Centaurus, 2006, 48.4: 319–322. Donald B. Wagner

thesis, the Demotic texts introduce relatively few innovations, all of which are noted.

No table of non-trivial parallels between Demotic and Babylonian mathematical texts is included. The adoption of 5/6 as a basic fraction and the use of Babylonian methods to compute the area of a circle ought to have been mentioned by Parker. Other connections such as the methods of finding the area of triangles and squares inscribed in circles or the volume of a pyramid with a square base depend on more recently discovered Babylonian texts. One recurring connection—the use of 'hidden' sexagesimal fractions—deserves particular comment.

With the postulation of 'hidden' sexagesimal fraction, Friberg advances an interesting and probably correct proposition, but the evidence presented is not the best. Furthermore, Friberg limited himself in his approach to the question. This chapter reads much like a commentary to Parker's *Demotic Mathematical Papyri*, and the first instance of 'hidden' sexagesimal fractions may also be explained as manipulation of improper fractions (p. 114). Friberg notes this possibility but later also postulates the use of 'hidden' common fractions (p. 152). Such an argument is not erroneous, but it teeters on circularity. Perhaps the structure of Parker's *Demotic Mathematical Papyri* ought to have been abandoned in favor of a stronger argument for 'hidden' sexagesimal fractions, beginning with P. BM 10794. Moreover, some documentary texts could be presented in support of this claim.

Several significant improvements are made to specific Demotic texts. First, the interpretation DMP #41 surpasses previous attempts. A plausible reinterpretation is advanced for DMP #72—73. Finally, a significant modification is proposed P. Cairo J. E. 89127—30, 89137—43, *verso*, resulting in two new mathematical examples. This important reconstruction remains somewhat unclear: in part because of Parker's treatment and in part because the details of the reconstruction are outside the focus of Babylonian parallels.

The chapter on Greek-Egyptian and Babylonian mathematics challenges logical consistency. The proposition that 'there is no discernible difference between the form and content of demotic and (non-Euclidean) Greek-Egyptian mathematical papyri' is presented (p. 268). However, because the Greek-Egyptian mathematical papyri that differ from the Demotic material are defined as non-Euclidean, the conclusion is true by tautology. Moreover, if the Demotic texts are accepted as having Babylonian parallels, the non-Euclidean Greek-Egyptian texts need share similarities with only the Demotic texts to establish a Babylonian link. Despite these concerns, the Greek-Egyptian texts do benefit from analysis with Babylonian predecessors.

Micah Ross

Karine Chemla and Guo Shuchun, *Les neuf chapitres: Le Classique mathématique de la Chine ancienne et ses commentaires. Édition critique bilingue traduite, présentée et annotée* (Paris: Dunod, 2004). 1140 pp. €80. pb. ISBN 2 10 049589 5.

Jiu zhang suanshu, which I translate, 'Arithmetic in nine chapters', a Chinese book of the Han period (206 BC to AD 220), is 'the world's earliest extant comprehensive arithmetical textbook'.[1] It has been a central text throughout the history of mathematics in China; not only does it present some remarkably sophisticated calculating techniques, but the many commentaries it has attracted through the centuries have developed the techniques and given explanations which often amount to proofs of mathematical propositions. The book under review, by the two most erudite scholars of the *Jiu zhang suanshu* and its commentaries, is a *tour de force* which will forever change Western approaches to it and to Chinese mathematics.

The core of the book is a complete translation of the *Jiu zhang suanshu* and its two earliest commentaries, with the original Chinese text on facing pages. Guo Shuchun is the leading authority on the textual history of the *Jiu zhang suanshu*, and this is now undoubtedly the best available critical edition of the Chinese text. The translation is the first in a Western language to include the whole text plus the commentaries by Liu Hui (third-century AD) and Li Chunfeng (AD 602–670), and to take into account all of the later commentaries. This inclusiveness has cost the authors decades of labour, and the printer much technical difficulty, and will no doubt cause readers some frustration, but it has meant important new insights for the interpretation of the text and its mathematics.

The translation is in Part 2 of three parts. In the first chapter of Part 1, called Chapter A (pp. 3–42), Karine Chemla gives a clear and concise overview of the mathematics of the *Jiu zhang suanshu* and its commentaries, and ends with a short note suggesting approaches to their place in the world history of mathematics (pp. 40–42). This chapter will prove to be of great use, also for readers who read no further.

Chapters B and C, written by Guo Shuchun and translated by Karine Chemla, concern respectively the history of the text and the problems involved in editing it (pp. 43–70, 71–97). They will primarily be of interest to Sinologists. The treatment in Chapter B of the earliest history of the text, and of Liu Hui's biography, seems to me extremely speculative—almost nothing is known of either subject, but on the basis of this 'almost nothing' Guo Shuchun produces a very detailed story.

