usefulness of the glossary might have been increased if there were an indication of which Persian version uses the term (if the term differs from one version to the other). It would also be helpful to include references indicating where in the text an idea or technical term is specifically discussed / defined so that interested readers can see these terms in their context, rather than in isolation, especially since in a few cases the French equivalent appears different from the usual Arabic meaning of the terms. (The term “ahl al-şinā’āt” for example is rendered as “artisan” although the Arabic construction would more commonly refer to a “(collective) group of artisans”.)

Even though readers may at times find the inconsistencies of both the diagrams and the supplementary material accompanying the introduction rather frustrating, these features do not detract significantly from the overall value of the work. The scholarly community owes a vote of thanks to Professor Aghayani-Chavoshi for making this important work available in an accessible and easy to understand form. Historians of mathematics who have too often been cut off from the ancient and medieval sources by linguistic constraints now have a major new resource in hand.

Gregg De Young

The present volume assembles a collection of 19 papers published between 1965 and 2001 by the great Polish historian of Astronomy Jerzy Dobrzycki, who died in 2004. Seventeen of them had previously been published in English in journals with wide readerships like the Journal for the History of Astronomy (eight articles), Centaurus, Vistas in Astronomy, and in several volumes of proceedings of congresses and symposia. Most of the papers deal with Copernican studies, a field of research which Dobrzycki shared with Owen Gingerich, who dedicates his “Foreword” (pp. 7-11) to talk of their mutual relationship, friendship and collaboration between 1964 and 2004.

I would like to stress that two of the papers contained in the volume originally appeared in Polish and are now reprinted in an English translation: “Theory of Precession in Medieval Astronomy” (1965, pp. 15-60) and “The Astrological Tables of Regiomontanus in Cracow” (1988, pp. 137-145). The first of these papers is particularly important, as it is one of the earliest modern analyses of the theory of trepidation, contemporary to the papers published by B.R. Goldstein (1964) and John D. North (1967).

For many years I was extremely interested in Dobrzycki’s paper but I only had access to the English summary, fortunately not too brief, which accompanied the Polish text. I have now been able to read the complete paper, which is an excellent survey of the history of precession and, more specifically, of the theory of trepidation in Western Europe from its origins until the time of Copernicus. The article focuses on the trepidation model described in the Liber de motu octae spere, and Dobrzycki follows the trend common in the nineteen sixties of attributing this work to Thābit ibn Qurra. He also deals with trepidation in the Alfonsine Tables and, to the best of my knowledge, was the first scholar to suggest an improvement of the method for the calculation of the table of equation of trepidation by using $\sin \Delta \lambda = \sin i \times \sin(\text{max. eq})$ ($i$ being the angle formed by the moving Head of Aries with the equator on the small trepidation epicycle) instead of the commonly used $\Delta \lambda = \sin i \times \sin(\text{max. eq})$. The paper continues with the physical interpretations made by 15th century European astronomers and finishes with Copernicus’ new interpretation of the theory. On the whole, I believe that Toomer’s evaluation in his article on Theon of Alexandria (DSB vol. 13, 1976, p. 325), in which he states that Dobrzycki’s paper is “the best discussion of the history of the theory of trepidation in the Latin West” remains completely valid.

When Dobrzycki published the paper on trepidation in 1965, he did not seem to believe in the possibility of the influence of the Marâgha’s
Thus, he talks (pp. 50-51) of Copernicus’ use of “the composition of harmonic motion from two circular motions” (Tusi’s couple) and he adds that “one can hardly speak in terms of any borrowing by Copernicus”. His attitude clearly changed later: in the paper written in conjunction with Richard L. Kremer, “Peuerbach and Maragha Astronomy? The Ephemerides of Johannes Angelus and their Implications” (1996, pp. 73-127), the authors analyse the Ephemerides published by the Vienna physician and mathematician Johannes Angelus in 1510 and 1512, in which the planetary positions show major corrections in respect to the results one can obtain by using the Alfonsine Tables. This, according to Angelus, is due to his use of a new set of planetary equations calculated by Peuerbach and completed by him. The paper is a splendid and partially successful attempt by the authors to reconstruct the new equation tables, underneath which there are, obviously, new planetary models which Dobrzycki and Kremer attribute to Peuerbach. The authors argue that the hypothetical new equations which give good results for Saturn and Jupiter, but not so good for Mars and the inferior planets, can be explained by models using either the Tusi couple or Ibn al-Shāṭir’s double epicycle. Their conclusion (p. 97) is that “at least one of the Maragha sources must have been available to the Latin West before 1461, the year of Peuerbach’s death”.

