

one in this series deals with the phenomenon of creep in metals, a phenomenon which is very important for industry and quite elusive for solid state theory. Although the various attempts to describe it range from a purely empirical approach to more speculative treatments of mobility of dislocations and of vacancies, few of these efforts seem to have found much use among engineers who usually rely on questionable extrapolation of empirical data. The present small booklet describes the rudiments of the physics of creep in metals and the author succeeds admirably in putting some order into the maze of facts and theories of various degrees of reliability. Unfortunately some important facts, such as the Rehbinder effect and other surface phenomena, are not mentioned. The eight small chapters are on the characteristics of the creep curve, crystalline flow, metallographic features of creep, grain boundary creep, transient creep, steady-state creep, tertiary creep, and development of creep-resistant alloys. No need to say that most of the subjects are barely touched upon and, as suggested by the author, the numerous original references have to be extensively read to obtain a more complete picture. It is most refreshing to see a text primarily intended for engineers in which such "revolutionary" notions as dislocations and vacancies are freely discussed. Let us hope that this very readable booklet will do its share in bridging the still appalling gap between the science and the engineering of metals.

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The Expansion of the Universe. By Paul Couderc. 231 pp. The Macmillan Company, New York, 1952. \$6.00.

In this book, Paul Couderc of the Paris Observatory brings together and summarizes the various theories and the observational evidence regarding the structure of the universe. He starts with a discussion of the astronomical methods of measurement of distances of remote objects, stars, and nebulae. He reviews the astronomers' evidence about the recession of the spiral nebulae. He then describes the various geometries and discusses how the observations fit each. He compares Einstein's and De Sitter's universes, the implications of Riemannian geometry and the cosmological problem. In conclusion he presents the various expanding models, depending on the value of the cosmological constant chosen, and the residual vestiges of a hyperdense state. Although he states that he personally favors the Lemaître solution, he devotes about the same amount of space to the other solutions as well.

This reviewer found the book interesting and readable. It gives an excellent account, in language that any physicist can understand, of the various points of view that have developed and of the interesting work that has been done in recent years in this field. With the new contributions made by the 200-inch telescope now beginning to emerge, the book provides an excellent background to enable one to fit the announcements into

their proper place. The book will be of interest not only to students of astronomy but also to physicists and engineers who have some acquaintance with cosmology and who wish to keep up-to-date in their familiarity with this subject.

S. A. Korff

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Vision Through the Atmosphere. By W. E. K. Middleton. 250 pp. University of Toronto Press, Canada. 1952. \$8.50.

The basic problem connected with seeing through the atmosphere is "to establish usable theoretical relationships between light, eye, target and atmosphere that will permit the calculation of the visual range at any time; and to provide means of measuring the necessary parameters quickly and accurately. . . ."

The initial chapters of the book deal with photometric theory, scattering and absorption of light, and the alteration of contrast by the atmosphere. The treatment is essentially from an engineering viewpoint: the usual, confusing photometric labels are introduced, and a series of relations are stated and manipulated. However, this is compensated by the rather extensive bibliography, the numerous tables and curves, and the comprehensive coverage of the experimental literature. The data on atmospheric constituents affecting the propagation of light and the section on observations of aerosols are particularly noteworthy.

The relevant properties of the eye, the visual range of objects and sources, the colors of distant objects, and the instruments for measuring the quantities of interest are treated in following chapters. Various curves of practical interest are included. The book ends with a discussion of the special problems of the meteorologist and a statement of the problems solved by the "new visual science", and of the problems still open. The final problem is "to insure the acceptance by the public of the remarkable techniques that are even now emerging. The public concerned is one that has been 'oversold' on such non-visual aids as radar and ground control, to the extent that they are likely to underrate the importance of actual seeing".

The present volume replaces the author's *Visibility in Meteorology*, which was initially published in 1935. The style is pleasantly discursive, and often colored by the author's extensive experience in the field. At the practical level, the book will be of direct interest to all concerned with seeing through the atmosphere, particularly as it affects transportation and military tactics. The theoretician may be stimulated to attempt rigorous treatments of certain of the problems posed by the book.

V. Twersky

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Photoelectric Tubes

Photoelectric Tubes, by A. Sommer, a slim volume in the Methuen series of monographs on physical subjects, is the second and revised edition of the book published as *Photoelectric Cells* in 1946. The changed title indi-