ELEMENTARY TREATISE ON NATURAL PHILOSOPHY. IN FOUR PARTS, PART I: MECHANICS, HYDROSTATICS, AND PNEUMATICS

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649291694

Elementary treatise on natural philosophy. In four parts, Part I: Mechanics, hydrostatics, and pneumatics by A. Privat Deschanel

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

A. PRIVAT DESCHANEL

ELEMENTARY TREATISE ON NATURAL PHILOSOPHY. IN FOUR PARTS, PART I: MECHANICS, HYDROSTATICS, AND PNEUMATICS

Trieste

ELEMENTARY TREATISE

ON

NATURAL PHILOSOPHY.

BY

A. PRIVAT DESCHANEL,

FORMERLY PROFESSOR OF PHYSICS IN THE LYCÉE LOUIS-LE-GRAND,
INSPECTOR OF THE ACADEMY OF PARIS.

TRANSLATED AND EDITED, WITH EXTENSIVE ADDITIONS,

BY J. D. EVERETT, M.A., D.C.L., F.R.S.E.,

PROFESSOR OF NATURAL PHILOSOPHY IN THE QUEEN'S COLLEGES, BELFAST.

IN FOUR PARTS.

Part I.

MECHANICS, HYDROSTATICS, AND PNEUMATICS.

ILLUSTRATED BY

181 ENGRAVINGS ON WOOD, AND ONE COLOURED PLATE.

LONDON:
BLACKIE & SON, PATERNOSTER BUILDINGS, E.C.
GLASGOW AND EDINBURGH.
1872.

GLASGOW:
W. G. BLACKIE AND CO., PRINTERS,
VILLAFIELD.

DESCHANEL'S NATURAL PHILOSOPHY.

By Professor J. D. Everett, D.C.L.

LITERARY OPINIONS.

"Mr. Everett has done great service to the cause of natural science in England by undertaking, and so faithfully carrying out, a translation of the work of M. Deschanel."—*Educational Reporter.*

"We have no work in our own scientific literature to be compared with it, and we are glad that the translation has fallen into such good hands as those of Professor Everett. . . . The book is a valuable contribution to our scientific literature; it will form an admirable text-book for special science classes in schools; and we look forward with pleasure to the appearance of the remaining portions of the work."—*Quarterly Journal of Science.*

"The clearness of Deschanel's explanations is admirably preserved in the translation, while the value of the treatise is considerably enhanced by some important additions."—*Nature.*

"The treatise is remarkable for the vigour of its style, which specially commends it as a book for private reading; but its leading excellence, as compared with the best works at present in use, is the thoroughly rational character of the information which it presents. . . . As an example of the concise style in which the book is written, it may be mentioned that the explanation of the composition of parallel forces occupies less than three pages; yet we have no hesitation in saying that the information given within that small space will give the student a more thorough and useful insight of the subject than could be acquired from the study of ten times the quantity in many of our best works on Mechanics."—*Scientific Review.*

"It differs principally from other works of the same class in its experimental treatment of the subjects with which it deals; a style which is coming more and more into use in our best elementary class-books. It may be called the common-sense method, as opposed to the theoretical . . . Of course, there have been popular books on mechanical science before, but they have been mostly *too* popular—too light and superficial for any valuable purpose in instruction. The present work does not fall under this category; it seems just to hit the mean between a dry school-book and a popular treatise. . . . Altogether this promises, when finished, to be a most complete and really valuable work, of a kind of which we possess but few."—*Educational Times.*

"In addition to being a good class-book, it is well adapted for private reading, as the style is good and the examples remarkably well chosen."—*Student.*

"All who are familiar with the treatise in its original form will admit that Dr. Everett deserves the thanks of English teachers and students generally, for having furnished them with an admirable translation of three sections of a work which is characterized by those good qualities that are summed up in the old English word 'thoroughness.'"—*Journal of the London Institution.*

"That so much can be compressed into so small a space is the natural wonder of the student of this little work; and were it not for the admirable manner in which the author writes, and has been translated, not one fourth part of the information could have been brought within the space."—*Engineering.*

AUTHOR'S PREFACE.

THE importance of the study of Physics is now generally acknowledged. Besides the interest of curiosity which attaches to the observation of nature, the experimental method furnishes one of the most salutary exercises for the mind—constituting in this respect a fitting supplement to the study of the mathematical sciences. The method of deduction employed in these latter, while eminently adapted to form the habit of strict reasoning, scarcely affords any exercise for the critical faculty which plays so important a part in the physical sciences. In Physics we are called upon, not to deduce rigorous consequences from an absolute principle, but to ascend from the particular consequences which alone are known to the general principle from which they flow. In this operation there is no absolutely certain method of procedure, and even relative certainty can only be attained by a discussion which calls into profitable exercise all the faculties of the mind.

