AN ELEMENTARY TREATISE ON ELECTRICITY

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649570874

An Elementary treatise on electricity by James Clerk Maxwell

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

JAMES CLERK MAXWELL

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Trieste

Clarendon Press Series

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MAXWELL

London
HENRY FROWDE

Oxford University Press Warehouse
Amen Corner, E.C.

Clarendon Press Series

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ELECTRICITY

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SECOND EDITION

Oxford

AT THE CLARENDON PRESS

1888

EDITOR'S PREFACE.

MOST of the following pages were written by the late Professor Clerk Maxwell, about seven years ago, and some of them were used by him as the text of a portion of his lectures on Electricity at the Cavendish Laboratory. Very little appears to have been added to the MS. during the last three or four years of Professor Maxwell's life, with the exception of a few fragmentary portions in the latter part of the work. This was partly due to the very great amount of time and thought which he expended upon editing the Cavendish papers, nearly all of which were copied by his own hand, while the experimental investigations which he undertook in order to corroborate Cavendish's results, and the enquiries he made for the purpose of clearing up every obscure allusion in Cavendish's MS., involved an amount of labour which left him very little leisure for other work.

When the MS. came into the hands of the present Editor, the first eight chapters appeared to have been finished and were carefully indexed and the Articles numbered. Chapters IX and X were also provided with tables of contents, but the Articles were not numbered, and several references, Tables, etc., were omitted as well as a few sentences in the text. At the end of the table of contents of Chapter X three points to be treated were mentioned, viz. :—the Passage of Electricity at the surfaces of insulators; Conditions of spark, etc.; Electrification by pressure, friction, rupture, etc.: no Articles corresponding to these headings could be found in the text. Some portions of Chapters IX and X formed separate bundles of MS., and

there was no indication of the place which they were intended to fill. This was the case with Arts. 174–181 and 187–192. Arts. 194–196 and 200 also formed a separate MS. with no table of contents and no indication of their intended position.

It was for some time under consideration by the friends of Professor Maxwell, whether the MS. should be published in its fragmentary form or whether it should be completed by another hand, so as to carry out as far as possible the author's original design; but before any decision had been arrived at it was suggested that the book might be made to serve the purposes of students by a selection of Articles from Professor Maxwell's *Electricity and Magnetism*, so as to make it in a sense complete for the portion of the subject covered by the first volume of the last-mentioned work. In accordance with this suggestion, a number of Articles have been selected from the larger book and reprinted. These are indicated by a * after the number of the Article. Arts. 93–98 and 141 are identical with Arts. 118–123 and 58 of the larger treatise, but these have been reprinted in accordance with directions contained in Professor Maxwell's MS.

In the arrangement of the Articles selected from the *Electricity and Magnetism* care has been taken to interfere as little as possible with the continuity of the MS. of the present work, and in some cases logical order has been sacrificed to this object, so that some subjects which are treated briefly in the earlier portions are reintroduced in the latter part of the book. In Chapter XII some articles are introduced from the larger treatise which may appear somewhat inconsistent with the plan of this book; this has been for the sake of the practical value of the results arrived at. The latter part of the note on pages 149 and 150 may be taken as Professor Maxwell's own comment on the method proposed in Art. 186, written a few years subsequently to that Article.

All references, for the accuracy of which Professor Maxwell is not responsible, and all Tables, notes, or interpolations in-

serted by the Editor, are enclosed in square brackets. This system has not been carried out in the table of contents, but the portion of this contained in Professor Maxwell's MS. is stated above.

Of the Author's Preface the portion here given is all that has been found.

W. G.

CAMBRIDGE:
August, 1881.

PREFACE TO THE SECOND EDITION.

WHEN it became necessary to reprint this work, it appeared to some desirable that certain changes should be made, and especially that the articles taken from the larger work of Professor Clerk Maxwell should be omitted. When the first edition was published, very few books on electrical measurements were available to the student; but since that time, the literature of the subject has developed enormously, and there is no longer the same reason for extending this book beyond the limits of the Author's MS. In addition to this some of the Articles taken from the larger book assume a knowledge on the part of the student which is not to be obtained from the chapters of this work. On careful consideration it was, however, thought best that no change should be made, and, except for a few slight corrections, the present edition is simply a reprint of the former.

W. G

NEWCASTLE-UPON-TYNE:
August, 1888.

FRAGMENT OF AUTHOR'S PREFACE.

THE aim of the following treatise is different from that of my larger treatise on electricity and magnetism. In the larger treatise the reader is supposed to be familiar with the higher mathematical methods which are not used in this book, and his studies are so directed as to give him the power of dealing mathematically with the various phenomena of the science. In this smaller book I have endeavoured to present, in as compact a form as I can, those phenomena which appear to throw light on the theory of electricity, and to use them, each in its place, for the development of electrical ideas in the mind of the reader.

In the larger treatise I sometimes made use of methods which I do not think the best in themselves, but without which the student cannot follow the investigations of the founders of the Mathematical Theory of Electricity. I have since become more convinced of the superiority of methods akin to those of Faraday, and have therefore adopted them from the first.

In the first two chapters experiments are described which demonstrate the principal facts relating to electric charge considered as a quantity capable of being measured.

The third chapter, 'on electric work and energy,' consists of deductions from these facts. To those who have some acquaintance with the elementary parts of mathematics, this chapter may be useful as tending to make their knowledge more precise. Those who are not so prepared may omit this chapter in their first reading of the book.

The fourth chapter describes the electric field, or the region in which electric phenomena are exhibited.