

the individual tends either to protest to the local planning authority or to appeal to the Minister. Planners are thus liable to find that their closest contacts with the public are with those members of it who have real or imagined cause for complaint. They tend in consequence to decide that the public is obstructive, and has to be circumvented in its own interest.

There are other factors which encourage both the central and local authorities to feel that the less the public knows about their planning schemes the less trouble they will have. The task of planning, in so far as it is not purely technical, is largely one of reconciling, or striking a workable balance between, a whole series of divergent interests, private and public, short-term and long-term. It may seem to the planner not only that the layman can have few constructive suggestions to offer in such a complicated process, but also that the need to consult the public may upset the nice balance of needs and counter-claims which he has achieved in his plan.

In spite, however, of the further danger of arousing public expectations which the slender resources for building and development in Britain, and the inevitably slow pace of progress, will deny fulfilment for a matter of decades, failure to bring the public to understand and approve the aims of such schemes would be a mistake. Town planning has already to contend with the often conflicting demands of powerful public and private interests, as well as with the pressure of social forces, such as population movement, which we have not yet learnt to control. Its own technical immaturity and lack of experience constitute further obstacles which could become a real danger if the gulf between planners and planned be allowed to develop. The broadsheet issued by Political and Economic Planning is not so much a warning to the planners as a challenge to every citizen of goodwill, and to all who have specialized knowledge in some of the fields concerned, to play their part in filling or bridging that gulf, and in securing not merely a sympathetic and helpful handling of points of difficulty by local planning authorities, but also a widespread public understanding of what is involved. A sustained interest must be promoted in the processes by which the changes are to be concerted, both at the local level and at the broader national level where the claims for land for the military and electricity authorities, for example, have to be reconciled with those for agriculture and national parks.

STRUCTURE OF THE UNIVERSE

The Structure of the Universe

An Introduction to Cosmology. By Dr. G. J. Whitrow. (Hutchinson's University Library, No. 29.) Pp. 171. (London: Hutchinson's University Library, 1949.) 7s. 6d. net.

DR. WHITROW is to be congratulated on this survey of the cosmologies of essentially the pre-1939 period. The remarkable achievements of

Hubble and his colleagues are described in detail—distance measurements, the velocity-distance law, and the large-scale uniformity of the distribution of matter in space being fully and adequately treated. Then follow two chapters that deal with space-time and the theory of relativity. These are written in a fluent, expert style and should prove of great value to the lay reader. They provide an excellent introduction to the difficult problems of cosmology that are treated in the last part of the book.

In cosmology more significance is attached to a few observational results than in any other branch of science. At first the uniformity of space and the red-shifts of the spectra of the extra-galactic nebulae formed almost the only evidence available to cosmologists, and it was perhaps natural that some men of science should have come to regard this as a somewhat flimsy basis for the support of such weighty matters. But, as Einstein himself has pointed out, it is difficult to gainsay the orthodox interpretation of the red-shifts without undermining the whole structure of physical science. Nevertheless, it is of the first importance that our store of observational knowledge on this subject should be extended to the maximum degree, and it is for this reason that such great efforts have been made by Hubble to obtain crucial information from nebular counts. The completion of this work is only now within sight. In the meantime, by good fortune, vital new information has accrued from developments in astrophysics. Most important are, first, that several methods of deriving the ages of the stars within our own galaxy all yield results close to 4,000 million years; and second, that the galaxies must have condensed from a more diffuse background. Both these new requirements have a serious impact on many of the older cosmological theories.

Dr. Whitrow discusses the age of our galaxy at length, and directs attention to the discrepancy between the four thousand million years given by astrophysics and the very short age of the universe—no more than two thousand million years—demanded by many systems of cosmology. Perhaps even greater weight might have been attached to this discrepancy, especially in the case of Milne's kinematical theory. Milne was able to avoid many of the difficulties of other cosmologies by means of his dual time-scale. But this no longer suffices to explain away the ages of the stars, which are now determined by a method that uses the physical time-scale. This gives four thousand million years, in agreement with methods that use the dynamical time-scale.

Although this review is not intended to be critical of Dr. Whitrow's book, there is one error that should be pointed out. In the final paragraph on p. 147, Milne's explanation of the origin of angular momentum is highly commended. This part of Milne's theory has always seemed to the reviewer to be open to the serious criticism that many satellites of the great planets show no evidence of a large spontaneous increase of angular momentum. Also, Dr. Whitrow is wrong in saying that apart from Milne's theory there is no explanation of the origin of the spins of the galaxies. For this follows without difficulty in any theory that regards the galaxies as condensations in a diffuse gaseous medium.

But for the rest, the book is eminently readable and is packed with a fund of interesting historical details. It cannot fail to be a great success with all who are interested in the fascinating problems of cosmology.

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