Be this as it may, physical science has now taken an important place in education, and plays a prominent part in the examinations for the different university degrees. The present treatise is intended for the assistance of young men preparing for these degrees; but I trust that it may also be read with profit by those persons who, merely for purposes of self-instruction, wish to acquire accurate knowledge of natural phenomena. Having for nearly twenty years been charged with the duty of teaching from the chair of Physics in one of the lyceums of Paris, I have been under the necessity of making continual efforts to overcome the inherent difficulties of this branch of study. I have endeavoured to turn to account the experience thus acquired in the preparation of this volume, and I shall

be happy if I can thus contribute to advance the taste for a science which is at once useful and interesting.

For the convenience of candidates for the Bachelor's degree, I have appended to this treatise a number of problems, most of which have been taken from the examinations of the Faculty of Sciences of Paris or of the departments. With the same view I have made it my object to omit from the work none of the formulæ which are usually required for the solution of such questions. Beyond this point I have made very limited use of algebra. Though calculation is a precious and often indispensable auxiliary of physical science, the extent to which it can be advantageously employed varies greatly according to circumstances. There are in fact some phenomena which cannot be really understood without having recourse to measurement; but in a multitude of cases the explanation of phenomena can be rendered evident without resorting to numerical expression. In such cases calculation is of secondary importance, and may be said to be merely practical.

The physical sciences have of late years received very extensive developments. Facts have been multiplied indefinitely, and even theories have undergone great modifications. Hence arises considerable difficulty in selecting the most essential points and those which best represent the present state of science. I have done my best to cope with this difficulty, and I trust that the reader who attentively peruses my work, will be able to form a pretty accurate idea of the present position of physical science. I shall be happy in a second edition to avail myself of any observations which may be communicated to me on this or any other point.

TRANSLATOR'S PREFACE.

THE "TRAITÉ ÉLÉMENTAIRE DE PHYSIQUE" of Professor Deschanel, though only published in 1868, has already obtained a high reputation in France, and has been adopted by the Minister of Instruction as the text-book for Government Schools.

I did not consent to undertake the labour of translating and editing it till a careful examination had convinced me that it was better adapted to the requirements of my own class of Experimental Physics than any other work with which I was acquainted; and in executing the translation I have steadily kept this use in view, believing that I was thus adopting the surest means of meeting the wants of teachers generally.

The treatise of Professor Deschanel is remarkable for the vigour of its style, which specially commends it as a book for private reading. But its leading excellence, as compared with the best works at present in use, is the thoroughly rational character of the information which it presents. There is great danger in the present day lest science-teaching should degenerate into the accumulation of disconnected facts and unexplained formulæ, which burden the memory without cultivating the understanding. Professor Deschanel has been eminently successful in exhibiting facts in their mutual connection; and his applications of algebra are always judicious.

The peculiarly vigorous and idiomatic style of the original would be altogether unpresentable in English; and I have not hesitated in numerous instances to sacrifice exactness of translation to effective rendering, my object being to make the book as useful as possible to English readers. For the same reason I have not scrupled to suppress or modify any statement, whether historical or philosophical, which I deemed erroneous or defective. In some instances I have endea-

voured to simplify the reasonings by which propositions are established or formulæ deduced.

As regards weights and measures, rough statements of quantity have generally been expressed in British units; but in many cases the numerical values given in the original, and belonging to the metrical system, have been retained, with or without their English equivalents; as it is desirable that all students of science should familiarize themselves with a system of weights and measures which affords peculiar facilities for scientific calculation, and is extensively employed by scientific men of all countries. For convenience of reference, a complete table of metrical and British equivalents has been annexed.

The additions, which have been very extensive, relate either to subjects generally considered essential in this country to a treatise on Natural Philosophy, or to topics which have in recent years occupied an important place in physical discussions, though as yet but little known to the general public.

The sections distinguished by a letter appended to a number are all new; as also are all foot-notes, except those which are signed with the Author's initial "D."

In many instances the new matter is so interwoven with the old that it could not conveniently be indicated; and I have aimed at giving unity to the book rather than at preserving careful distinctions of authorship.

Comparison with the original will however be easy, as the numbering of the original sections has been almost invariably followed.

The chief additions in Part I. (Chap. i.–xviii.) have been under the heads of Dynamics, Capillarity, and the Barometer. The chapter on Hydrometers has also been recast.

ADVERTISEMENT TO REPRINT OF PART I.

The first impression of Part I. having been exhausted, opportunity has been taken, in the present reprint, to extend the Table of Contents, and to make a few unimportant corrections and additions in the body of the work.