

It is unfortunate, by the way, that Boole's simple and direct demonstration of this last theorem (Differential Equations, p. 276) should not have been reproduced in the more recent text-books of the subject.

H. B. FINE.

*Elements of Theoretical Physics.* By DR. C. CHRISTIANSEN, Professor of Physics in the University of Copenhagen. Translated into English by W. F. MAGIE, PH.D., Professor of Physics in Princeton University. London, Macmillan and Co.; New York, The Macmillan Company; 1897. 8vo, pp. xii + 339. Price, \$3.25.

This work by Professor Christiansen aims to give, within the limits of a single octavo volume, a survey of the whole field of mathematical physics. We realize, with the translator, that there is need of a book which will enable us to get a bird's-eye view, as it were, of the whole subject, showing the interrelations of its various branches, and using a consistent notation. The task set himself by the author in attempting to condense his survey into such a narrow compass is a most difficult one and, bearing that in mind, the measure of success which he has achieved is very gratifying. It is doubtful, however, whether in this country there is any considerable body of readers to whom this book will be of much use. It is not sufficiently comprehensive to be used as a reference book by one who has worked much in the subject, and it is too condensed and too barren of illustration and detail to be consulted with profit by the beginner.

Professor Christiansen makes no pretence of giving the various theorems in their most general form, but deals with a great many special examples and problems, and always with those of great practical importance. For example, there is no general treatment of sound, but the vibration of strings is discussed as an example of elasticity. In the chapter on thermodynamics we find Planck's equations, and the following section is given up to a discussion of their application to the subject of dissociation; but that is all we find on thermodynamic potential. The first chapter, "General theory of motion," is by far the best in the book, and can be recommended to any one wishing a digest of that subject.

This volume cannot but suffer from a comparison with Voigt's two volumes upon the same subject which appeared somewhat later. Although Voigt's aim is that of Christiansen, he has succeeded where the latter has failed, mainly,

by reason of the greater space he has allowed himself, thereby gaining enormously in comprehensiveness and lucidity. A noticeable feature of Voigt's book is the admirable bibliography of each branch of the subject; Christiansen's book has nothing of the nature of a reference for collateral reading.

Professor Magie has used for translation the German edition by Müller of the Danish original. His rendering into English is excellent, and does not slavishly follow the German text, but is free and natural.

We wish that the work of the publishers were equally deserving. The Macmillans have brought out the book in their usual elegant dress in so far as paper and type are concerned; but upon what score of economy can they be excused for the manner in which the equations are treated? One may pardon the use of the Solidus for mathematical expressions printed in the text, but surely no valid reason can be advanced for the use of the Solidus in all equations, and for the placing bodily of most of the equations in the text. The effect of a page upon the eye is dazzling and confused; and not only is eye-sight ruined, but valuable time lost, in trying to discover an equation to which reference has been made. It is to be hoped that the publishers have already come to the conclusion that this experiment in economizing in paper has not been a brilliant success.

The typographical errors which we have observed have not been numerous, and have been usually quite unimportant.

A. STANLEY MACKENZIE.

*Introduction to Infinite Series.* BY WILLIAM F. OSGOOD, PH.D., Assistant Professor of Mathematics, Harvard University. To be obtained of the Publication Agent of Harvard University, 2 University Hall, Cambridge, Mass. 8vo, 71 pp. Price, 75 cents.

A beginner is almost invariably repelled by the aridity and apparent unprofitableness of the subtle discussions that occur in the theory of infinite series. In his interests it is highly desirable that stress should be laid at first on the essential principles involved, to the neglect of such parts of the subject as belong merely to what we may call mathematical technique: *e. g.*, complicated tests of convergence. That it is possible at once to interest the reader, to make no sacrifice of thoroughness, and to arrange the material in organic connection with the other parts of mathematics is proved by Professor Osgood's short pamphlet on infinite series.