T. Padmanabhan, *Structure Formation in the Universe*, Cambridge University Press, Cambridge, XVI+483 pp., 1993, paperback £19.95/$34.95, ISBN 0–521–42486–0, hardback £50.00/$89.95, ISBN 0–521–41448–2.

Most talks about cosmology these days deal with how the large-scale structures formed in the Universe.

This book attempts to describe in one place this whole story. Twelve chapters spread over three parts cover the topic in a systematic manner. Thus the first part deals with the smooth universe and the approximation to it by homogeneous and isotropic models. The first chapter gives the ingredients of the Universe ranging from stars to superclusters, the second describes the Friedmann models, and the third gives the introduction to the early history of the Universe including the primordial nucleosynthesis and the microwave background. It also provides an introduction to the different kinds of relics of particles and radiation from the early hot epochs.

The second part deals with the 'meat' of the subject matter, the examination of evidence on large-scale structure of matter, its distribution and correlations, its large-scale motions (over and above the expansion of the Universe) and its relationship to the spectrum and anitropy of the radiation background. This relationship can be established through the perturbative analysis of the Friedmann models developed in the first part.

The third part is devoted to the current speculations on structure formation. Five chapters examine the aspects of nonlinear evolution (when the linear perturbation theory fails), including the Zeldovich approximation, the adhesion model, N-body simulations, etc., the formation of disc and elliptical galaxies, the constraints from data on high redshift quasars and galaxies, the inflationary scenarios, the evidence for dark matter and the cosmological constant. The last of these chapters, the Epilogue, has an appraisal of the theories, scenarios, and speculations in the light of the observational constraints.

The style of presentation is matter-of-fact-type pitched at the research student level. The author has clarity of exposition and it shows clearly that he has experience of dealing with students. The reader is, however, expected to work hard while going through the text: it is not suited for bedside reading. In fact, one should have the proverbial back of the envelope available to work through the statements and in

some cases several envelopes would be needed. But the effort would be worthwhile for someone who really wants to follow the logic of the arguments and appreciate the conclusions. One strong point is that there are numerous exercises at the end of each chapter to test and supplement one's understanding.

The book was under process when the COBE data on inhomogeneities of the microwave background appeared. So its implications are examined in an appendix. (There are two other appendices, one on some details of general relativity and the other on some aspects of field theory.) The account of implications of COBE would necessarily improve if the author writes it now.

I must point out one defect in what I otherwise consider to be an excellent book. Reading it the graduate student will not know that Hubble discovered the expansion of the Universe, that Gamow was the first to do calculations of primordial nucleosynthesis and that Penzias and Wilson discovered the microwave background. Looking at the references in the end the reader may be forgiven if he mistakenly concludes that cosmology really began in the 1980s! While a review article should predominate in recent references, a textbook expecially if it claims to be 'a *textbook* intended for the *non-expert*' (italics are author's, not mine) is expected to give a historically balanced view of the subject. This is more so in cosmology where current fashions are such that (again in the author's own words) the half life for the 'best' models is about four years. Surely the reader deserves to know who did the works of more lasting value on which the whole facade of this book rests.

Thus I strongly recommend this book for the research scholar wishing to enter the field, but with the caveat that he should first read an introductory text in cosmology.

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