

**THE ELEMENTS OF DYNAMICS
(MECHANICS), WITH
NUMEROUS EXAMPLES AND
EXAMINATION QUESTIONS**

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The Elements of Dynamics (Mechanics), with Numerous Examples and Examination Questions
by James Blaikie

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JAMES BLAIKIE

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AND
EXAMINATION QUESTIONS

BY

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PREFACE.

THE object of this treatise is to provide a manual on what has been generally known as the "Elements of Mechanics," but is here, in accordance with the more precise phraseology of recent works, termed "Dynamics."

As the work is intended for beginners, special pains have been taken to establish the necessary propositions by proofs involving no higher mathematics than the geometry of the first two books of Euclid, and algebra as far as simple equations. At the same time, the nomenclature, definitions, and general treatment are in harmony with advanced modern works on the subject.

Examples and examination questions have been introduced into the text, in order to furnish all who make use of the book with the means of testing, as they proceed, whether each portion of the subject has been duly mastered. A selection of examination papers from those set in various Universities has been added. Most of the general examples which follow each chapter are also taken from University Examinations. Answers are given in each case, and all points likely to present difficulty to beginners are explained.

PREFACE.

I gladly embrace this opportunity of thanking the many friends who have aided me. My special acknowledgments are due to Professor Balfour Stewart, of Owen's College, at whose suggestion I undertook the work; to Professor Tait, of Edinburgh University, for his ever ready encouragement and advice; and to the Rev. N. M. Ferrera, of Gonville and Caius College, and Mr J. S. Mackay, of the Edinburgh Academy, for their kind assistance in revising proof sheets.

JAMES BLAIKIE.

EDINBURGH, *February* 1878.

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CHAPTER I.

PRELIMINARY.

1. Natural Philosophy.—NATURAL PHILOSOPHY *treats of the Laws of the Material World.* It is concerned with the five fundamental ideas of *Time, Space, Motion, Matter, and Force.* Each of these ideas is the subject of a particular science. The five corresponding sciences are *Algebra, Geometry, Kinematics, Physics, and Dynamics.* The present work contains the elementary parts of Kinematics and Dynamics. It assumes a knowledge of Algebra as far as simple equations, and of the Geometry contained in the first two books of Euclid.

2. Dynamics.—DYNAMICS *treats of the action of Force.*

FORCE *is any cause which tends to alter a body's state of rest, or of uniform motion in a straight line.*

KINEMATICS *treats of Motion without reference to Force.* It is a branch of pure Mathematics, and a necessary preliminary to Dynamics.

When more forces than one act on a body, their effect is either (1) to produce or change motion, or (2) to maintain rest or prevent change of motion.

Hence Dynamics is divided into two parts—*Kinetics and Statics.*

KINETICS *treats of the action of Force in producing or changing Motion.*

STATICS *treats of the action of Force in maintaining Rest or preventing change of Motion.*