equation of the centre of Venus and the lunar equation of anomaly.

The last paper of the collection was published in the entry *Ta'rīkh* (2000) of the second edition of the *Encyclopaedia of Islam* and deals with the chronological part of Islamic *zīj*es: calendars and eras (including the Jalālī and Chinese-Uighur calendar), computation of the number of days elapsed since epoch, date conversion from one particular calendar to another, how to determine the day of the week of the beginning of a year, a month, or any particular date, and tables for solving any of the three aforementioned problems. In general, it is a complete survey of questions of this kind which appear in the canons and tables one finds at the beginning of any *zīj* and which can now be easily solved by using van Dalen's calendar conversion programme (CALH).

To sum up, a most interesting collection of papers by the greatest authority today in the field of Islamic *zīj*es and a radical innovator of the methodology to analyse them. For people like me, who believe strongly in the interest of sources of this kind, this book, like the rest of van Dalen's publications, is an absolutely essential tool and, as I said before, I hope it will be complemented by other similar volumes.

Julio Samsó

SIDOLI, Nathan & VAN BRUMMELEN, Glen (eds.), *From Alexandria Through Baghdad. Surveys and Studies in the Ancient Greek and Medieval Islamic Mathematical Sciences in Honor of J. L. Berggren*, Springer-Verlag (Berlin-Heidelberg, 2014).

This volume is a collection of essays compiled in honor of the well-known historian of science Len Berggren, "a remarkable scholar, but above all, a wonderful human being", in Keith R. Benson's words in the initial appreciation, "as a tribute to his powerful scholarship and gentle leadership", quoting the editors, Nathan Sidoli and Glen Van Brummelen, in the preface. It is an ambitious endeavor because it is not limited, as most volumes in the category *Festschrift* are, to a collection of papers offered to a scholar in his or her homage. In this case the reader is also offered various very useful overviews of two broad research fields: ancient Greek and medieval Islamic mathematical sciences. The book has been structured in three parts, quite different in contents, extension, and scope: surveys, studies, and a history of π.

Part I consists of surveys in the two fields examined in this book. Three papers, covering successive periods, are devoted to each of these fields.

As for the history of Greek mathematics, the first paper is written by J. Lennart Berggren himself. It was originally published in 1984 and it surveys the research developed up to that time in a number of areas, such as methods in Greek mathematics, proportion and the theory of irrationals, Archimedes's works, and Greek mathematical methods (including Ptolemy's work, connection between Greek and Indian mathematics, papyri, and archaeological investtigation of scientific instruments). Ken Saito's paper dated 1998 focuses on the change that occurred towards 1970 in the historiography of Greek mathematics, primarily due to a shift in scholarly attitudes in the reading of ancient texts. Nathan Sidoli, one of the editors of the present volume, extends these surveys to 2012 and widens their scope by reviewing current trends in the historiography of the field regarding both methods (textual studies of medieval manuscripts, direct and indirect traditions, new editions and translations, interest in the material culture of science as well as in the social and institutional context, and new readings of familiar texts) and topics (numeracy, combinatorics, computation and algebra, analysis, Greek foundations of mathematics, and exact sciences). All three surveys are provided with their own list of references, which altogether add up to more than 300 references. If we consider that this number can be taken as an indicator of activity in the historiography of Greek mathematics, it gives support to Berggren's claim that this discipline is "alive and well", and more so in the last two decades.

