To come back to my first paragraph, could this book be described as a beginners' introduction as I suspect is its aim? It is certainly well made but at just under £20 for around 100 pages of text it probably isn't great value. But does it inspire and encourage? On balance — maybe. It is full of factual snippets without much 'how' or 'why' science. This strange brew might make a great gift for a fact-loving young person — maybe one of the same age as Clapton when he finally got around to enjoying the guitar. — Barry Kent.

The Whole Truth: A Cosmologist's Reflections on the Search for Objective Reality, by P. J. E. Peebles (Princeton University Press), 2022. Pp. 264, 22·7 × 14·7 cm. Price £18·99 (paperback; ISBN 978 0 691 23137 2).

This is a 'paperback review' of a book already reviewed in hardcover; as such I mention only some things related to the physical book and some matters not mentioned by Trimble in her review[1] of the hardback version, which I intentionally did not re-read before drafting this review. Peebles of course needs no introduction, but the cover reminds the reader that he won the Nobel Prize in Physics (in 2019). Like another book[2] from the same publisher that I reviewed[3] in these pages, the first thing I noticed were the unorthodox (though different) page headings; in that book, the chapter numbers and names are at the bottom of the page; this one follows the usual convention in that respect, though the page number is in square brackets and at a fixed distance from the name of the chapter or section, rather than from the edge of the page. There is a long preface explaining the motivation for the book, no figures, more than sixteen pages of references (including article titles; unusual but useful for a book of this type are author/year references in the text), and a six-and-one-half-page small-print index; there are a few, sometimes long, footnotes in the main text.

This book covers much of the same ground as his previous book[4] (reviewed by both Trimble[5] and me[6]), though the emphasis is different, something which is sometimes explicitly mentioned (p. 166): "Let us pass over the details entered in Cosmology's Century.... We are interested in the big picture." That holds for Chapters 3–6; the first two and Chapter 7 are relevant summaries of the history and philosophy of physics from the point of view of a physicist; my guess is that most working physicists agree with Peebles when he concludes, in spite of or perhaps because of knowledge of other ideas among philosophers, that something like objective reality exists and it is the job of physicists to study it. As always, I am happy when a real scientist is critical of Kuhn's idea of paradigm shifts (pp. 30–32), which I see as at best a caricature of the way science actually works. In several recent reviews I've complained about authors who should know better getting basic concepts in cosmology wrong; I can recommend Peebles' clear and detailed explanation of the Hubble–Lemaître law (pp. 92–93). In my review[6] of *Cosmology's Century*, I wrote that Peebles only briefly mentioned the flatness problem, although he did much to popularize it[7]. There is an entire section (6.4) on that and closely related topics here, presenting, in my view, a much more balanced approach. "You win some, you lose some."

Discussion of a 'fourth neutrino' might be confusing to those who are certain that there are only three; 'neutrino' is often used in a more general sense (*e.g.*, 'effective number of neutrinos') in cosmology, and in 1977 it wasn't yet clear that there could not be a fourth generation of elementary particles. For some reason, the unit 'Volt' is always capitalized, and "fact on the ground" — a phrase which I had never encountered before — or a variant of it occurs ten

times towards the end of the book. But those items are more interesting than annoying.

Of course I second Trimble's recommendation: "Please read the book." And read her review. — PHILLIP HELBIG.

References

(1) V. Trimble, *The Observatory*, **143**, 142, 2023.
(2) L. Page, *The Little Book of Cosmology* (Princeton University Press), 2020.
(3) P. Helbig, *The Observatory*, **140**, 281, 2020.
(4) P. J. E. Peebles, *Cosmology's Century: An Inside History of Our Modern Understanding of the Universe* (Princeton University Press), 2020.
(5) V. Trimble, *The Observatory*, **141**, 41, 2021.
(6) P. Helbig, *The Observatory*, **141**, 43, 2021.
(7) R. H. Dicke & P. J. E. Peebles, in S. W. Hawking and W. Israel (eds.), *General Relativity: An Einstein Centenary Survey* (Cambridge University Press), 1979, p. 504.

An Introduction to General Relativity and Cosmology, 2nd Edition, by Jerzy Plebański and Andrzej Krasiński (Cambridge University Press), 2024. Pp. 577, 17·5 × 24 cm. Price £69·99 (hardbound; 978 1 00 941562 0).

Both authors are well known for their highly mathematical approach to General Relativity (GR), which had a strong tradition in the former Soviet Union (Sakharov, Zel'dovich, Novikov, *et al.*) and many neighbouring countries (both authors are Polish, though the first author spent a substantial fraction of his life in Mexico). Some might quibble with the title; of the many books I've read covering both GR and cosmology, this book is both one of the longest and the most mathematical. The second author (the first died in 2005) is aware of the tension between the title and the contents, mentioning it in the preface to this second edition, and justifies calling it an 'introduction' because not all topics are covered* and because no prior knowledge of GR or differential geometry is assumed, though knowledge of calculus, Special Relativity, classical mechanics, and electrodynamics is assumed (thus one could start learning GR and cosmology with this book, though the author notes that "[it] takes a careful reader to some height of advancement"). This is very much a 'maths first' book which, despite the author's caveat, covers a large range of topics; that it also does so to a significant depth while 'showing much of the work' explains the length. The first part of eleven chapters (at only a bit more than a hundred pages) covers 'Elements of differential geometry' while the second, with thirteen chapters (but about four-hundred pages), 'The theory of gravitation'. The first part is rather standard, though it does mention Bianchi models and the Petrov classification (though that chapter, like several sections, is marked with an asterisk as being less relevant and more advanced, sort of like 'track two' in *MTW*[1]). The second part includes chapters on standard topics such as the Einstein equations, relativistic cosmology, and the Kerr and Schwarzschild

*Missing topics which are mentioned are gravitational waves, the Cauchy problem, generating new stationary-axisymmetric solutions out of known solutions, the Penrose transform, cosmic censorship, experimental tests, spinor methods, relativistic astrophysics, history of relativity, and Special Relativity.