As a conclusion: this volume contains an excellent collection of papers that will be extremely useful to historians of Early Modern European astronomy, with occasional treatments of Medieval topics and their influence at later stages: this is the case of his studies of the Western European developments of the Alfonsine Tables which appear almost everywhere in the book, and especially in the “Tabulae Resolutae” (1987, pp. 129-135), two papers on Calendar Reform (1975, pp. 61-62; 1983, pp. 63-72) and “Alfonsine Meridians” (coauthored by R.L. Kremer, 1998, pp. 147-159).

Julio Samsó


The book under review, which offers a critical edition with a facing page English translation of Hunayn b. Ishāq’s Arabic version of Galen’s Περὶ κρίσεων ἡμερῶν, represents a most welcome addition to the almost centenary corpus of the Galeatus Arabus. The author comes thus to inscribe his name on a list in which figure such distinguished scholars as R. Walzer, M. Lyons, P.

Rather than merely putting forward a raw edition-with-translation, the author provides “an introductory discussion on the history of the transmission of the doctrine of the critical days from Greek into Arabic”. This is intended to be “a first foray” into the topic’s intricate conceptual world (pp. XIX-XX).

The volume is structured in four parts: (1) a study of the historical background (pp. 3-90), (2) the annotated edition of the Arabic text and its translation (pp. 91-385), (3) a commentary (pp. 387-500), and (4) two appendices, the first of which (pp. 503-528) presents a provisional Graeco-Arabic apparatus with relevant textual clues, and the second one (pp. 529-551) the edited and translated texts of al-Kindī’s *Risālah* and Qustā b. Lūqā’s *Masā’il*. The whole work is complemented with a bibliography (pp. 553-585) and three indexes (pp. 587-615).

As the author states in Chapter 1, Galen’s *Critical Days* is a work to which scarcely any attention has been paid by modern scholarship, in spite of its having laid the foundations of medical astrology. Against this neglect (probably derived, as suggested here, from the presumed tangentiality of Galen’s astrological framework to his more overtly scientific doctrines), the author proposes a reappraisal of the text from two standpoints. First, it should be reassessed as a paradigm of Galen’s derivation of a predictive model from medical case histories (which, in the author’s opinion, may find a parallel in Ptolemy’s mathematical models for the planetary motions). Second, it should be approached as a pivotal text of his prognostic theory, composed within the frame of his refutation of Scepticism and Methodism and his defence of empirical knowledge. Galen’s purpose would thus have been to validate the doctrine of critical days (in use since Hippocratic times) as a trustworthy prognostic tool pertaining to scientific astrology (a discipline consecrated by Aristotle and Ptolemy) as opposed to divinatory astrology (pp. 6-7). With this aim, he sought an explanation of the pattern behind the critical days (those days of the illness in which the occurrence of crises is much more frequent than on other days) by sifting through the data of Hippocrates’ *Epidemics*. Then, he produced a list of critical days which he ultimately
interpreted in accordance with the Hippocratic medical week, whose length Galen calculated as 6 35/48 days (cf. p. 373).

