As for the translation of the star table, the column corresponding to its transit may be somewhat confusing. A footnote informs us that the number in this column is the one assigned to the zodiacal signs. But there are two exceptions, since the two last stars whose transit corresponds to Taurus and Aquarius respectively are shown with letters instead of numbers.

The commentaries to the text are illustrated by the reconstruction of the figures found in the manuscript and supplementary figures of the celestial sphere showing the significant arcs involved in the questions (in these figures I think I identify Kennedy's characteristic style of drawing) which help to understand the topics described. The tables at the end of Ḥabash's text are recomputed by the authors of the study; for instance, the first one shows differences that in most cases do not reach 2 minutes of arc.

This study is completed with three appendices. One of them includes three texts which are considered relevant to the trigonometric procedures described by Ḥabash because they contain descriptions of similar procedures by other astronomers. These texts are al-Māhānī's treatise giving graphical solutions for five spherical astronomical problems without proofs and without application to an instrument. Ḥabash applied most of them to the construction of the melon astrolabe. The second is an anonymous text in ms. 2457 ff. 150r-v in which we find two procedures for finding the azimuth and the arc of daylight also found in al-Māhānī's text. The third one is a text by Abū Naṣr ibn ʿIraq on azimuths in the astrolabe.

The second appendix includes nine texts relevant to the history of this instrument, written by al-Fargānī, al-Sijzī, Ibn al-Nadīm, al-Bīrūnī (four of them), Ibn al-Ṣalāḥ and Ḥājjī Khalīfa. The scope of these texts is enormous because they include almost all that is said in Arabic literature on this kind of astrolabe. In these two appendices we find the edition and translation of these texts and also commentaries of most of them.

The third appendix is a commentary of a passage in Ḥabash's *zīj* on transformation of coordinates: from the sun's horizon coordinates, the text calculates the solar equatorial coordinates and the solar longitude. The example is worked out for Samarra (local latitude taken as 34;12°). The study is completed by a final list of technical terms in Ḥabash's text ordered by Arabic roots.

In the preface the authors ask the reader to forgive any inconsistencies possibly remaining due to the fact that this book has three different authors. I think that they have succeeded not only in harmonizing the style but also in making the characteristics of the melon astrolabe more understandable to the reader, and, therefore, that the final result is a highly commendable piece of work.

Emilia Calvo

Menso Folkerts and Richard Lorch (eds.), *Sic Itur ad Astra. Studien zur Geschichte der Mathematik und Naturwissenschaften. Festschrift für den Arabisten Paul Kunitzsch zum 70. Geburtstag.* Harrassowitz Verlag, Wiesbaden, 2000. XII + 598 pp.

This book is a well deserved tribute to Paul Kunitzsch to mark his seventieth birthday and its title (Virgil's *Aeneid*, IX, 641) could not be more appropriate, given

Kunitzsch's long, deep and fruitful interest in stars. The tribute starts with a short biography, followed by a complete list of publications. Kunitzsch's interests cover a wide range of subjects, and this variety is reflected in the 29 papers presented here.

Reflecting one of Paul Kunitzsch's interests, eleven articles describe the transmission of Greek scientific writings into Arabic and of Arabic writings into Latin and Romance languages, above all the transmission of numerical forms. Charles Burnett ["Latin Alphanumerical Notation, and Annotation in Italian, in the Twelfth Century: MS London, British Library, Harley 5402", 76-90] presents the use of Latin letters in their alphabetical order as numerals -following a Greek, Arabic and Hebrew tradition- in a group of works by a certain Stephen of Pisa and an ᶜAbd al-Masīḥ of Winchester. Some of these works were copied at the very beginning of the 12th century in Antioch. The paper points to the interest of one of these texts, a planetary table in MS British Library Harley 5402, for scholars of Italian philology, due to the fact that it contains a set of annotations written in a mixture of Latin and Italian. These annotations probably are one of the few examples extant of the language used by Jewish or Arabic scholars in Tuscany as a translation intermediate stage. Richard Lemay's paper ["Nouveautés fugaces dans des textes mathématiques du XIIe siècle. Un essai d'abjad latin avorté", 376-392] aims to show the adoption of the Arabic numerals and the Latin *abjad* representation of numbers in the *Astronomia*, a hitherto unknown work, by Hermann of Carinthia (MS Cambrai Bibliothèque Municipale 930). In Hermann's Latin *abjad* only 21 letters have values, due to the elimination of some letters whose similarities might have lead to confusion. When Hermann needs higher values he uses Indian-Arabic numerals, in the oriental form. The combined system did not prosper, maybe due to the fact that the similarity of some letters and numerals is the source of a variety of errors pointed out by the author. Lemay also offers a digression on the attribution of the *Liber Judicum* (MS Arundel 268) to Hermann, against C.S.F Burnett's attribution to Hugh of Sanctalla. Menso Folkerts's paper ["Frühe westliche Benennungen der indisch-arabischen Ziffern und ihr Vorkommen", 216-233] deals with the early western names of the first nine Indo-Arabic numerals and their origins. The author edits and comments on an anonymous ten hexameter verse from the 11th century and lists 13 manuscripts in which the verse can be found. Other short references are found in several lists of the nine names (6 manuscripts are detailed). Edgar Reich ["Ein Brief des Severus Sēḇōkt", 478-489] edits and translates a text by Severus Sēḇōkt, which gives evidence of the origins of Indian numerals in the Middle East. Danielle Jacquart ["De l'arabe au moyen français, en passant par le latin: *Le livre de Albubeth*", 285-303] presents two late 15th century translations into French of the *Kitāb al-Manṣūrī*, the medical compendium by al-Rāzī, derived from the Latin version of Gerard of Cremona, both incomplete but complementary. D. Jacquart adds a third translation, originated in 15th century southern France, kept in two manuscripts containing medical and astrological works in French or in Langue d'Oc. This translation contains only book II, which seems to have circulated in Latin independently of the rest of the treatise. The surgeon-barbers of

