

naturally do not want the answers available; and I would feel that a much cheaper edition containing only the questions would be a better proposition.

G. R. NOAKES

### Advances in Geophysics

Vol. 9. Edited by H. E. Landsberg and J. van Miegheem. Pp. xi+374. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1962.) 103s. 6d.

THIS ninth volume completes the first decade of the series. It contains six chapters. The largest (90 pages), by W. M. Kaula and entitled "Celestial Geodesy", deals with the dynamical aspects of the use of extra-terrestrial objects which are close to the Earth, to determine the external gravitational field and the form of the Earth. This chapter discusses the dynamics of a satellite in orbit around the Earth and sufficiently close to be influenced not only by the Earth's central gravitational field, by the Sun and Moon, but also by the non-central terms in the Earth's atmosphere. There are 281 references.

W. Stander, in a 70-page chapter entitled "The Focal Mechanism of Earthquakes", surveys the work of the past 35 years, most of it in the past 12 years, on the study of both compression and shear waves to elucidate the focal mechanism of earthquakes. There are 111 references.

A chapter by K. L. Cook, entitled "The Problem of the Mantle-Crust Mix", summarizes in 55 pages the evidence for the possible lateral inhomogeneity of the Earth's uppermost mantle and postulates that it arises from a mixture of mantle and crustal type rocks. It concludes with 260 references.

A chapter entitled "Effects of Trapped Particles on the Geomagnetic Field", by J. R. Apel, S. F. Singer and R. C. Wentworth, gives a 53-page mathematical exposition of the perturbations introduced into the geomagnetic field by trapped particles and a comparison of these perturbations with experience. There are 30 references.

In a short 28-page chapter entitled "Identification of Aerosols", J. P. Lodge discusses the methodology of measuring the properties of aerosols, sampling techniques, particle size determination, identification and concentration, and concludes with 108 references.

Finally P. A. Sheppard contributes a chapter entitled "Properties and Processes at the Earth's Surface in Relation to the General Circulation of the Atmosphere". These 18 pages are mainly concerned with the effects of the turbulent transfer of momentum, energy and water vapour near the surface of the Earth. There are 45 references.

A. C. BEST

### Entropy

The Significance of the Concept of Entropy and its Applications in Science and Technology. By Prof. J. D. Fast. (Philips Technical Library.) Pp. xii+320. (Eindhoven, Holland: Philips Technical Library; London: Cleaver-Hume Press Ltd., 1962.) 57s. 6d.

AFTER a relatively brief account of entropy as a thermodynamic function, the bulk of this book takes a statistical-mechanical view of entropy. The author describes at length the standard simple derivations of the Bose and Fermi statistics, and of the entropy of monatomic and diatomic gases. There is also a chapter on "Applications of the Concept of Entropy" in which emphasis is given to all the various uses of the entropy function. As the author deliberately restricts himself to writing for the beginner in the subject, this chapter is somewhat disappointing. For example, he refers to irreversible internal friction effects but makes no mention of the detailed work of Zener, nor of the techniques of entropy production in fluids developed by Landau and Lifshitz. However, the book provides a useful if somewhat lengthy introduction to an important branch of physics.

Like many physicists before him, the writer has difficulty in stating clearly those experimental facts first discovered and codified by Charles. Quite frequently one reads that it is a matter of observation that the product of the pressure and volume of a gas is proportional to the temperature, without any indication being given on the vital point of how the temperature is to be measured. Although the present author clearly appreciates this difficulty, his treatment might well be misleading to the beginner.

J. WILKS

### Great Ideas and Theories of Modern Cosmology

By Jagjit Singh. Pp. xii+276. (London: Constable and Co., Ltd., 1963.) 21s. net.

THIS is a survey in non-technical terms of almost the whole range of astrophysics and cosmology. Emphasis is on evolutionary aspects. There is even a chapter describing some recent ideas on the nature and origin of life. There is some discussion of the significance, or lack of significance, of cosmology for other departments of thought.

To digest so vast an amount of knowledge into so small a bulk is a feat indeed. The presentation is enlivened by a wealth of metaphors and literary allusions. While the account appears to be largely sound, so far as it goes, it is not very critical and not always well balanced. It is inevitable that a single author attempting to survey such an enormous amount of work should sometimes misjudge what are the most important contributions and sometimes not know which contributions have been superseded. One wonders, however, whether the attempt is worth making. One is taken for a breathless run through as many ideas as possible when one would have preferred to be invited to contemplate the leading ideas only. The title actually leads one to expect such a treatment, and it is a pity that Mr. Jagjit Singh has not given it because one gains the impression that he could have done this very effectively.

W. H. MCCREA

### The Rational and the Real

An Essay in Metaphysics. By Prof. Leslie Armour. Pp. vii+97. (The Hague: Martinus Nijhoff, 1962.) 8.25 guilders.

THIS work arose out of a doctoral thesis, and is in effect an extension of the views therein elaborated. Its value consists in the author's attitude towards a number of perennial problems rather than in any claim to basic novelty, even though there is probably enough to brand the writer as a rebel. This is all to the good, since metaphysics has long been suspect, and as a discipline unlikely to command respect in a scientific age until it can come to terms with experience. Prof. Armour helps this process by showing that metaphysics is a necessary subject in its own right, and assuredly not a mere something beyond physics. In this context he finds the ultimate justification of metaphysics, and proceeds to a radical discussion of mind and matter.

It is probably correct to say that most of us are post-Cartesians when left to ourselves. Dr. Armour is deeply dissatisfied with this, and wishes to substitute permanent possibility for material object and a "tendency to have experiences" for mind. Evidently there is much to be said for this, and its dutiful adoption might well eliminate a number of paradoxes, and clarify the linguistic problems of philosophy.

What the scientist will ask for, however—if it is a fair request—is some rule, or set of rules, by means of which he can select from compossible experiences those of which he may become experimentally aware. It is well for him to be reminded of this, when technological development is rapid, and a materialistic view of the Universe perhaps getting out of hand.

F. I. G. RAWLINS