Seven centuries later Galen’s Critical Days was rendered into Arabic by Hunayn b. Ishāq (ca. 809-873) for the well-known Baghdadi patron Abū Ja’far Muhammad b. Mūsā b. Shākir in the context of the Abbasid Translation Movement. After a cursory survey of Hunayn’s figure and œuvre within the historical scenario set by the combined works of D. Gutas and G. Saliba, the author attempts to reconstruct the transmission of the doctrine of critical days in ninth-century Baghdad. Evidence is gathered on the discussion thereof by such leading figures as al-Kindī, Qusṭā b. Lūqā and Hunayn b. Ishāq himself (pp. 23-42). The mainly mathematical approach (aprioristic and rationalist in nature) of al-Kindī is examined through the text of his Risālah (ca. 830-850), of which the author presents a “working translation” (pp. 529-540) and concludes that it most probably is “pre-Galenic” in the sense that its author seems to be unacquainted with the existence of Hunayn’s translation and the basically empirical doctrine contained therein. As for Qusṭā b. Lūqā’s Masā’il (transcribed and translated into English for the first time on pp. 541-551), a terminology clearly different from Hunayn’s seems to indicate that it is derived directly from the original Greek text (pp. 37-42). As estimable and enlightening as this reconstruction is, one cannot but regret that the analysis was not broadened to encompass evidence from other contemporary physicians, of which not even passing mention is made. It may be relevant, for instance, that the critical days are utterly absent from the Risālah Hārūniyyah (ed. S. Gigandet, Damascus 2001) ascribed, perhaps pseudoepigraphically, to Masāʾī b. Ḥakam al-Dimashqī (floruit 840), who was otherwise well acquainted with Hippocratic and Galenic doctrines and with Greek and Indian iatromathematics. When dealing with this early stage, one should also take into account ’Alī b. Sahl Rabban al-Ṭabarī’s (died 855 or 864) testimony – cf. especially Firdaws al-hikmah IV 10, 19 (ed. Šiddīqī pp. 30313-30413 | al-Jundī pp. 21516-2162) and IV 10, 23 (Šiddīqī pp. 31053-31221 | al-Jundī pp. 22052-22123).

Chapter 2 opens (pp. 43-49) with a microhistorically shaped reconstruction of the Graeco-Arabic Translation Movement and a critique of the “Older Scenario” or traditional paradigm, characterized – in the author’s opinion – by a rather simplistic conception of the movement and a profound misunderstanding of the role played therein by the bayt al-hikmah. A new picture is then proposed that leads to the consideration that “the translation culture of ninth-century Baghdad was a far more complex environment than has been assumed. It was a highly organized – but not centralized – research-driven pursuit of knowledge, and the Greek corpus...
was searched for any material that could assist practicing scientists” (p. 49).

There follows a subsection on the later history of the Critical days (pp. 49-60) that summarizes (somewhat unequally) the fortune of the text in the Arabic, Byzantine, Hebrew and Latin traditions. In the brief paragraphs devoted to its development in the Arabic Islamic medical tradition, the author provides some hints for further study, namely al-Nasawī, Ibn Sinā and al-Rāzī. On al-Nasawī (not indeed a first- or even second-rank physician, not to say an utter unknown in the history of Arabic Islamic medicine), little more is reported than the fact that he wrote a treatise on critical days that the author “suspect[s] is arithmological in nature”. On Ibn Sinā, attention is called to his Qānūn IV, 2 as deserving a separate study. Lastly (with a rather surprisingly antichronological order), al-Rāzī’s al-Hāwī is altogether dismissed as a textual witness to Galen’s Critical Days, since quotes therefrom are more closely related to free paraphrasing than literal quotations. Again, no further reference is made to any other physician, and even the names of such outstanding authors of medical encyclopaedias as al-Majūsī or al-Zahrāwī are absolutely ignored.

Still within the chapter on the Historical Background, all the information related to the collated manuscripts is gathered, followed by an assessment of Hunayn’s translation, some valuable remarks on the textual tradition leading to the establishment of a stemma (p. 88), and, finally, the editorial criteria.

The core of the volume is, of course, the critical edition of Hunayn’s Arabic version and its English translation (in fact, the first-ever rendering of the text into a modern language). The author’s painstaking, careful effort can clearly be seen in the numerous footnotes (over one thousand in total, most of them pertinent and useful, with hundreds of Greek originals for Arabic words and expressions in the text) and in the page-and-line references to Kühn’s Greek text that are included in the edition and the translation. It is also revealed in the excellent one-hundred-page commentary contained in Part III, which analyses all the intricacies of Galen’s doctrine and the details of the relation of Hunayn’s text to its Greek original.

Notwithstanding the author’s praiseworthy diligence, a number of errors have found their way into the final draft. We venture to submit here some corrigenda for an eventual second edition, ranging from minor inaccuracies that have escaped notice through the process of proofreading and editing (as is normal in such a complicated work as this) to more substantial mistakes that may convey the impression of a certain unfamiliarity with Arabic texts. The following examples are related to editing and grammar:

p. 97. In the bādī, most likely MSS في البدي . and according to modern practice في البدي .
p. 128 "illā followed by wa- is nonsense", against both MSS and the very grammar of Arabic.

p. 173, which should read: Ayyi for Ayyi

p. 299, an example of overediting, against both EL and the very grammar of Arabic.

p. 380, footnote 1164: one might think that it was not worth the trouble to justify such a simple and common emendation as MS and E.

