Apart from these matters, this looks like a good book with a novel viewpoint that many mathematicians will want on their bookshelf, and it should certainly be in every mathematics library.

T. BAILEY

SHEN KANGSHEN, CROSSLEY, J. N. AND LUN, A. W.-C. *The nine chapters on the mathematical art: companion and commentary* (Oxford University Press and Science Press, Beijing, 1999), xiv+596 pp., 0 19 853936 3 (OUP) and 7 03 006101 2/0.947 (Science Press), £110.

The *Nine chapters* is a classic of Chinese mathematics. It was written no later than 100 BC but is derived from earlier works going back to the eleventh century BC In the third century AD an important commentary on the work was provided by Liu Hui, who is described as 'the earliest notable Chinese mathematician' and who also wrote the text *Sea Island Mathematical Manual*. Several other commentators extended Liu's work, notably Li Chunfeng in the seventh century AD. The present work contains a translation of all this material along with extensive introductions and notes dealing with mathematical, historical and pedagogical matters.

Chapter 0 (Introduction) contains a wide-ranging survey of ancient mathematics both in the east and in the west and deals in particular with the scholarship and research devoted to the *Nine chapters*. Then we have Liu's Preface to his commentary, followed by the nine chapters themselves: field measurement; millet and rice; distribution by proportion; short width; construction consultations; fair levies; excess and deficit; rectangular arrays; right-angled triangles. These are followed by the *Sea Island Mathematical Manual*, which we are told 'is a unique work on mathematical surveying unmatched anywhere by any other similar work of the period.' There is an extensive list of references and the Index seems to be quite comprehensive.

Each of the nine chapters as well as the manual is made up of a series of problems with answers, plus in some cases a statement of the method, and descriptions of general rules; the approach is essentially algorithmic. In the present work the authors introduce each of these chapters and the manual with a summary and a discussion of the nature of the problems along with a comparison of what was being done in China and other parts of the world. A typical problem presentation consists of (i) statement of the problem, its answer and its method, (ii) Liu's comments, (iii) comments from Li and others, (iv) extensive notes from the authors. Different fonts are used for these four parts; this of course serves to highlight individual items, but it often gives the page a bizarre appearance. The notes contain many tables and diagrams which are often lengthy; I think it is regrettable that the authors have chosen to insert them in many instances mid-sentence, causing unnecessary disruption to the flow of the text.

We are told of the painstaking way the authors went about their work, carefully discussing individual words and phrases in an attempt to find exactly the right English words to express the ancient ideas. Although I am unable to read the original, I have no doubt that they have succeeded in producing an admirable translation—it certainly reads well. The notes provided by the authors are helpful, even if one is not always convinced by their conclusions or assertions. I noticed quite a few typographical or editing errors; the corrections are obvious in most cases, but a few might be troublesome: on p. 26 the sentence beginning 'In Table 0.6 ... ' has been corrupted; I do not follow the logical structure of the paragraph beginning 'The modern definition ... ' on p. 85; at the foot of p. 105 the notation ΔAD is suspect (two places); at the top of p. 109 a command has been wrongly entered, so that $1\{frac12$ appears in place of $1\frac{1}{2}$; there are two tables labelled 10.3 (pp. 551, 559). I believe that the authors have produced a book which is both interesting and fascinating and I am sure that it will be of great value to scholars with an interest in Chinese mathematics and more generally to students of ancient mathematics. The casual reader may find the style of presentation a little off-putting.

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The book will also be welcomed by revisionists. This brings me to a perceived aspect of this otherwise quite impressive work that I did not like: I have the distinct impression that the underlying theme pursued by the authors is that the Chinese generally did it first and where this is not the case they still did it better. Certainly credit should go where it is due and if research shows that results have been wrongly attributed we must be prepared to revise our views on the historical development of our subject. However, I think that revisionists must present their claims with a degree of caution, otherwise they are in danger of finding themselves guilty of those very offences of which they accuse others. For example, I wonder if the authors can really justify absolute statements such as the following: 'In doing this Jia Xian was the first author to record the triangle of binomial coefficients ... ' (p. 178); 'However, no other advance in solving linear equations can be found in the work of the Indians from Aryabhata, Bramagupta and Mahavira up to Bhaskara' (p. 387). Inevitably, the Greeks come in for some adverse criticism. I find several of the attempts to appropriate some of their credit rather petty; on a number of occasions we are presented with a proof by a Chinese mathematician writing several centuries later and are told of the elegance, simplicity, clarity or superiority of the Chinese proof as compared to the Greek version (see, for example, pp. 195, 234, 240, 277, 419, 464, 470). So what?

Here is a list of some of the topics which the authors appear to claim as Chinese discoveries or as ideas to which the Chinese made superior contributions: the Euclidean algorithm (p. 3); the rules of arithmetic (including the use of negative numbers) (pp. 36, 388); the rule of three (p. 136); the rules of proportion (including compound ratios) (p. 173); the method of exhaustion (p. 103); Romberg extrapolation (p. 117); the numerical solution of polynomial equations (p. 176); Pascal's triangle (pp. 178, 226); Horner's method (p. 184); Cavalieri's principle (pp. 234, 240); Legendre's formula for the volume of a pentahedron (pp. 254, 287); limits (p. 277); the rule of double false position (p. 354); Gaussian elimination (p. 388); Pythagoras's theorem (pp. 439, 458). These claims certainly have to be given serious consideration.

I. TWEDDLE

Swaters, G. E. *Introduction to Hamiltonian fluid dynamics and stability theory* (Monographs and Surveys in Pure and Applied Mathematics, Chapman & Hall/CRC, 2000), 274 pp., 1 584 88023 6, £54.95.

Classical mechanics can be firmly grounded on a Hamiltonian and/or Lagrangian formulation. While both approaches are essentially equivalent, Hamiltonian dynamics and the notion of symplecticness have perhaps become the prevalent foundation of mechanics. The extension of the Hamiltonian approach to infinite-dimensional systems, such as wave and fluid dynamics, has become an active area of research over the last twenty to thirty years. Even today the question of which formulation, Hamiltonian or Lagrangian, is to be preferred is largely open. However, it is without doubt that Hamiltonian dynamics has had an important impact on ideal fluid and wave dynamics. This is in particular true for geophysical fluid dynamics, as can be seen from the work of Holm, McIntyre, Morrison, Salmon, Shepherd and others.

The book under review summarizes some of the recent work on Hamiltonian fluid dynamics. In particular, it provides a rather non-technical and entertaining introduction to the Hamiltonian formulation of ideal two-dimensional fluids and stability results for steady flows and travelling waves.

Let me highlight a few of the topics covered in the book. Chapter 2 gives a very compact introduction to the basic concepts in Hamiltonian classical mechanics. The material is self-contained and is kept to the basics. Chapter 3 is concerned with the Hamiltonian structure of two-dimensional ideal incompressible fluids. In a first step the non-canonical Hamiltonian structure of the vorticity formulation is stated and the various properties of the associated Euler–Poisson

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