

**NEWTON'S PRINCIPIA. FIRST BOOK,  
SECTIONS I, II, III. WITH NOTES AND  
ILLUSTRATIONS AND A COLLECTION OF  
PROBLEMS PRINCIPALLY INTENDED AS  
EXAMPLES OF NEWTON'S METHODS.  
[LONDON-1900]**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649657520

Newton's Principia. First Book, Sections I, II, III. With Notes and Illustrations and a Collection of Problems Principally Intended as Examples of Newton's Methods. [London-1900] by Percival Frost

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.  
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

[www.triestepublishing.com](http://www.triestepublishing.com)

**PERCIVAL FROST**

**NEWTON'S PRINCIPIA. FIRST BOOK,  
SECTIONS I, II, III. WITH NOTES AND  
ILLUSTRATIONS AND A COLLECTION OF  
PROBLEMS PRINCIPALLY INTENDED AS  
EXAMPLES OF NEWTON'S METHODS.  
[LONDON-1900]**



FIRST THREE SECTIONS OF THE FIRST BOOK  
OF  
NEWTON'S PRINCIPIA.



# NEWTON'S PRINCIPIA

FIRST BOOK SECTIONS I. II. III.

WITH

NOTES AND ILLUSTRATIONS

AND A

COLLECTION OF PROBLEMS

PRINCIPALLY INTENDED AS EXAMPLES OF NEWTON'S METHODS

BY

PERCIVAL FROST D.Sc. F.R.S.

FELLOW AND MATHEMATICAL LECTURER OF KING'S COLLEGE;  
FORMERLY FELLOW OF ST. JOHN'S COLLEGE.

Fifth Edition

*Principiis enim cognitis, multo facilius extrema intelligetis.*—CICERO.

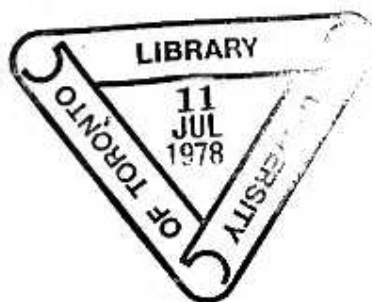
London

MACMILLAN AND CO. LIMITED,

NEW YORK: THE MACMILLAN COMPANY

1900

[All rights reserved]



CAMBRIDGE :

PRINTED (FROM PLATES) BY MEDICALS & CO LTD., TRINITY STREET AND ROSE CRESCENT.

1900.

QA  
803  
F7  
1900



## PREFACE.

---

IN publishing the following work my principal intention is to explain difficulties which may be encountered by the student on first reading the *Principia*, and to illustrate the advantages of a careful study of the methods employed by Newton, by shewing the extent to which they may be applied in the solution of problems. I have also endeavoured to give assistance to the student who is engaged in the study of the higher branches of Mathematics, by representing in a geometrical form several of the processes employed in the Differential and Integral Calculus, and in the analytical investigations of Dynamics.

In my version of the first section and the beginning of the second I have adhered as closely as I could to the original form; and, in the cases in which sections have been interpolated, or the form of demonstration changed, I have indicated such changes and interpolations by brackets.

It is generally advisable not to deviate from Newton's words in the demonstrations of the Lemmas; but in many cases, I suppose purposely, he expressed himself very concisely, as in Lemmas iv. and x., and he was contented with simply giving the enunciation of Lemma v.; therefore in these cases interpolations have been made which, I believe, are in accordance with Newton's plan of demonstration.

Throughout the Problems and Theorems which depend upon the sixth proposition, the variations are replaced by equations. By this method of treating the subject I conceive that clearer ideas of the meaning of each step are obtained by the student.

In this edition I have introduced some notes on the geometrical solution of some problems relating to maxima and minima, and I have placed the investigations of the properties of the curves, which, after the conic sections, are the best examples for illustrating geometrical methods, in a more prominent position, at the end of the first section.

I have derived great assistance in the preparation of my notes from the study of Whewell's *Method of Limits*, and from several early editions of *Newton*, especially that of Carr.

With respect to the three Laws of Motion, I may remark that I have not commenced the work by enunciating and making observations upon them, partly because I should only have been repeating

what has been said so well by Thompson, Tait, and Maxwell, whose works are in everybody's hands, and partly because in the course of reading recommended to students, for whose benefit my work was especially intended, those laws will have been already discussed in the elementary treatises on Dynamics.

The Problems are principally selected from the papers set in the Mathematical Tripos, and in the course of the College Examinations, and I have generally divided them into two portions, the first of which contains those problems which are capable of solution by more direct applications of the propositions which they illustrate, and are within the powers of a larger number of students. In both portions I have been careful to introduce very few problems which are not capable of solution by methods given in the work.

At the end of the work I have given hints for the solution, and in many cases complete solutions, of the problems; and in doing so I am acting in direct opposition to my previously expressed opinion, but additional experience of fifteen years has shewn me that it a satisfaction to a student who has not been able to solve a problem to see a solution of it; and, even when he has been successful, to compare his solution with that of an older hand. The principal objection to the publication of solutions