In the case of the three surveys on the history of mathematics in the Islamic world, Berggren is the author of two articles originally published in 1985 and 1997, dealing with other disciplines such as optics, geography, and astronomy, in addition to the usual branches of mathematics. The author highlights the importance of the debates on the interpretation of relevant texts in the field, because "only on the basis of reliable edited texts can the history of Islamic mathematics move beyond what has often been random development dependent on chance discoveries" (p. 66). Glen Van Brummelen, the other editor of this volume, enlarges the surveys to 2011, [and continues to update them at https://pub.questu.ca/~gvb/ islamsci.html], indicating the new topics that are inserted and explaining the self-imposed restrictions. Van Brummelen's paper examines the impact of Greek and Indian material on Islamic sciences as well as the different attitudes in different regions towards topics such as geometry and disciplines allied with it (architecture, mensuration, optics, etc.), methods in astronomy and geography (trigonometry, astronomical tables, instruments, etc.), arithmetic (numeration systems, numbers in practice, recreational mathematics, etc.), algebra (language, equation solving, number theory, etc.). The number of reerences provided in the three sureys in this field exceeds 630 and, as was the case with the history of Greek mathematics, the number corresponding to the last two deades goes well beyond that for the whole previous period — probably a sign of the vitality of the field of Islamic mathematical sciences.

Part II is the most extensive section of the book with almost 300 pages. It is composed of 17 studies authored by some of the most distinguished scholars in the field of Hellenistic and Arabic mathematics and astronomy, on topics currently under research.

In the first paper, James Evans and Christián Carlos Carman examine the relation of astronomy to mechanics in the ancient Greek world. More specifically they explore a new approach to Greek planetary theory, as expressed by epicycles and eccentrics, taking into account gearwork mechanisms, such as that found in Antikythera, and suggest the possibility of mutual interaction between both activities.

Alexander Jones discusses three unusual sundial mechanisms (meridian scales), associated with Miletos, Alexandria, and Histria (Romania).

Christian Marinus Taisbak proposes a reconstruction of the heuristics that led to the proof by Archimedes of Heron’s formula for determining the area of a triangle.

The paper by Ken Saito and Pier Daniele Napolitano addresses the determination of the volume of solids by means of a virtual balance in Archimedes’s *Method*, and concentrates on two novel solids, the hoof and the vault (the intersection at right angles of two equal cylinders), for which the proof given by Archimedes is lost.

Robert Thomas’s article considers the geometrical constructions presented in the *Spherics* of Theodosius, by introducing the notion of ideal agents, able to perform actions stated in mathematical texts that are not feasible for human agents.

İhsan Fazlıoğlu and F. Jamil Ragep offer an updated survey of Archimedean material produced and disseminated during the Ottoman period, mostly in Istanbul, together with an edition of a manuscript by Taqī al-Dīn al-Rāṣid (16th century) on specific gravity.

As indicated in Richard Lorch’s contribution, Theodosius’ *Sphaeri-*

ca was translated at least twice into Arabic: one served as the basis of the translation into Latin by Gerard of Cremona, and the other, he suggests, as the basis of the translation into Hebrew by Moses b. Tibbon.

Jan P. Hogendijk's paper deals with two propositions that Borelli and Echellensis added in 1661 to their translation into Latin of the Arabic *Book of Assumptions*, attributed to Archimedes, but not found in Greek. It turns out that one proposition is an adaptation of an Arabic text by Abū Sahl al-Kūhī (10th century). The Latin text and an English translation of the two propositions are also provided.

Ahmed Djebbar presents a wide survey of the research carried out up to 2011 on mathematics in Western Arabic countries during the period from the 9th to the 18th century. The survey covers topics such as algebra, computing science, number theory, geometry, combinatory analysis, astronomy and astrology, computation regarding transactions and legacies, and dissemination of Arabic astronomy from West to East. An abundant literature of more than 120 items is also given.

Julio Samsó's paper is a detailed annotated description of a newly discovered *zīj* by the Tunisian astronomer Ibn al-Raqqām (d. 1315, Granada), *al-Zīj al-Mustawfī.* This *zīj*, as well as his two previously known *zīj*es, is based on that of Ibn Isḥāq (fl. Tunis and Marrākush, ca. 1293–1322). The *Mustawfī zīj* consists of canons and tables computed for Tunis, displays several innovative features, and provides more evidence of the influence in the Maghrib of the Andalusian astronomical tradition, represented by Ibn al-Zarqālluh (d. 1100), such as the use of sidereal rather than tropical coordinates.

