

thermodynamic significance of the mass-action equilibrium constant, Helmholtz's method of calculating the E.M.F. of a cell, the meaning of thermodynamic probability in relation to entropy, the laws of radiation, and many other problems, by no means simple in themselves, are here treated in an exceptionally clear and convincing manner. Prof. Sackur's book, regarded as a whole, is a demonstration of the truth of the words with which the introduction commences: "Everyone will admit that a thorough understanding of physical chemistry, and of the success of its applications in science and in technology, can only be obtained on the basis of thermodynamics."

It only remains to add that Dr. Gibson's translation is thoroughly satisfactory.

W. C. McC. LEWIS.

OUR BOOKSHELF.

The Borderlands of Science. By Dr. A. T. Schofield. Pp. viii+255. (London: Cassell and Co., Ltd., 1917.) Price 6s. net.

DR. SCHOFIELD tells us in the preface that his object in writing this book is "to present to the reader an entirely new outlook on the subject with which it deals. The word 'borderland' has hitherto been practically confined to a study of psychic phenomena; but here the meaning is so extended as to cover all that is obscure and unproved in any science." The world of concrete and abstract things is pictured as a huge disc, in the centre of which is God, "the first great cause (though Himself uncaused), dwelling in perfect light" (p. 3); and round the edge of the disc stand "the scientists" in a crowded circle studying the disc by feelers which each mind possesses and "by the light of their own reasoning powers" (p. 4). There are patches of the disc only half illuminated by either the human light or the Divine light, and these patches form the "twilight" regions—the borderlands of science (p. 6); and also there are patches "which we should know and need to know, but which science now clearly sees cannot be penetrated by its lights" (p. 7). "The goal of all human knowledge . . . is in touch with the Light itself, although to scientists at the circumference, who use only their own lights, it may appear to be impenetrable darkness" (p. 4). The Central Unity is also the God of revelation (p. 40); "as we leave the clear though limited light of science we become conscious of a vague premonition or prescience of the spirit world" (p. 63), and "there are some few districts of thought which are illumed neither by science nor by religion" (p. 62).

One would like to know how Dr. Schofield knows all this about the Central Unity. There seem to be some sensible and tolerant views on the borderlands of psychical science, and it is mostly the fundamental parts that seem self-contradictory. But there are also somewhat contradictory statements about the functions of science and philosophy (p. 10 and p. 12) and what makes up "mathematics" (p. 240 and

p. 246). We read on pp. 33-34: "According to Myers, Socrates originated the idea of material sciences; but Swedenborg first attempted to introduce a science of the unseen, and his most illustrious follower in this particular direction has been Sir William Crookes." φ

The Pruning-Manual. Being the Eighteenth Edition, Revised and Reset, of the *Pruning-Book*, which was first Published in 1898. By L. H. Bailey. Pp. xiii+407. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1916.) Price 8s. 6d. net.

THIS book deals with an important side of the care of fruit trees. The author considers that "the habit of growth, mode of flowering and fruit-bearing, and response to manipulation" may be grouped under the heading of pruning, and this wide view of the subject gives a special value and interest to the book.

In the earlier chapters the descriptions of the growth and branching of the more important fruit trees are remarkably clear, and should prove useful not only to fruit-growers, but also to teachers of botany and Nature-study. The later chapters deal with the general principles of pruning, and give directions for the treatment of the various fruit trees and ornamental shrubs grown in America. Prof. Bailey lays great stress on the necessity for the continuous good care of orchards as regards both pruning and tillage.

An interesting chapter on the care of street trees may be mentioned; instructions are given for the repairing and preservation of old trees which, on account of their position or association, may be specially valuable.

This manual is intended by the author to bring together the results of long experience in pruning "as handed down from gardener to gardener, fruit-grower to fruit-grower, and as recorded in many books." As early as the latter half of the sixteenth century the subject was dealt with by Heresbach in "Four Bookes of Husbandrie" (1586), and also by Mascall (1575). The numerous references in this book, however, are chiefly to works published in the last twenty years, and especially to the reports of the valuable experimental trials which have been carried out at Woburn, at Wildpark (Germany), and in Utah, California, and Missouri. It is unfortunate that the author has not added a short bibliography, as the references are scattered in the text or in footnotes, and in one or two cases no date is given.

H. A.

The Aviator and the Weather Bureau. By Dr. Ford A. Carpenter. Second edition. Pp. 54. (San Diego: Chamber of Commerce, 1917.)

THIS small book gives a brief history of American aviation as it is associated with southern California, and contains a considerable number of interesting illustrations. It points out the advantage of the climate of California for aviation studies, and gives in chap. iii. an account of an ascent made by the author over the city of San Diego.