One textual problem, which very curiously is not taken up in Chapter B or C concerns the role of Li Chunfeng in the transmission of the text. All extant versions of the *Jiu zhang suanshu* and Liu Hui's commentary are based ultimately on Li Chunfeng's edition. Liu Hui was a very important original thinker and mathematician (in my opinion the most interesting premodern figure in the history of mathematics in China), while Li Chunfeng was a mediocre mathematician who often misunderstood Liu Hui (see e.g. pp. 60, 137–138). This evaluation of Li Chunfeng seems to be broadly accepted by historians. Now at the very beginning of the text, in Li Chunfeng's first comment, he makes a statement which seems to say that in this edition he has *corrected* and *abridged* Liu Hui's commentary. I have often wondered whether I understand the statement correctly, for any 'correction' or 'abridgement' by Li Chunfeng of Liu Hui's text could only damage it, and would have been a violation of scholarly norms which were already current in Li Chunfeng's time. Guo and Chemla understand the statement as I do, and translate: 'Le commentaire présent conserve ce qui est bon et supprime les erreurs, effectue quelque peu une sélection critique, qu'il donne en présent aux érudits des générations ultérieures' (p. 153; see also pp. 137, 959). But they nowhere discuss the implications of this remarkable statement; nor, as far as I know, does any other historian.[2]

Chapter D, by Karine Chemla, concerns the language of the text and the problems it presents to the translator (pp. 99–119). This is a difficult technical account, but it is essential reading, for the translation uses conventions which set it apart from ordinary French, and it is here that these conventions are explained (more on this further below).

Part 3 contains a glossary of the technical terms used in the Chinese text (pp. 879–1035). This will be enormously useful for everyone who works with Chinese mathematical texts (of any period), but it is also an essential adjunct to the translation, for many necessary explanations are found only here.

Part 2 gives, for Liu Hui's preface and each of the nine chapters of the *Jiu zhang suanshu*, a presentation, typically 10–20 pages, of the chapter's mathematical content, followed by the Chinese text and translation. The translations are supported by a total of 1385 endnotes, which discuss all of the large and small questions mathematical and philological, which arise in the interpretation of the text. The endnotes occupy 148 large pages of small print, and are often very long and detailed. A few are so long, and so important, that they could easily have been published as journal articles.

The presentations of the individual chapters make good reading. They provide an excellent general view of the mathematics of this text and its commentaries, at a level of detail which seems well chosen, giving neither too much nor too little. Many readers will find that the presentations, together with Chapter A, tell them everything they need to know about Chinese mathematics up to about the seventh century AD.

Here and there I find reason to disagree with particular points in the translation, but not in matters which seriously affect the mathematical content of the text.[3] Partial translations, and studies of particular passages, have been published by various authors (including myself), and these are included in the bibliography, but Chemla and Guo do not in general comment on differences in interpretation (see p. 124). This is a kindness, for so many new insights have emerged from their study of the entire text and all of its commentaries that most earlier work comes to seem naive.

A remarkable example is the reconstruction of a lost diagram which accompanies Liu Hui's proof of the Pythagorean Theorem (pp. 673–684). A careful study of all of Liu Hui's uses of diagrams, and of other uses of diagrams in his time, leads to what seems to be a well-founded reconstruction. It appears to make other reconstructions, including mine,[4] obsolete.

One exception to the translators' silence concerning earlier translations is on page 398: 'certains historiens contemporains' have a different interpretation of one stage in Liu Hui's derivation of the volume of a particular type of pyramid. This is in fact a reference to an article of mine, and I have to say that I still prefer my own interpretation.[5]

Reading the translation, on the other hand, is hard work, for a variety of reasons, some of which are clearly unavoidable. Translations from Classical Chinese, if they can make any claim to scholarly precision, are rarely easy to read, and the necessity of dealing with sophisticated mathematics in an exotic premodern mode of presentation greatly increases the troubles of the translators and their reader.

It is clearly the ambition of the translators to carry over as many aspects of the original as possible to the translation, and their efforts toward this end lead to increased difficulties for the reader. One finds for example the curious term 'cône à base carrée' (e.g. p. 427); this sent me flying to the dictionary to see whether French *cône* has a wider usage than English *cone*, but no. Here the translators stretch the French language in order to reflect the fact that the Chinese word *zhui* (whose ordinary meaning is 'awl') is used in mathematical texts to mean both 'cone' and 'pyramid'. The reader can look up *cône* in the 'Table d'équivalences' (pp. 1037–1042) and find that it is used for *zhui*, then look this word up in the glossary and find an explanation (p. 1034; see also p. 103). Similarly we find 'cylindre à base carrée', which turns out to mean a parallelepiped with square section (pp. 421, 816, 900). These translations were chosen in order to reflect a symmetry in the text's terminology, but many other symmetries are, thankfully, not reflected. For example, *li fang* and *li yuan*, 'standing square' and 'standing circle', are not translated literally, but are translated 'cube' and 'sphère', which is what the words actually mean.