In his contribution David A. King describes an intriguing Ottoman astrolabe made in Istanbul around 1700, containing seven plates from an Andalusian astrolabe of the 11th century (!), one of which is for the latitude 16;30º south (!!) of the equator.

The next two papers deal with the Egyptian algebrist Abū Kāmil Šujā^{c} ibn Aslam (d. ca. 930). The one by Adel Andouba, originally published in 1963 and updated here by Jacques Sesiano, gathers the little information known about his life and reviews his works. The other paper is authored by Sesiano and focuses on Abū Kāmil's *Book on Mensuration,* giving a summary of the contents together with a transcription of the original text and an English translation.

The paper by Tzvi Langermann concerns two Hebrew texts on the five regular polyhedra (the five Platonic solids). One is a translation made by Qalonymos ben Qalonymos in the early 14th century of an Arabic text, possibly by al-Kindī, as suggested by Langermann, and the other is a chapter of a geometrical encyclopedia of unknown authorship in a manuscript now in Mantua. The author offers an edition and an English translation of the first text and of selected passages in the second.

For his part Takanori Kusuba examines the treatment given by al-Birūnī (973–1048) of the rule of three and its variations in his *Maqāla fī rāshīkāt al-Hind*, a mixture of Indian and Greek mathematics.

In her superbly illustrated paper, Sonja Brentjes surveys several manuscripts produced at the Safavid court and its environment, and highlights the need to find new approaches in the study of sciences in seventeenth-century Iran under the rule of Shāh ʿAbbās I and Shāh ʿAbbās II. Of particular interest are the illustrated copies of Persian versions of Ṣūfī's *Star Catalogue*, representing the constellations. It is noteworthy that in one of the manuscripts, some images represent the view from inside the globe, whereas others are from outside; however, no list of the stellar coordinates is displayed.

The last paper in this section is authored by Gregg de Young. It describes the Arabic translation of John Playfair's *Elements of Geometry* (Edinburgh, 1795) by Cornelius Van Dyck (d. 1895), an American medical missionary in the Ottoman province of Syria.

Part III consists of a single paper by Jonathan M. Borwein. It is a large chronological account of the computation of the number π from about the time of Archimedes to the present. In this 30-page article we are given many different approximations of π (from the value of $3^1/_8$ (= 3.125) used by Babylonian mathematicians at about 4,000 years ago, and the lower and upper bounds of 223/71 and 22/7, respectively, estimated by Archimedes), as well as a great variety of formulas established by many of the greatest mathematicians to our time. Among the copious information provided is the fact that the notation for π was introduced by William Jones in 1737, and that the number of decimal digits computed for π has already reached 10 trillion (October 2010). The author emphasizes the progress made in reducing the complexity of the algorithms in place to compute π, the use of increasingly powerful computing tools, and the problems and perspectives in experimental mathematics in this context.

The volume ends with two large indexes covering altogether 20 double-column pages, one for personal names and another for ancient and medieval titles, which are complemented by a subject index concerning the surveys in Part I.

The extent and variety of subjects treated in this volume in honor of J. L. Berggren testifies of the extraordinary scholarly gifts of the group of friends he has gathered around him. These include the editors, Sidoli and Van Brummelen, who have done a remarkable good job and deserve recognition for it, among other things because managing a volume of almost 600 pages by so many authors and with texts in so many different languages (Arabic, English, French, Greek, and Hebrew) is not an easy task.

In short, this volume offers a broad overview of history of the mathematical sciences in the Greek and the Islamic worlds, together with numerous examples of topics currently been studied. It is not only an excellent volume, but also a useful and pedagogical one, for it has been conceived as a tool to contribute to the development of the discipline. Students about to begin research in the history of mathematics will certainly find in this book a full assortment of paths to follow, while established scholars will see many hints for future research.

José Chabás