Strong Gravitational Lensing in the Era of Big Data, IAU Symposium 381, edited by Hannah Stacey, Alessandro Sonnenfeld & Claudio Grillo (Cambridge University Press), 2024. Pp. 183, 25·5 × 18 cm. Price £120/$155 (hardbound; ISBN 978 1 009 39899 2).

Many of my own papers are on strong gravitational lensing and I considered attending the conference, so it seems appropriate for me to review the proceedings, in part to update myself on the field, which has already benefitted, and will continue to benefit, from recent and planned improvements in observations, hence the 'big data' in the title. The first strong-lensing system (defined as a gravitational-lens system which produces multiple images of the source, as opposed to weak lensing which is limited to magnification and, for resolved sources, distortion) was discovered about 45 years ago[1]. I was involved in a radio survey for strong lensing[2], which, discovering 22 lens systems (including one previously known), approximately doubled the number of known strongly lensed quasars.* As noted in the first contribution in these proceedings, it is expected that instruments such as *Euclid* and the *Roman Space Telescope* will discover about 100 000 such systems. Not only is that a quantitative change, but a qualitative one as well: no one person can have even a passing familiarity with all systems, and 'manual' modelling will have to give way to automated procedures.†

The book consists of five 'chapters' (really parts, if an article is a chapter). Those have no names but roughly correspond to the main topics mentioned in the preface: cosmology, dark matter, galaxies, clusters of galaxies, and high-redshift sources. More-specific topics are machine learning, measuring the Hubble constant, and substructure in galaxies. The book is far too short to give even an overview of the field‡, but does provide a useful short introduction to several currently hot topics. In some areas, applications of gravitational lensing, such as measuring the Hubble constant or small-scale structure in galaxies, are comparable to or better than other methods. For a while now, the theoretical side of lensing has been clear; the next several years will concentrate on the massive amounts of observational data; in that sense, the field now reminds me of that of the cosmic microwave background between *COBE* and *WMAP*, with interesting hints about what is to come, but a while before practical observational limits are reached. It appears that the community is ready.

My goal of getting a feel for current research was fulfilled, though I wonder what I am missing, since, comparing the book with the on-line programme, fewer than half of the contributions are included in the proceedings. (Most of

*At the end of 1998, Wambsganss[3] mentioned that by then "about two dozen multiply-imaged quasar systems [had] been found, plus another ten good candidates". Somewhat more than twenty years later, Hamed & Weisner[4], in an attempt to catalogue all known strong-lens systems, listed 1832.

†Another change is that most people now working in the field are younger than I am (I also know only about half a dozen of the hundred or so participants and recognize perhaps that many names in addition). That is not a problem in itself, but I wonder why there is so little knowledge of the history of the field. Several times at conferences, when meeting someone new who works on gravitational lensing, I've mentioned that I had been a student of Sjur Refsdal, only to be astounded by the fact that the other person had never even heard of him. That's almost as bad as working on the Hubble constant and not having heard of Hubble, especially since Refsdal essentially single-handedly founded the modern study of gravitational lensing, in a series of papers about sixty years ago (while also finding time to co-author what I consider to be the most interesting paper in relativistic cosmology[5].)

‡The proceedings of the 1993(!) gravitational-lens conference ran to 747 pages[6].

those in the proceedings refer to refereed-journal papers, so assuming that that is also true of those not included as well, the information is out there, but not all in one place.) Unfortunately, instead of 'edited', 'collated' might be more appropriate, as apparently little actual editing was involved. Apart from my usual peeves about language and style, the number here probably setting a new record, there are several other annoying aspects: the list of participants is not in alphabetical (nor, as far as I can tell, any other) order; the author index (there is no subject index) lists some people twice, according to the number of initials; the reference format is not uniform; while it is sometimes good to list the titles of papers and even all authors, that is not the case for such a proceedings volume — some of the reference lists which do (the formats differ) are thus longer than the corresponding contributions; many figure captions refer to colour, though in the book itself all of the many figures are in black and white — unless one is already familiar with the topic, it is hard to guess which colour should correspond to which of the fifty shades of grey*; hyperlinks (not showing the actual URL nor any corresponding information) are useless on paper.

One can question the value of publishing books of conference proceedings in this day and age, especially if most contributions are essentially condensed versions of refereed-journal papers which will have already appeared before publication of the book (see also my correspondence piece in this issue[7]). (Although, with many journals now on-line-only, books of proceedings might be an alternative to printing a large number of pages for those who prefer reading on paper.) However, for contemporary readers, they can offer up-to-date reviews of rapidly developing fields (many traditional review articles are somewhat out of date by the time they appear), and questions and answers could prove useful for future historians of science, but neither of those is realized here.

Despite my qualms, for me it was an interesting read, and the relatively short length might even be an advantage if the goal is to get a taste of current research in the field. — Phillip Helbig.

References

(1) D. Walsh, R. F. Carswell & R. J. Waymann, *Nature*, **279**, 381, 1979.
(2) I. W. A. Browne *et al.*, *MNRAS*, **341**, 13, 2003.
(3) J. Wambsganss, *Liv. Rev. Rel.*, **1**, 12, 1998.
(4) A. Hamed & M. Wiesner, *BAAS*, **52**, 140.02, 2020.
(5) R. Stabell & S. Refsdal, *MNRAS*, **132**, 379, 1966.
(6) J. Surdej *et al.* (eds.), *Gravitational Lenses in the Universe: Proceedings of the 31st Liège International Astrophysical Colloquium*, University of Liège, 1993.
(7) P. Helbig, *The Observatory*, **144**, 254, 2024.

Astrophysics is Easy, 3rd Edition, by Mike Inglis (Springer), 2024. Pp. 434, 23·5 × 15·5 cm. Price £24·99 (paperback; ISBN 978 3 031 16804 8).

The third edition of Mike Inglis's book has been expanded to add extra chapters on exoplanets, relativity, and more on cosmology. Various thought questions have been added in the text along with some more mathematical ones at the end of chapters. In a book of this type obviously only a limited coverage can be given to any one topic but I was disappointed to see that in the discussion of planetary nebulae no mention was given to the fact that some of

*Each contribution is available *via* its own DOI. According to the notes on the first page of each contribution, some, but not all, are open-access (confirmed by spot checks). Colour figures are thus available on-line.