Several faulty transliterations from Arabic also betray some grammatical awkwardness:

p. 128, f. 130 muþin for muþyin (معين).

p. 148, f. 206 wa-liyakun for walyakun (وليكن).

p. 444 yantafu (=§841.1, p. 228): rather (kuša ma) yantafu (bihi), not so much "to be beneficial" as indeed χρήσις.

p. 460 hila (vs. hila some lines further), p. 447 'indayat.

p. 486 'an nubhab (النحاب), where the introduction of a shaddah was not compulsory (cf. 'an nubhaba and which at any rate should read 'an nubhaba.

p. 98, f. 13, on the Arabic transliteration of ἐπιησμός, rather than considering it a "confusion", one may think of the divergent renderings of non-Arabic p as both b and f (e.g. فاصل / فاصل for Paulus). This duality is also present in Judaeo-Arabic texts, in which no confusion of dots or obscuring of loops could be invoked – this very same word is written ﺮﻛ `{ in Ibn Wāfīd’s Book on Simple Medicines (ed. Aguirre de Cárcer pp. 65.5, 110.13). Therefore, it might not be so clear whether Ḥunayn’s افرطنس (actually not “the Arabic text”, but L’s reading against E’s افرطنس) agrees with Kühn’s Φυκράττοις or with Littré’s Ἐπιαράττοις (cf. p. 250, f. 722).

Moreover, some of the deviations from and misunderstandings of the Vorlage with which Ḥunayn is charged may well be a mere product of the editor’s mind, as for example:

p. 174, f. 308: on قول مرسال, which actually matches Greek ἀπλός “simply”.

p. 188, f. 385: ignoring that عراض may also convey pretty much of the sense of unforeseeability of ἀδοκίμας (cf. Arabic ﺓ تعتبر) and is not only “something that merely happens”.

p. 212, f. 534: Arabic ﺑﺎﻟﻌﺮﺽ makes full sense as an equivalent to φαυλότρων, so there was no need to emend the reading of both L and E.

p. 376, f. 1148: it should be al-kalām al-bārid, not just al-bārid, and the Greek should read φυσικόλογης, not *φυσικόλογος (cf. Kühn IX 935, φυσικόλογος).
Leaving aside these details, we must unreservedly commend the author for having successfully undertaken the hard task of editing, translating and commenting on such a complex text. He has presented us with a valuable contribution to Galenic studies and an indispensable tool for scholars interested in the history of Greek and Arabic Islamic medicine, as well as in the history of the transmission of science in the Mediterranean societies from Late Antiquity to the Renaissance. We look forward to the announced publication by the same author of an edition of Galen’s *De Crisibus* and its Arabic translation.

Theo Loinaz


The two elegant volumes here reviewed embody the most comprehensive and thoroughly documented research on Arabic pharmacognosy published to date. Not that the subject was virgin soil, since there is a remarkable amount of literature on this ancillary discipline of medicine (although in the case of mineralogy much of it is rather obsolescent). However never has such a full-scale philological study been attempted to document the knowledge and use of simple mineral drugs in the Arabic Islamic pharmacognostical tradition.

The task certainly was no less than titanic, the main goal being the production of an exhaustive concordance of mineral *materia medica*, in the broad sense conveyed by the Arabic concept of *adwiyah ma’daniyyah*, as opposed to drugs based on plants and animals. The minerals range from stones and gems to metals, salts and earths, from natural pearls and coral to man-made porcelain and glass.

The impressive corpus that has been scrutinized speaks most eloquently of the author’s unparalleled endeavour. It comprises the bulk of early, classical and postclassical literature on pharmacognosy written from Iran to al-Andalus: from the ninth-century Abbasid translations of Greek and Syriac texts and the great Iranian medical encyclopaedias (al-Tabari, al-Razi) to the beginning of the modern era (e.g. eighteenth-century al-Jazā’iri). An outstanding and most valuable feature of this corpus is the fact that, besides items of primary literature including published and manuscript sources, it incorporates the fragmentary transmission (through direct and indirect quotations by later authors) of a number of no-longer extant texts.
The concordance is arranged according to the Arabic alphabet. Each entry is introduced by a lemma in both Arabic script and Roman transliteration, immediately followed by a chronologically arranged compilation of references to passages in which the mineral under examination is mentioned. To the meticulous collection of relevant loci many cross-references are added that concisely but clearly show the relations of textual dependence within the tradition of each drug. Every entry also includes a critical analysis of the data gathered in the concordance, in the form of a commentary on transmission-related matters, along with useful considerations on identification and etymology.

