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PHYSICS
THE ELEMENTS

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Ταράσσει τοὺς ἀνθρώπους οὐ τὰ πράγματα
ἀλλὰ τὰ περὶ τῶν πραγμάτων δόγματα

It is not the facts, but the explanation of them, that matters

PHYSICS

THE ELEMENTS

BY

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PREFACE

THE object and nature of this book is sufficiently explained in the introduction; here I will only warn the reader who gets no further that, in spite of its title, it is not an elementary treatise on physics. On the other hand, although there is a just prejudice against an author who seeks to disarm criticism, I would explain here how the book came to be written—not in order to explain its faults away, but in order, by giving notice of them, to render them less harmful.

The book was planned in 1904; and from that time onward parts of it were written in the form of separate essays as various problems forced themselves on my attention in the course of the ordinary scientific work which occupied most of my time. Some of these essays have been already published in their original form in various Reviews and in a little book called *The Principles of Electricity* (Jack, 1912). At the end of 1912 all the present chapters, and some others, were written in that form; but since they had been written independently and my views had naturally developed in the writing of them, coordination was needed. I began the work, but was interrupted, first by the preparation of a new edition of another book, and then by the war.

In 1919 an opportunity for completing the book occurred, better than was ever likely to occur again. But it was not entirely favourable; time was limited to eight or nine months, and the work had to be done in the country, without access to libraries or even to my own collection of books. Moreover, I found that I had forgotten about the matter so completely that, at the outset, the manuscript might have been that of an unknown author. It would have been wiser to read it, burn it, and start afresh; but in a mistaken attempt to save time, the old material was used; and though everything except the Introduction has been re-written, at least half of it is practically a mere transcript. There were two reasons for preserving the Introduction with as few alterations as possible. First though, unlike most introductions, it was actually written before the rest of the book, I found that I had really carried out my plan and had stated my intention as well as I could state it now. The second reason is personal piety. When the chapter was first written it was sent to my friend, Charles Donald Robertson, with whom, although his tastes were literary rather than scientific, I had often discussed with much profit the principles of science. It was found among his papers after his death in 1910, and returned to me.

Two faults arise from these circumstances. The coordination of the separate essays is still incomplete, and there are several instances (which I leave the reader to discover, if he is sufficiently interested) where the point of view is rather different in different parts of the book. On the whole I

attach more value to the later portions. The most serious inconsistency arises in a reference in the earlier chapters to Part III, which is not included in the present volume; it was only when half the book was in type that it was decided to omit this Part, both on account of lack of time and because the volume would be too bulky. A summary of some of the conclusions of that Part are given in an appendix.

And here perhaps a brief account should be given of the plan of the remainder of the treatise. Part III, under the title Motion, deals with temporal and spatial conceptions. Part IV, Force, with statics and dynamics, both classical and modern. Part V, Energy, with the doctrine of energy, especially in its application to heat, thermodynamics and radiation. The remaining great branches of Physics, Electricity and other parts of Radiation, do not seem to raise so many fundamental questions as those dealt with in these Parts, and the original plan did not include them. Of these Parts, III is complete in substance but not in form (except for some of the more recent developments of the Theory of Relativity—most of which, however, belong to Part IV); and isolated chapters of Parts IV and V are also done. I have not the remotest idea when, if ever, they will be published. I have been tempted to publish what is already written, after suitable revision, in another volume of about the same size as this. But as it would consist of isolated essays and would not be a complete treatise, it would be so directly contrary to my original idea that I have determined not to abandon the plan, although at present there seems little prospect of carrying it out.

The other fault is a complete lack of reference to the work of others. My large index of references was lost in the disorder of war-time removals, and I had no chance, and no time, to replace it. But perhaps the omission is not an unmixed evil. As is pointed out in the Introduction, there is very little original in the substance of the book; there is hardly a paragraph which is not a paraphrase of something that can be found in well-known treatises or papers. If complete references were given, the notes would be almost as bulky as the text, and the book would be quite unreadable; if they were incomplete, they would probably be misleading and might cause offence. Moreover if anything valuable has been added to a mere compilation of what everyone knew before, it arises from a unity conferred by the passage of all this matter through a single mind; for though the conclusions reached are seldom new, they have not been easy to reach, but represent many hours of strenuous thought and result from many changes of opinion. Such unity, it seems to me, might be destroyed if the reader were constantly reminded of what others have said on the matter, even if they only said the same things in rather different words.

For the same reason I find it difficult to make the usual acknowledgements of prefaces. I have probably read as widely as most people in the ordinary literature of physics and in discussions of the principles of science; and there is none of it to which I am prepared to say that I do not owe valuable ideas. If anybody thinks that anything in the book is of sufficient

PREFACE

vii

worth for them to claim the right to it, I shall gladly acknowledge the claim, and ask them to accept the reasons that have been given for not admitting it beforehand. But for the general train of thought which inspires the whole I can make acknowledgements to my masters, Henri Poincaré and Mr Bertrand Russell; but I fear that the latter (at any rate) will think his pupil anything but a credit to him. Lastly, I would render thanks to a source which does not receive thanks as often as it should. The inspiring authors of *The King's English* would doubtless find the book a mine of the blunders which they hold to scorn so amiably; but it would have been even more fruitful if they had not written.

N. R. C.

KETTLEWELL,
October 1919

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CONTENTS

	PAGE
INTRODUCTION	I

PART I

THE PROPOSITIONS OF SCIENCE

CHAP.		
I.	THE SUBJECT MATTER OF SCIENCE	15
II.	THE NATURE OF LAWS	38
III.	THE NATURE OF LAWS (<i>contd</i>)	56
IV.	THE DISCOVERY AND PROOF OF LAWS	88
V.	THE EXPLANATION OF LAWS	113
VI.	THEORIES	119
VII.	CHANCE AND PROBABILITY	159
VIII.	THE MEANING OF SCIENCE	215
IX.	SCIENCE AND PHILOSOPHY	230

PART II

MEASUREMENT

	X. FUNDAMENTAL MEASUREMENT	267
	XI. PHYSICAL NUMBER	295
	XII. FRACTIONAL AND NEGATIVE MAGNITUDES	310
	XIII. NUMERICAL LAWS AND DERIVED MAGNITUDES	328
	XIV. UNITS AND DIMENSIONS	361
	XV. THE USES OF DIMENSIONS	403
	XVI. ERRORS OF MEASUREMENT; METHODICAL ERRORS	437
	XVII. ERRORS OF MEASUREMENT; ERRORS OF CONSISTENCY AND THE ADJUSTMENT OF OBSERVATIONS	457
	XVIII. MATHEMATICAL PHYSICS	522
	APPENDIX	550
	INDEX	561