15th century France should be considered amongst the possible intended readership of these translations. Raymond Mercier's paper ["From *Tantra* to *Zīj*", 451-460] offers a philological digression on the origin and meaning of the Arabic term *zīj*. According to Mercier, the term would be the Persian equivalent of the Sanskrit *tantra*, with the double sense of something woven and something written. W. Hübner's paper ["Ἰχθῦς - *PISCIS*. Der singularische Gebrauch des Namens der zodiakalen Fische im Griechischen und Lateinischen", 266-284] deals with the chronological development of the use of the name corresponding to the zodiacal sign of Piscis in singular in Greek and Latin. In contrast to Arabic and other western traditions in which it always appears in the singular, in Latin and Greek the use of singular, dual and plural fluctuates. Hübner examines a wealth of textual material, from the astronomical, astrological, mythological, linguistic and chronological point of view, and from Ptolemy to the early Middle Age authors of France and the Iberian Peninsula. The author deduces that the use of the name in singular does not originate in the Arabic tradition but in the changing Greek mythology and specifically in the ambivalence of the Greek form Ἰχθῦς. Manfred Ullmann ["Die Milchstrasse in der Bildersprache der arabischen Dichter", 555-571] collects up to 109 textual metaphorical images related to the Milky Way, from the Arabs to the Middle Ages. The metaphors are grouped under images, with the corresponding transcription, author, and source. The collection, followed by an index of names and a list of the manuscripts used, is a real gold mine for readers interested in a variety of subjects. H.L.L. Busard ["Über zwei Algorismus-Schriften aus dem 13 Jahrhundert", 91-137] edits and comments on two texts on algorithms written in the first half of the 13th century: the *Demonstratio Jordani* and the *Opus numerorum*. The author compares the two treatises, in particular their terminological features, and concludes, against the previous thesis, that the *Demonstratio Jordani* may be an early work of Jordanus, previous to the *Opus numerorum*. Combining philology and astronomy with great erudition as always, John North ["Chaucer, Libra and the Crucifixion", 461-473] devotes his paper to the Christian Latin Cross, its origins and a specific aspect of its rich symbolism: the use of the balance as a symbol associated with the cross, which in turns leads to the association of the crucifixion and the zodiacal sign of Libra. The author presents the materials relating Libra with crucifixion found in Geoffrey Chaucer' *Parson's Tale* (*Canterbury Tales*), which he proves to be linked with Holbein's painting *The Ambassadors*. Finally, the most purely philological paper is Federico Corriente's ["Classical and Andalusi Arabic Features Reflected in Loanwords of Medieval Latin Translations of Scientific Works", 138-146]. The paper starts with a clear distinction between technical or scientific Arabic loanwords in European languages and those terms of Arabic origin used in everyday life, transmitted through written and oral channels respectively. Corriente's linguistic comments -numbered from 1 to 5- deal with *ʿirāb*-markers, *iḍāfa*-markers, first degree-*imāla*, disjunctive vowels and inner vocalisation. The conclusion reached is that translators or their helpers did not know Classical Arabic well, although there was no lack of first rate Muslim scholars.