Furthermore, as promised by its title, the study includes a series of brief monographs devoted to the main authors and texts examined in the corpus (pp. 1-197). Grounded on the sound tradition of German textual criticism and Quellenforschung, the author offers what he too modestly qualifies as a “knappe Charakterisierung” of each work with a double synchronic-diachronic focus: the text itself and its contents; and its place within the pharmacognostical tradition as revealed by its relations to other works (the Abbhängigkeitsverhältnisse). The author’s display of solid scholarship is best exemplified by his precision in dealing with material in manuscript form, such as al-Rāzī’s Khawāṣṣ (pp. 35-36), al-Tamīmī’s Musḥīd (pp. 50-56), Ibn Janāḥ’s Talkhiṣ (pp. 61-73, a work hitherto deemed lost), Ibn Biklārish’s Mustaʿīnī (pp. 97-103) or Ibn al-Baytār’s Mugham (pp. 155-158).

Never shallow in his analysis, the author shows that this kind of strenuous investigation, however merely mechanical it may seem, undeniably yields its fruits and can help to corroborate, complement, modify or even refute details of our understanding of the medico-pharmacognostical tradition, which still depends in great measure on Arabic medical historiography. The interpretation of quotes from the pseudo-Aristotelian Book of Stones, for example, leads to the postulation of two different recensions: a standard one represented by Ruska’s edition and an apocryphal recension from which al-Qazwīnī, among others, must have derived part of his lithognomical data (pp. 5-7). Some light is also shed on the problematical ascription of the Risālah Hārāniyyah to al-Masḥīb.  The evidence gathered from quotations by both Eastern and Western physicians clearly shows that the al-Masḥī from which they drew their information has rather little to do with the real author of the Hārāniyyah. In this respect, we deem especially enlightening the finding of some coincidences between Isḥāq b. Ṭimān’s work (as reflected mainly in Ibn al-Jazzār’s I’timād and later Andalusi authors) and the Hārāniyyah. These coincidences do not seem to point to a common source, but rather to pseudo-Masḥī having elaborated on
some testimony to Ibn 'Imrān’s tradition – a question that undoubtedly deserves further investigation. We hope that these two novel contributions may serve as a tiny sample of the kind of in-depth research carried out by the author, to which one cannot render due justice within the limits of a short review.

Let us now be permitted to make some comments on the choice of texts included in the corpus – and we hasten to say beforehand that these remarks are in no way intended as a criticism, but, on the contrary, as a sincere assessment of the study under review, to which one can do little more than add an expanding note here and there, the vast mass of information having already been gathered and carefully sifted for one’s use. Therefore, when we speak of omissions or missing items, we are not talking about shortcomings, but restrictions to which the corpus has been necessarily (yet perhaps not always happily) subjected.

The first of these restrictions (and it was an obvious one that needed no excuse) has been to limit the main corpus to texts written in Arabic, with the major exceptions of Muwaffaq’s Persian Abniyah and Syriac lexicography. Therefore, the comprehensiveness of the study does not extend to Hebrew or Latin and vernacular mediaeval traditions, which are precious witnesses (sometimes even unique, the original work being lost or unknown) to the history of Arabic Islamic science – cf. for instance the Latin Mesue (definitely not Ibn Māsawayh but nonetheless his works are worth a look) or the Liber Serapionis de Simplicibus Medicinis.