The Chinese word *ji* (whose ordinary meaning is 'to accumulate, an accumulation') is used in mathematical texts to mean 'area', 'volume', and 'product' (see pp. 932–933). A translator whose primary concern is the mathematical content would translate with one of these words according to the context, but Chemla and Guo wish equally to reflect the form and language of the text. When *ji* means 'product', they translate it as 'nombre-produit' rather than 'produit'; in some of the contexts in which it means 'area' or 'volume' (e.g. pp. 307, 411), it is translated as such, but in others, 'nombre-produit' is used (e.g. p. 369).

These difficulties are a necessary consequence of the task which Chemla and Guo have set themselves, but there are many matters in which they could have done more to ease the task of the reader, who must constantly have several fingers holding places in the book. For example, in the translation of Problem 9.13 of the *Jiu zhang suanshu*, on page 723, the reader finds an immediate need to see a diagram explaining how the French text is to be understood. One goes therefore to endnote 59, which is on page 887. This note refers to figure 9.6.1, but where is that? No clue is given there, but it turns out to be on page 668, in the presentation of Chapter 9.

Part 1 of this book, together with the 'presentations' in Part 2, will be of great value to all historians who wish to know more about early Chinese mathematics. The rest of Part 2, the translation proper, together with the glossary in Part 3, gives us for the first time a complete interpretation of the relevant texts, and it is also the most sound translation available. This is a gigantic contribution to the history of Chinese mathematics, and it will be used as an aid to reading the texts by generations of students and scholars. But because of the extraordinary degree of patience which reading it requires, I predict that outside the narrow group of serious—and sinophone—scholars of the subject, only a few very determined readers will get very far with the translation. That seems a shame, for it leaves most readers with only some very second-rate translations of these important texts.

Donald B. Wagner

NOTES

1. Christopher Cullen, in his very useful brief discussion of the *Jiu zhang suanshu* in Michael Loewe (ed.), *Early Chinese Texts: A Bibliographical Guide* (Berkeley: Institute of East Asian Studies, 1993), pp. 16–23.
2. In a communication to me, Karine Chemla points out that Li Chunfeng twice (in remarks translated on p. 225 and p. 369) indicates errors by Liu Hui which he has let stand. But the issue is not taken up in the book.
3. One example is a curious translation of the phrase *yi suo de* in the algorithms for extracting square and cube roots (pp. 363, 373). I believe the phrase clearly means 'propose a result', i.e. guess the next digit of the root (cf. pp. 991, 1024). Chemla and Guo translate, 'Une fois le quotient obtenu . . .', which seems grammatically indefensible. But this disagreement does not affect the overall interpretation of the passage.
4. *Historia Mathematica*, 1985, 12: 71–73.
5. *Historia Mathematica*, 1979, 6: 164–188. I think the objection to my interpretation stated here is adequately answered by my remark on page 180, and that my interpretation better fits Liu Hui's text. This difference in interpretation is in no way fundamental to an understanding of Liu Hui's mathematics; I am merely annoyed that all writers on Liu Hui's treatment of volumes call my interpretation an *error* rather than an *alternative*.

Sabine Rommevaux, *Clavius. Une clé pour Euclide au XVIe siècle* (Paris: Vrin, 2005). 312 pp. €30. pb. ISBN 2-27116-1787-4.

This book is based on the author's 1994 doctoral dissertation. The book is in two parts. In the first part, the author discusses the significance of the commentary on Euclid's *Elements* by Christoph Clavius (1538–1612). In the second, a French translation is furnished of Clavius' version of the definitions from book five of the *Elements*. The book is completed by four appendixes, a bibliography, an *index nominum*, and an *index rerum*.

The first part comprises five chapters and a Conclusion section. The first chapter is a general introduction on Clavius and mathematics in the 16th century. The second is a presentation of Clavius' commentary. The third focuses on the notion of 'denomination' of a numerical ratio and its medieval ascendancy. The fourth is devoted to Clavius' justification of Euclid's definition of proportionality of magnitudes based on the use of equimultiples of magnitudes. The fifth is given over to Clavius' treatment of arithmetic, geometric, and harmonic proportionalities.

This fine book will be appreciated by scholars interested in the history and philosophy of mathematics, and more generally science, in the 16th and early 17th centuries. First of all, the importance of Clavius for the development of early modern mathematics, and mathematical natural philosophy, is beginning to emerge, thanks to a number of studies, which have brought to light the numerous connections between Clavius and other early modern towering figures, such as Descartes and Galileo. This book contributes to this recent trend while emphasizing, most correctly, in my view, the relevance for the early modern period of Clavius' discussion of the Euclidean theory of proportions. In addition, the author argues that Clavius' pedagogical motivations explain the gradual growth of the original material incorporated by Clavius in the commentary, which went through numerous editions.

This study of Clavius' commentary by Rommevaux indicates that Clavius belongs squarely in the centuries-old tradition of Arabic and Latin commentators who contributed to the formation of our present day image of Euclid. In effect, I think that though obviously based on the 'original' Greek text established by Heiberg long ago, our current understanding of Euclid's *Elements* also owes much to the process of translating, commenting, and editing the text of the