Another group of eleven articles is devoted to astronomy and related sciences. Most of the articles deal with star lists. Benno van Dalen ["A Non-Ptolemaic Islamic Star Table in Chinese", 147-176] edits an Islamic Star Table in Chinese (277 stars covering a belt of around 9° on either side of the ecliptic). The stars are designated according to the system of the *Almagest*, inside or outside the Ptolemaic constellations, and their positions with respect to the traditional Chinese constellations are also given. Although in the note quoted on page 149 something is wrong, it is clearly stated that the applied precession is 4'/5 Arabic years. This precession, corresponding to 1° every 75 years, is close to Ibn Abī 'l-Shukr al-Maghribī's. Furthermore, according to van Dalen, the data in the note is recorded from an erroneous Hijra epoch. The question is: could this table have something to do with the Andalusī and Maghribī star tables calculated for the moment in which precession is 0°, corresponding to some 40 or 50 years, according to the authors, before the Hijra? The author also compares the table with other Islamic star tables from China. In particular with two tables in al-Sanjufīnī's *zīj* (Tibet) and with the star table found in a Chinese translation of Kūshyār ibn Labbān's *Introduction to Astrology*, carried out by the team that translated the *Huihui li*. Van Dalen concludes that both tables derive from the same original, dated probably around 1262-3. This date fits very well with Ibn Abī 'l-Shukr and Alphonse X, whose solar declination table -in my opinion related to that of al-Sanjufīnī- could have reached Tibet through Marāgha. Most of these papers deal with astrolabe star lists. David Pingree ["A Greek list of Astrolabe Stars", 474-477] offers a Greek list of astrolabe stars found in an astrological text. According to the author, the list (19 astrolabe stars of first and second magnitude) was computed for year 908 and was drawn up in all probability in Byzantium. The list was supposed to present Ptolemaic longitudes and latitudes with a constant value, of around 7;40°, added to longitudes, corresponding to Ptolemaic precession in 770 years. However this only occurs in a few cases; the rest of the longitudes show added values from 7;20° to 15;20° (twice 7;40°). Comparing this list with those compiled by Kunitzsch (*Typen von Sternverzeichnissen in astronomischen Handschriften des zehnten bis vierzehnten Jahrhunderts*. Wiesbaden, 1966), and leaving aside small differences and the copious errors in the longitudes, the author concludes that the list is close to *Typen* I, corresponding to Maslama al-Majrīṭī's star table for the astrolabe. Another point worth mentioning is the fact that the 14 star names in this list correspond to the stars found on the rete of the only surviving Byzantine astrolabe (1062) and the spelling is almost identical. Still more interesting is the fact that the list contains the error of giving β Cas the coordinates of α And, which is present in the Greek list as well as in *Typen* I and in Maslama's commentary to *Ptolemy's Planisphaerium*. This error, which appears in several star tables made by Andalusī and Maghribī authors since the 10th century (al-Qaṭṭān, Azarquiel, Ibn al-Kammād, Ibn al-Bannā' and al-Marrākushī, amongst others) is repeated in a number of further astrolabes, such as the one constructed in Baghdad by Aḥmad ibn Kamāl or, as we will see in other papers in this volume, in some European astrolabes. Julio Samsó's paper ["Maslama al-Majrīṭī

and the Star Table in the Treatise *De mensura astrolabii*", 506-522] is related to the above topic. Samsó supports Kunitzsch's theory about the relationship between the early Catalan-Latin text on the astrolabe and the treatises of Maslama's school on this instrument and presents new evidence derived from his study of the treatise *De mensura astrolabii*. However, in this study, he interprets that *latitudo* (α), which agrees in most cases with the *mediatio coeli*, is measured on the graduation of the circle of Capricorn instead of on the ecliptic. According to the author, the star table in this treatise - classified by Kunitzsch as *Typen* III- is related to *Typen* XI and depends on a hypothetical table from Maslama's school, compiled in Cordova after year 978, the date of compilation of *Typen* I. Both tables (*De mensura* and Maslama), carefully recalculated, appear appended at the end of the paper. E. Dekker ["A Close Look at two Astrolabes and their Star Tables", 177-215] poses the problem of interpreting the stellar data found on astrolabes and, after dismissing Stautz's graphical method, presents the author's own procedure for analysing this material, through the study of the stars in two astrolabes. The star lists on which the retes of these astrolabes are based are related to Kunitzsch's *Typen* XI and VI. To compare the longitudes of the stars with Ptolemy's and then derive the precession value used and the date of composition, the author converts mediation and declination into longitude and latitude. The procedure is not as simple as it appears. To begin with, the correspondence of the pointers with the correct position of the stars is often inaccurate. Secondly, the author's use of mean data does not seem to be reliable enough; examples of the possible errors that could be derived from its use can be seen if we try to use the procedure, for instance, in the list in D. Pingree's paper. Furthermore, we have to take into account the different values for precession as well as the possibility of using trepidation tables, because any one of these possibilities will lead to different solutions. It is interesting to find a confusion between β Peg (and indirectly α And) and β Cas in the astrolabe NMM AST 0570, which supports, in part, the author's hypothesis, also mentioned by Samsó, that *Typen* XI derive from Maslama's corpus of stars. David A. King ["The Star-Names on Three 14th-Century Astrolabes from Spain, France and Italy", 307-333] stresses once again the potential of the study of the surviving astronomical instruments as a historical source, in this case from a philological point of view. King records the star names of three 14th century astrolabes from different parts of medieval Europe: Christian Spain, Northern France (Picardy) and Italy. To these astrolabes, King adds a fourth dated in Urbino, 1462, and now lost. The two following papers are also related to astrolabes. G.L'E. Turner ["A Critique of the Use of the First Point of Aries in Dating Astrolabes", 548-554]. The author questions the use of the date of the Vernal Equinox for dating Medieval and Renaissance astronomic scientific instruments, especially astrolabes, although he does not propose a new procedure. According to Turner, the possibility of error is considerable. The problem is that the date depends on the type of calendar used (i.e. civil or astronomical), the instrument makers often use out-of-date texts, the accuracy achieved by the craftsman is debatable and they do not