Although relevant data has only exceptionally been extracted from strictly medical literature, namely from pharmaceutical and ophthalmological texts, much attention has been paid to other related sources, such as old lapidaria (e.g. pseudo-Aristotle’s Book of Stones) and general encyclopaedias containing sections on mineralogy (for instance, al-Qazwīnī’s ‘Ajā’īb al-makhluqāt). Regarding other not so evidently related genres, the exclusion of alchemy as a whole is explicitly (but maybe not convincingly) justified. However, no mention is made of geography, which is an almost unexplored realm in terms of pharmacognostical contents. Let one simply glance at any treatise, such as al-Masʿūdī’s Murūj al-dhahab, and one shall be easily persuaded of the unexpected wealth of information found therein. There we learn that he systematically distinguishes مَرَحَم from مرمر (cf. for example Murūj ed. Pellat II 13.10.13, relevant to the entry on p. 998), knows a variant مغشطس مغشطس and مغشطس in the concordance (cf. pp. 1017-28), and mentions four species of emerald from the mines in Upper Egypt (مَرْمَر/مَرْمَر, cf. II 132.8-134.8) unheard of in the pharmacognostical tradition (cf. pp. 665-9). This, again, is only to illustrate how much more usefully one can peruse
these texts with this gigantic concordance in one’s hand.

Within the strict limits of pharmacognostical literature, it is remarkable that no manuscript has been consulted for Stephanus’ Arabic translation of Dioscurides’ book (Paris MS BNF Ar 2849 being an easily available item), despite the many shortcomings of the Dubler-Terés edition. Abū l-Salt Umayyah’s Book on Simples, on the contrary, is quoted from Cairo MS Dār al-Kutub al-Miṣriyyah Tibb 509, as the author seems unaware of the existence of a critical edition of this treatise as well as of its mediaeval Latin and Catalan translations in Arnaldí de Vilanova Opera Medica Omnia XVII (Barcelona 2004). The edition of the Arabic text by A. Labarta is based on six MSS, one of them (Q) being the one used by the author in his research.

Moreover, there are a few major omissions of texts the examination of which may eventually affect (although, one must acknowledge, not drastically) the details of some entries. One of these is Ibn Juljul’s Tafsir on Dioscurides’ Book V, not indeed lost against what is stated here (p. 57). This omission is all the more regrettable since the author was in fact acquainted with its publication by I. Garijo (Cordova, 1992). Even if the ending is wanting, it can add some noteworthy non-redundant data (cf. nos. 27-74, pp. 98-103). Cf. for example:


Cf. also no. 37 murdārsanj (→ pp. 974-8, especially p. 977 footnote 1), no. 41 kiyānu = lāzaward nūṣūd (→ pp. 944-8, no. 45 zāwīq (→ p. 630)), no. 71 ḥajar aţrūj = ḥajar iţrīq (→ pp. 407-410).

Another Andalusi unnecessarily underrepresented is Ibn Wāfid with his Book on Simple Medicines. The section on minerals (lost in Arabic and only retrievable in fragments, as here, through quotes therefrom in Ibn Biklārish, al-Ghāfiqī, al-Idrisī, etc.) is partially preserved in a fourteenth-century Catalan translation (ed. L. Faraudo, Barcelona 1943), with minerals on pp. 161-168: from atamade (= ḳṭīm) to or (= ḫīb). An even more important testimony is provided by the abovementioned Liber Serapionis, which is actually a Latin translation of Ibn Wāfid’s treatise by Simon of Genoa with the help of Abraham of Tortosa, as proved by J.C. Villaverde in 1997 (Aljamía 9: pp. 111-118). In the princeps edition of 1473 the rele-
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Vant section occupies fols. 150a-166c.

Besides Ibn Zuhr’s *Kitāb al-aghdhiyah* and *Taysir* one misses his father’s (Abū l-'Alā’ Zuhr, d. 1131) *Khawāṣṣ* (diverse MSS and some fragments edited by L.M. Arvide) and *Mujarrabāt* (ed. C. Álvarez, Madrid 1994). A scan of the latter yields an unrecorded مﺮﺗﻚﺫﻫﺒﻲّ(p. 121) to be added to pp. 974-8; ﺑﻄﺮﻧﻴّﺔ (pp. 101714, 171414, 201101), a variety of tutty apparently not mentioned by any other authority (cf. pp. 361-9), whereas ﻣﺮﺍﺯﻴّﺔ (p. 1714) seems to be related to Ibn Juljul’s ﺑﺎﻟﻤﻮﺍﺯﻴّﺔ and to the ﺑﺎﻟﻤﺮﺍﺯﻴﺒﻲّ known, among others, to Bakht÷shýþ, al-*Tam÷m÷*, and al-*B÷rýn÷* (cf. pp. 368-9); a ﻣﻄﻴﻦ ﺍﻻﻧﺠﺒﺎﺭ (pp. 2311, 3510, p. 10213) ≠ ﻣﻄﻴﻦ ﺍﻧﺠﺒﺎﺭ (pp. 247, 471, 5215, p. 1041) / ﻣﻄﻴﻦ ﺍﺭﻤﻴّ, much in the line of Ibn Samajûn and Ibn Rushd (cf. pp. 786-7) or an extraordinary medical attestation of حجر ﺑﺎﻛ ﺗﺎ (p. 10413) to back up the scanty available data gathered on p. 926.

