ELECTRONS; OR, THE NATURE AND PROPERTIES OF NEGATIVE ELECTRICITY

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OR

THE NATURE AND PROPERTIES OF NEGATIVE ELECTRICITY

BY

SIR OLIVER LODGE, F.R.S.

D.Sc. Lond., Hon. D.Sc. Oxon. et Vict., LL.D. St. Andrews, Glasgow, and Aberdeen

VICE-PRESIDENT OF THE INSTITUTION OF ELECTRICAL ENGINEERS
RUMFORD MEDALLIST OF THE ROYAL SOCIETY
EX-PRESIDENT OF THE PHYSICAL SOCIETY OF LONDON
LATE PROFESSOR OF PHYSICS IN THE UNIVERSITY COLLEGE OF LIVERPOOL
HONORARY MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY OF PHILADELPHIA, OF THE BATAVIAN SOCIETY OF ROTTERDAM, AND OF THE ACADEMY OF SCIENCES OF BOLOGNA
PRINCIPAL OF THE UNIVERSITY OF BIRMINGHAM

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TO THE

CAVENDISH PROFESSORS OF PHYSICS

IN THE UNIVERSITY OF CAMBRIDGE, AND ESPECIALLY

TO THE PRESENT HOLDER OF THE CHAIR, THIS SMALL BOOK IS

DEDICATED WITH PROFOUND ADMIRATION

BY THE AUTHOR

PREFACE

In 1902 I was asked by the President of the Institution of Electrical Engineers to give to that body a discourse on recent progress towards knowledge of the nature of Electricity, especially concerning its discontinuous or atomic structure. This discourse, greatly extended, appeared in Vol. 32 of the Journal of the Institution, and constitutes the nucleus of the present book.

Many additions have now been made, and some of the difficulties recently promulgated concerning the possibility of an electric theory of matter are touched upon. They are of date too recent to have been mentioned even in my "Romanes Lecture" before the University of Oxford, published under the title *Modern Views of Matter* by the Clarendon Press.

The most important addition is a more detailed account of the proof of the purely electrical nature of the mass or inertia of an electron: an investigation generally associated on the experimental side with the name of Kaufmann, but of course based on the work of many predecessors and contemporaries. A proof that the atom of matter is essentially composed of such electrons, and that its mass too is of purely electromagnetic nature, is lacking: the electromagnetic theory of Matter,

unlike the electromagnetic theory of Light, must be regarded for the present as no better than a working hypothesis. It is a hypothesis of stimulating character, and of great probability, but its truth is still an open question that is probably not going to be speedily closed.

I am indebted to Professor Larmor for information about some recent theoretical work, and for the substance of Appendix M; I have also to thank Mr. Gwilym Owen, of the University of Liverpool, for assistance in the revision of the proof.

As an introduction to an allied subject, the book called *Becquerel Rays*, by the Hon. R. J. Strutt, is to be recommended; and the standard treatise of Professor Rutherford on *Radioactivity* is well known. I have avoided dealing at length with the topics so conveniently to be found in these writings. I have also barely touched on the large subject of 'ionisation': it was difficult to do so without overloading the principles with detail, a knowledge of which is nevertheless necessary for investigators. The treatise of Prof. J. J. Thomson, *The Discharge of Electricity through Gases*, contains a mass of information and original work highly valued by physicists.

The present book is intended throughout for students of general physics, and in places for specialists, but most of it may be taken as an exposition of a subject of inevitable interest to all educated men.

OLIVER LODGE.

THE UNIVERSITY OF BIRMINGHAM,
July, 1906.

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