always choose the actual data for their instruments. The author gives examples of the inaccuracy of the procedures used. In some cases, the dates given for certain instruments differ by almost 300 years. Richard Lorch ["Ibn al-Ṣalāḥ's Treatise on Projection: a Preliminary Survey", 401-408] offers a preliminary study of Ibn al-Ṣalāḥ's treatise *Tasṭīḥ basiṭ al-kura*. The treatise is divided into chapters I and II, comprising thirteen and seven propositions respectively, and the projection used is stereographic, in contrast with the melon-shaped projection he describes in *al-Asṭurlāb al-mubaṭṭakh*. One of the most interesting points is the relationship between one of Ibn al-Ṣalāḥ's propositions and a proposition found in Maslama's commentary to Ptolemy's *Planispherium*. Different explanations are possible, but the Andalusī connection deserves further investigation. Two more papers deal with clocks. Anne Tihon ["*Un texte byzantin sur une horologe persane*", (523-535)] edits, translates and comments on a short Byzantine text on a Persian candle clock. This clock is quite primitive, compared with the ones in the rich Arabic tradition. As it has neither automats nor sophisticated mechanisms it seems to be a common instrument, of the kind usual in Byzantium during the 14th and 15th centuries. A.J. Turner ["*The Anaphoric Clock in the Light of Recent Research*" (536-547) presents an account of the situation of the Latin anaphoric clocks following Vitruvius' tradition and the relationship between this instrument and the astrolabe. The author uses Nordon's and Soubiran's descriptions of the fragments of the dials of two anaphoric clocks, discovered in the last quarter of the 19th century in Grand (Vosges) and Salzburg, which attested to the diffusion of these instruments throughout the Roman Empire during the first centuries of our era. On a different subject, George Saliba ["The Ultimate Challenge to Greek Astronomy *Ḥall mā lā yanḥall* of Shams al-Dīn al-Khafrī" (d. 1550)", 490-505] examines the three known works of the 16th century Persian astronomer al-Khafrī. As he had already studied the first two -*Takmila* and *Muntahā*-, which he calls "supercommentaries", Saliba devotes this paper to the third one, *Ḥall mā lā yanḥall* ("Resolving that which cannot be resolved"). In this short text, al-Khafrī's main aim is to show how to solve the most difficult problems of Greek astronomy simply by following his application of the five astronomical principles common to all the planets. Finally, Miquel Forcada ["The *Kitāb al-Anwā'* of ᶜArīb b. Saᶜīd and the *Calendar of Cordova*", 234-251] aims to prove that the Kātib al-Andalusī, author of an *anwā'* book, is Abū l-Ḥasan ᶜArib b. Saᶜīd al-Kātib, one of the authors of the *Calendar of Cordova*. In the paper the author presents and discusses four reasons for his conclusion: the date of composition, the coincidence of long sections of both texts, the *shuhra* of both authors and the comparison of the two texts with the *Risāla fī l-anwā'* by Ibn al-Bannā'.

