A TEXT BOOK OF
PHYSICS

FOR STUDENTS OF SCIENCE AND ENGINEERING

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PREFACE

THE preparation of this volume was undertaken to meet a demand that has been growing for some years past for a text-book of Physical Science which should connect more intimately than has hitherto been usual the scientific aspects of Physics with its modern practical applications. The reader must be left to judge how far the authors have succeeded in thus combining the outlooks of the man of science and the engineer.

The contents have been selected to meet the requirements of various classes of students: those preparing for Intermediate and other examinations of London and other Universities; and those entering for appointments in the Army, Navy, and Civil Service, or offering themselves for examination in Electrical Engineering (Grade I) by the City and Guilds of London Institute.

The book has been arranged in parts, in accordance with the divisions of the subject found convenient in most schools and colleges. Part I, Dynamics, comprises the sections of Mechanics and Applied Mathematics usually studied, and includes sections on motion, statics, and the properties of fluids. Part II, Heat; Part III, Light; Part IV, Sound; and Part V, Magnetism and Electricity; deal respectively with the principles of these subjects and their applications.

Complete courses of laboratory work have been provided in each Part. Many physical laboratories are equipped with apparatus differing in some respects from the instruments here described, nevertheless the guidance given will enable intelligent use to be made of other forms of apparatus designed for the same or similar purposes.

Attention is directed to the experimental treatment of dynamical principles, because its neglect, which is unfortunately common, makes it difficult for a student to secure a thorough and systematic knowledge of physical science. The complete course of experimental work has been devised to meet both the requirements of the physicist and of the engineer; in cases where the methods of treatment adopted by these differ radically, the teacher or student may choose the experiment which best suits his special needs.

In Part V, the treatment of the Dynamo, Telegraph, and so on, is that which follows naturally and logically from the earlier theoretical principles explained; technical considerations of design and construction have been omitted as unsuitable in a text-book of Physics.

A large number of worked-out examples have been included to assist the student to understand the text and to solve the exercises at the ends of the chapters. Many of these exercises have been taken, with the permission of the authorities to whom grateful acknowledgments are made, from examination papers, the source being given in each case. Questions marked L.U. are from examination papers of the London University and those with C.G. from papers of the City and Guilds of London Institute.

Answers have been supplied in the case of numerical exercises, but it is too much to hope that these are entirely free from errors. The authors will welcome any corrections which readers may send to them.

The authors are glad of this opportunity to express their indebtedness to Prof. Sir Richard Gregory and Mr. A. T. Simmons for constant assistance and invaluable hints while the book was in preparation and passing through the press.

J. DUNCAN
1918 S. G. STARLING

A few additions have been made to the Text, together with a large number of exercises. Most of these exercises have been taken from Higher School Certificate examination papers, and for permission to include these grateful acknowledgment is made to the Joint Matriculation Board (J.M.B., H.S.C.) and to the Central Welsh Board (C.W.B., H.C.).

J. D.
1931 S. G. S.

PREFACE TO THE SECOND EDITION

SINCE the publication of the First Edition of this book in 1918, there have been many reprints of it and, in each of these, opportunity has been taken to make minor alterations and additions suggested from time to time by teachers and others. For the present edition, the complete text has been revised and is presented in a new form. In scope and substance, however, the original character of the book has been retained, and the changes which have been made are mainly in the nature of additions. Among these subjects are the continuous flow in heat measurements, the latest velocity of light measurements, and principles of radar and of artificial radioactivity.

Owing to the more general use of the differential and integral calculus, these methods have now been given in various cases, in addition to the longer methods, so that the student may still use the latter, or omitting them may use the shorter treatment. In order to make space for this, certain works such as stresses and strains in structures have been curtailed.

By the regretted death of my colleague, Mr. J. Duncan, in 1941, I have been deprived of his co-operation in the preparation of this edition, but I have retained his method of treatment in the sections of the volume to which he gave particular attention when we worked together.

In revising the works thanks and appreciation are due to Sir Richard Gregory, Bart., F.R.S., for the many valuable suggestions he has made.

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