vironment and heredity in development are distinctly stated without prejudicing either one. However, the advocacy of Mendelism in this book cost Schmalhausen his position in August of 1948.

HERMAN SLATIS

University of Chicago

From Euclid to Eddington: A study of conceptions of the external world. (The Tarner Lectures, 1947.) Edmund Whittaker. New York: Cambridge Univ. Press, 1949. Pp. ix + 212. $4.00.

Although the title suggests a systematic history of cosmological speculations, and the subtitle hints at a philosophy of science, the present book (containing the substance of the Tarner Lectures for 1947) is in fact neither. Its aim is to outline the development of some of the chief theoretical principles of modern physics, especially those which contribute to the systematic unification of physical knowledge and have a bearing on larger cosmological questions. The volume is thus addressed to readers concerned with the state of current theory; and Whittaker employs historical materials primarily to introduce modern notions and to make evident what is novel in them. His exposition is divided into five parts, dealing in sequence with basic ideas in the analysis of space and time, with the fundamental concepts of classical physics, with the notions underlying general relativity, with the concepts of quantum theory, and finally with Eddington's cosmological views.

Whittaker writes with his customary clarity, though he does assume more than mere literacy on the part of his audience; and he makes excellent use of his unusual mastery of the history of science to illuminate recent attempts at a unified conception of the physical world by showing the relevance of earlier efforts in this direction. Moreover, he expounds the remarkable achievements of modern theoretical physics with contagious admiration and enthusiasm; and his reasonably intelligible account of Eddington's fascinating but not widely known contributions to physical cosmology constitutes a specially useful service to the general reader.

However, the book has little to offer to anyone interested in the philosophical and logical analysis of modern theoretical formulations. Whittaker is indeed often on the verge of interesting methodological reflections, as in his brief comment on electrons as not being "particles in the old sense," or in his over-all remark on the use of alternative models in interpreting the formalism of quantum theory. He also tantalizes his readers by such asides as that recent work on the unified field theory, while marking important contributions to pure mathematics, does not possess much physical significance. It is also evident that Whittaker does not subscribe to the positivist-pragmatist account of the function of physical theory, as is clear from his somewhat negative evalution of Newtonian gravitational theory because of the latter's silence on the origin and mode of transmission of gravitational influences. But none of these essentially incidental observations are adequately developed, and in consequence the reader is never permitted to inspect the intellectual center from which Whittaker surveys and evaluates the fundamental ideas of modern physics.

ERNEST NAGEL

Columbia University

Atmospheric electricity. J. Alan Chalmers. New York (11): Oxford Univ. Press; Oxford, Engl: Clarendon Press, 1949. Pp. 175. (Illustrated.) $3.75.

The appearance of a new book on atmospheric electricity is most welcome. The textbooks of Chauveau, Mache and Schweidler, Benndorf, Benndorf and Hess, *et al.*, are all more or less obsolete and for English readers only the short monograph of Schonland (1932) and three chapters in Fleming's *Terrestrial magnetism* (1939) by Gish, Torreson, and Schonland were available until now.

Chalmers' book is well written and up to date. One can immediately see that the author has worked a great deal (with Whipple) in this field.

It is especially commendable that the new ideas on the mean lifetime of ions and the equilibrium between small and large ions (Nolan, Whipple, Schweidler) are fully presented and that the thunderstorm phenomena are described in modern form, taking into account the results of the altielectrograph recordings.

The author mentions in the preface that he purposely omitted a chapter on cosmic rays (as, for instance, given in Schonland's book) and I agree with him that a full presentation of these phenomena is not necessary for the explanation of atmospheric-electric phenomena. I wish, however, that the importance of ionization by cosmic rays had been stressed in the discussion of the ionization balance of the lower atmosphere, especially over the oceans. Also, I think, the treatment of the main problem of atmospheric electricity (maintenance of the earth's negative charge), although excellent, is perhaps incomplete, since the reader does not get any information with regard to the transfer of charges from the upper part of the thunderstorm regions to the ionosphere.

I also should have wished to see a quantitative treatment of the role of the various ionizing agencies in the atmosphere: contribution of the alpha, beta and gamma rays from the radioactive products in the atmosphere, their distribution with altitude (W. Schmidt's theory of mass exchange) and contribution of ionization by cosmic rays in the free atmosphere in the troposphere and the stratosphere.

In all other respects, Chalmers' book is a very fine, modern text, which deserves full recognition as a standard monograph and wide distribution among geophysicists and specialists in the field of atmospheric electricity.

VICTOR F. HESS

Fordham University