The rest of the book deals with Mathematics, Magic and Natural Philosophy. Sonia Brentjes ["Aḥmad al-Karābīsī's Commentary on Euclid's *Elements*", 31-75] focuses on the *Commentary on Euclid's "Elements"* by Aḥmad al-Karābīsī. The work tries to explain the principles of geometry to beginners. Al-Karābīsī devotes his attention to the theorems that raise doubts and to the ones for which new constructions have been proposed,

although he rarely mentions his sources. The paper is divided in two sections, dealing with the materials of Greek and Arabic origin, and ends with an Appendix, showing al-Karābīsī's direct quotations from the *Elements*, grouped by books and divided into: definitions, postulates and axioms. The author compares al-Karābīsī's commentary with other Arabic materials on the *Elements*, showing that this commentary deserves to be edited and translated, not only on account of the new elements it provides but also because of the information on the didactics of teaching geometry in the 10th century. Jan P. Hogendijk ["Al-Nayrīzī 's Own Proof of Euclid's Parallel Postulate", 252-265] edits and translates the Persian Abū 'l-ᶜAbbās al-Faḍl ibn Ḥātim al-Nayrīzī's *On the Proof of the Famous Postulate of Euclid*. He compares al-Nayrīzī's proof with the proof by al-Aghānis (5th c. Greece), presented by the same al-Nayrīzī in a Commentary he wrote to Euclid's *Elements*. The two proofs, based on the concept of equidistant lines, are different, though related. The author explains the above mentioned concept, presents the main differences, which are found in the final propositions, and proves the influence of al-Nayrīzī on other Islamic authors, mainly Thābit b. Qurra. E.S. Kennedy ["The Operation of Multiplication in a Sixteenth Century Persian Treatise", 304-306] describes a set of ten rules for multiplying numbers found in an anonymous Persian treatise, entitled *Qavā'id-i ḍarb wa qismat*, which appears appended to a manuscript copy of the *Irshād al-Zirāᶜa* (Instructions in Agriculture) by Qāsim b. Yūsuf Abū Naṣr from Herat (1515). The treatise belongs to a set of four appended to the *Irshād*, which contain rules for mensuration enabling different calculations, for instance to determine the areas of various shapes. The rules, presented in prose and verse as a mnemonic device, are based on the decimal system, no numeral symbols appear and a word for zero is never stated. The anonymous author uses a single digit (1-9) multiplied by a power of 10, including four kinds of numbers (ones, tens, hundreds and thousands). A translation of a section of the treatise is added to illustrate the explanation of the rules. Magic and Natural Philosophy are represented by four papers. Stefan Kirschner ["An Anonymous Medieval Commentary on Aristotle's *Meteorology* Stating the Supralunar Location of Comets", 334-361] presents an anonymous 14th century commentary on Aristotle's *Meteorology*. The interest of this commentary lies in the fact that, against the Aristotelian general view about the sublunar nature of the comets adopted by medieval scholars, a fragment here states that comets have a supralunar nature. The paper edits and studies Questions I.18 to I.21, the only four questions, of the 32 questions of book I, dealing with comets. The edition is followed by a full list of the Questions in Books I to IV. Again on Aristotle, E.I. Kouri and A.I. Lehtinen ["Disputed Questions on Aristotle's *De iuventute et senectute, De respiratione* and *De morte et vita* by Henricus de Alemannia", 362-375)] discuss a collection of Questions on Aristotle's *De iuventute, De respiratione* and *De morte*, by Magister Henricus de Alemannia (Paris University, 13th-14th c.). The authors uses the few known sources to reconstruct the life of Magister Henricus, comments on the transmission of his Latin Commentaries on Aristotle's aforementioned works and compares the texts with other contemp-

orary commentaries. Paolo Lucentini's paper ["L'ermetismo magico nel secolo XIII", 409-450] furnishes a comprehensive analysis of the magical hermetic tradition translated during the 12th and 13th centuries from Greek and Arabic into Latin. As an appendix, there follows the edition of two texts belonging to the hermetic corpus and quoted in the *Liber Introductorius* by Michael Scoto: the *De viginti quattuor horis* and the *Liber Imaginum Lunae*. Uta Lindgren ["Dämonen als Antriebskräfte in der Geographie: Frivole Thesen im *Colloquium Heptaplomers* (um 1600)", 393-400] and gives a comparative overview from Plato to the late Middle Ages of the "Colloquium of the Seven about Secrets of the Sublime" and reinterprets it as entertainment and escapist literature. The author uses the example of the demons' motive power as an explanation of meteorological phenomena to qualify the authors of around 1600 as "frivolous", because they try to break with the old scientific tradition and seek to establish a new one, based on non-scientific explanations and interpretations.

Beyond any doubt, this is an excellent book. It is highly recommended to any reader concerned with History of Science and Humanities, in general, due to the wide range of subjects treated and the interest of so many of the aspects it addresses.

Mercè Comes