Al-Shafrah’s (d. 1360) *Kitāb al-istiqqa’* (ed. E. Llavero, Alacant 2005) contains a second *maqālah* on simple and compound drugs (pp. 110-131) in which one finds on p. 11213, no. 17 - ﺛﺰﺭﻕ ﻭﻫﻮ ﺍﻟﺰﺭﻗﻮﻥ - a characteristically Western synonymy (cf. pp. 234-235) and an interesting marginal gloss to p. 117911, no. 49 ﺟﺰﺭﺓ ﺍﻟﻤﺎﺱّ ﺍﻟﺬﻱ ﻳﺠﺬﺏ ﺍﻟﺤﺪﻳﺪ in MS G (cf. Spanish translation p. 212, footnote 220).

The polygraph Ibn al-Khâtîb (d. 1374) wrote a *Kitāb al-waṣâl li-ḥtiq al-siḥbā Il-fusûl* (ed. M. de la C. Vázquez, Salamanca 1984) with a notable glossographical appendix on pp. 137-175. Although it contains practically no mineralogical data (p. 15014, ﻓﯿﻨﻮﻟ sûا 170, ﻓﯿﻨﻮﻟ sûا 17130), the entry on *maghnûtis* the magneto compass (p. 162) is an isolated Andalusi witness to a synonymy otherwise attested only in the late Maghreb (cf. p. 1019, footnote 2).

Still in al-Andalus and missing from the corpus is the ’*Umâdat al-tabûb* (ed. Bustamante, Corriente and Tilmatine, Madrid 2004; cf. nos. 177 and 940, for instance) or Alcoati’s treatise on ophthalmology (ed. M.C. Vázquez, Salamanca 1973 for the Arabic and Latin texts of the fifth *maqālah*, and ed. Deztnay, Barcelona 1933 for the fourteenth-century Catalan translation of the whole book).

As for the Eastern tradition, al-Qalanis÷ (m. 1165) may be considered a rather strange omission, because a modern edition of his *Aqrâbâdhîn* has been available since 1983 (M. Zuhayr al-Bābā, Aleppo). In Chapter 49 *On Properties* (pp. 299-312) we find: ﺗﺄﺭﺽ (← Galen), ﺑﻭﺭﻕ (← Alexander of Tralles), ﺯﻣﺮﺩ (← Ibn Mâsawayh), ﺑﺴﺪ (← Theophrastus), ﻣﻐﻨﺎﻃﻴﺲ (← Salmawayh and Alex. of Tralles), ﺷﻚّ (← Balinâs), ﻣﻠﺢ (← Al-Qalanis÷, Salamanca 1983 for the Arabic and Latin texts of the fifth *maqālah*, and ed. Deztnay, Barcelona 1933 for the fourteenth-century Catalan translation of the whole book). Nevertheless, all this is but trifling when set against the astonishing quantity of texts perused, many of which are unedited manuscripts. For each omission that one
might adduce there are at least twice
or thrice as many texts that have not
just been scanned, but systemati-
cally and scrupulously examined.
However, it is not a simple matter of
quantity: the study covers nearly all
major texts available, with no
exception. The contribution of
Dioscurides’ Arabic transmission is
analysed, when possible, through all
five versions known to us (Vetus,
Stephan-Hunayn, al-Nāṭīlī, al-
Malaṭī and Mihrān), Galen’s univer-
sally quoted Mufradah and Mayāmir
are both explored here for the very
first time, and so is al-Ghāfiqī’s
Mufradāt, of which three MSS have
been consulted besides Barhebraeus’
Muntakhab. All this is presented
with such a clear and systematic
arrangement and commented on
with such a wealth of detail that
there is no doubt that it shall
become a reference (we dare say the
reference) and the basic frame for
any further research in the field of
Arabic Islamic medicine in general.

Theo Loinaz