

A universe without mathematics

Hermann Bondi

The Lighter Side of Gravity. By Jayant V. Narlikar. Pp.194. Hbk ISBN 0-7167-1343-8; pbk ISBN 0-7167-1344-6. (W.H. Freeman: 1982.) Hbk \$17.95, £13.95; pbk \$9.95, £6.95.

JAYANT Narlikar's *The Lighter Side of Gravity* is a splendid effort to bring together many of the most exciting facets of physics and astronomy in a logical argumentation devoid of mathematics. Much so-called popular writing on physical science is content with a description of where today's science has got to; moreover, such a description is often marred (particularly in the media) either by delighting in stressing how "crazy and incredible" it all is, or by regarding the development of science as a sort of intellectual stock exchange where individual scientist's stock rises and falls according to how "right" or "wrong" their views have turned out to be (as though a scientist's standing depended on this!).

Narlikar is wholly free from these faults. He respects his reader and takes him gently, almost imperceptibly, through many of the important arguments leading to the advanced concepts of black holes, of the source of stellar energy, of white holes and of the structure of the Universe. He is outstandingly successful in this, though I feel that some of his derivations are a trace old-fashioned in their nature and in the analogies used. His clear writing, stressing how intelligible it all is, is a delight and indeed a breath of fresh air in contrast to so much of the sensation-hungry writing in this field.

There can be no doubt that this book meets an important need and meets it very well indeed. Yet one must admit that it is a curious aberration of our educational system that the need for such a book without mathematics is so great. Mathematics is used in physics and in astronomy to make arguments easier, to make the work lighter. Yet we create such a phobia of equations and formulae in the bulk of the population that there is a continuing demand for books that try to

make the going easier by explicitly excluding mathematics. This is no fault of the author or of this splendid book, but rather a fault of us all for engendering in so many thinking people a violent reflex action to anything mathematical. □

Sir Hermann Bondi is Chairman of the Natural Environment Research Council. His books include The Universe at Large (Heinemann, 1961) and Assumptions and Myth in Physical Theory (Cambridge University Press, 1967).

Sky-watchers A to Z

Stephen P. Maran

Observatories of the World. By Siegfried Marx and Werner Pfau. Pp.200. ISBN 0-7137-1191-4. (Blandford/Van Nostrand Reinhold: 1982.) £8.95, \$16.95.

IN *Observatories of the World* two astronomers at the University of Jena tell tales of 40 of their favourite observatories from Abustumani to Zelenchukskaya. The observatories have been selected to represent institutions of different types, including those that are research-orientated and education-orientated, those with optical, radio and infrared instruments or specializing in elaborate computational tasks, and those located in cities, on mountaintops or (in one case) aboard an aircraft. The English-language translation is by Simon Mitton, who also revised the text.

There is no common theme to the text, except perhaps historical development and, in a depressing number of cases, a history of gradually moving the facility further and further away from a growing metropolis. The authors have much to say about the research programmes that characterized the golden eras of the older observatories, but seem to base their occasionally perfunctory accounts of some modern facilities on the replies to

questionnaires that were distributed to the observatory authorities. This is not a professional reference work, then, nor a directory; there are no tabulations of telescopes and instruments, nor of observatory coordinates and altitudes.

Not all of the facilities described would have made my "Top 40"; the omission of Yerkes Observatory (mentioned in passing, and incorrectly, as being located "in the East of the United States") is particularly unfortunate for it was at Yerkes that much of modern astrophysics was born. Cerro Tololo Inter-American Observatory, that great and much-used telescope farm in Chile, is also not included, although it is briefly described in the section on its sister facility at Kitt Peak.

Observatories of the World is written for those who have some familiarity with the terminology of astronomy, although a number of elementary concepts are explained. It is extensively illustrated with attractive half-tones and rather primitive sketches (plates 11 and 12 appear to be interchanged, incidentally, but most readers should be able to tell a coronagraph from another kind of telescope). Only here, among books that come conveniently to mind, can one readily determine that the ancillary building of Konkoly Observatory near Budapest "has a grass-covered roof and cannot therefore be a source of troublesome air turbulence. . ." or that the little town of Coonabarabran provides scientists with "all the comforts of civilization". Amidst the interesting trivia, however, there is a brief but frank discussion of optical problems with the original 6-metre primary of the huge reflector at Zelenchukskaya, and many other informative tidbits.

The overall result is a pleasant and informative book, despite some awkward verbal constructions such as "Every observatory not recently established. . ." (p. 29) where "The older observatories. . ." might have done as well. If you are an armchair astronomer and you like to read about observatories, this is the book to buy. □

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Mount Wilson Observatory in southern California. To the left are three solar telescopes, centre and right are the domes of the reflectors. The picture is taken from Richard Learner's *Astronomy through the Telescope*, recently published by Evans/Van Nostrand Reinhold. Prices are £12.50, \$29.95. The excellent illustrations and accessible but comprehensive text make the book a stimulating guide to the history of astronomy and its instruments for both professional astronomer and layman.