

**MATHEMATICAL  
SERIES. MANUAL  
OF MECHANICS**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649483266

Mathematical Series. Manual of Mechanics by Samuel Houghton

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)

**SAMUEL HAUGHTON**

**MATHEMATICAL  
SERIES. MANUAL  
OF MECHANICS**



32396

GALBRAITH & HAUGHTON'S SCIENTIFIC MANUALS.

*MATHEMATICAL SERIES.*

MANUAL  
OF  
MECHANICS.

BY

THE REV. SAMUEL HAUGHTON, M.D., F.R.S.,

FELLOW OF TRINITY COLLEGE,  
AND PROFESSOR OF GEOLOGY IN THE UNIVERSITY OF DUBLIN.



*NEW EDITION.*

LONDON:  
LONGMANS, GREEN, AND CO.  
1866.

DUBLIN :  
Printed at the University Press,  
BY M. H. GILL.

# CONTENTS.

	PAGE.
INTRODUCTION, . . . . .	1

## STATICS.

### CHAPTER I.

#### ON FORCES MEETING AT A POINT.

1. Direction of a Force.—2. Magnitude of a Force.—3. Representation of Forces by Lines.—4. Composition of Forces.—5. Duchayla's Proof of the Composition of Forces.—6. The Principle of Moments, . . . . .	2
--	---

### CHAPTER II.

#### ON PARALLEL FORCES.

1. Composition of Parallel Forces.—2. Archimedes' Proof of the Composition of Parallel Forces.—3. Principle of Moments.—4. Centre of Parallel Forces.—5. Centre of Gravity, . . . . .	21
---	----

### CHAPTER III.

#### ON MACHINES IN EQUILIBRIUM.

1. Principle on which Equilibrium of Machines is determined.—2. The Lever.—3. The Wheel and Axle.—4. The Inclined Plane.—5. The Moveable Inclined Plane.—6. The Screw.—7. The Pulley, . . . . .	40
---	----

### CHAPTER IV.

#### ON FRICTION OR ADHESION.

1. Angle of Friction.—2. Laws of Adhesion.—3. The Lever.—4. The Wheel and Axle.—5. The Inclined Plane.—6. The Screw, . . . . .	64
--	----

A. C. M. P. J. 80-6-37

CONTENTS.

CHAPTER V.

ON THE EQUILIBRIUM OF FORCES IN A PLANE.

PAGE.

1. Equilibrium of two Forces in a Plane.—2. Equilibrium of three or more Forces meeting at a Point.—3. On the Transference of Forces in a Plane.—4. On the Equilibrium of Pairs or Twists.—5. Equilibrium of three or more Forces in a Plane, not meeting in the same Point, . . . . . 77

---

DYNAMICS.

CHAPTER I.

DEFINITIONS AND LAWS OF MOTION.

1. Motion, or Velocity.—2. Quantity of Matter and Motion.—3. Composition of Velocities.—4. Laws of Motion, . . . 81

CHAPTER II.

ON THE WORK DONE BY AGENTS OR MACHINES MOVING UNIFORMLY.

1. Work done by a Force.—2. Constancy of Work done by a Force in a Machine moving uniformly.—3. The Lever.—4. The Wheel and Axle.—5. The Inclined Plane.—6. The Screw.—7. The Pulley.—8. The Gain in Power is Loss in Time.—9. Effect of Friction on Machines moving uniformly, 94

CHAPTER III.

ON RECTILINEAR MOTION AND CONSTANT FORCE.

1. Relation between Velocity and Time.—2. Relation between Space and Time.—3. Relation between Velocity and Space.—4. Motion of Falling Bodies.—5. Motion of Bodies on Inclined Planes.—6. Experimental Proofs of the Laws of Rectilinear Motion, . . . . . 113



CONTENTS.

CHAPTER IV.

ON UNIFORM CIRCULAR MOTION.

1. Centrifugal Force.—2. Diurnal Rotation of the Earth, . . . PAGE  
182

CHAPTER V.

ON THE PENDULUM.

- 1.—Motion of a Body down a System of Inclined Planes.—2. Velocity acquired by a Heavy Body in falling down a Circular Arc.—3. Time of falling down a Circular Arc.—4. The Simple Pendulum.—5. Acceleration due to Change of Place.—6. Acceleration due to Change of Length, . . . 141

CHAPTER VI.

ON THE COLLISION OF BODIES.

1. Elasticity of Bodies.—2. Impact of Bodies upon Plane Obstacles.—3. Collision of Bodies in Motion.—4. Coefficient of Elasticity, . . . . . 152

CHAPTER VII.

ON PROJECTILES

1. Motion of a heavy Body projected obliquely.—2. Expression for the Direction and Velocity.—3. Time of Flight on a Horizontal Plane.—4. Range on a Horizontal Plane.—5. Greatest Vertical Height over a Horizontal Plane.—6. Time of Flight on an Oblique ascending Plane.—7. Range on an Oblique ascending Plane.—8. Time and Range on an Oblique descending Plane.—9. The Velocity and Angle of Projection of a Trajectory, two Points in which are given.—10. Velocity of Discharge, . . . . . 161

- 
- MECHANICAL GYMNASIUM, containing Miscellaneous Exercises for the Use of the Learner, . . . . . 173

The learner commencing **Mechanics** is recommended to study carefully the following Course, before reading the remaining Chapters of the Book:—

**STATICS**—Chap. I., omitting Sect. 5; Chap. II., omitting Sect. 2; Chap. III.

**DYNAMICS**—Chap. I.; Chap. II.; Chap. III.

# MECHANICS.

---

## INTRODUCTION.

**MECHANICS** is the science which treats of the effects of force, whatever may be the source or origin of that force. We are acquainted with two kinds of effects produced by force, viz., pressure and motion. For our knowledge of the first we are indebted to our muscular sense; the latter is made known to us by two of our senses, sight and touch. **Mechanics** is, therefore, naturally divided into two branches, which treat respectively of these two effects of forces. The first branch of **Mechanics**, which treats of pressure, is called **Statics**; and the second branch, which treats of motion, is called **Dynamics**. We shall proceed, without further explanation or definition, to exhibit the elements of these two departments of **Mechanics**.