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History of the Inductive Sciences

A central figure in Victorian science, William Whewell (1794–1866) held professorships in Mineralogy and Moral Philosophy at Trinity College, Cambridge, before becoming Master of the college in 1841. His mathematical textbooks, such as *A Treatise on Dynamics* (1823), were instrumental in bringing French analytical methods into British science. This three-volume history, first published in 1837, is one of Whewell's most famous works. Taking the 'acute, but fruitless, essays of Greek philosophy' as a starting point, it provides a history of the physical sciences that culminates with the mechanics, astronomy, and chemistry of 'modern times'. Volume 2 focuses on the rise and development of modern mechanics in the seventeenth century. Whewell shows how Galileo's laws of motion exemplify a paradigmatic shift from 'formal' to 'physical' sciences – a new approach concerned with explaining causes rather than merely observing phenomena. It also discusses the implications for physical astronomy of Newton's discoveries.

History of the Inductive Sciences

From the Earliest to the Present Times

VOLUME 2

WILLIAM WHEWELL

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HISTORY

OF THE

INDUCTIVE SCIENCES.

VOL. II.

HISTORY

OF THE

INDUCTIVE SCIENCES,

FROM THE EARLIEST TO THE PRESENT TIMES.

BY THE

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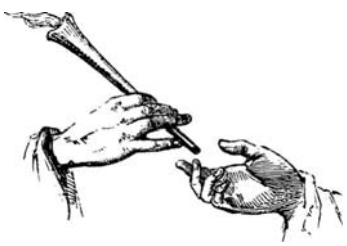
FELLOW AND TUTOR OF TRINITY COLLEGE, CAMBRIDGE; PRESIDENT OF THE GEOLOGICAL SOCIETY OF LONDON.

IN THREE VOLUMES.



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ADDITIONAL CORRECTION IN VOL. II.

Page 105, line 14. Euler was the true author of the method of the *variation of elements*. The first essay of this method appears in a memoir in 1749; and it was further developed in another memoir in 1756, ten years before that of Lagrange mentioned in the text. See Laplace, Mécanique Celeste, livre xv., page 305, 310.

A

HISTORY

OF

THE INDUCTIVE SCIENCES,

&c.

VOLUME THE SECOND.

As pilot well expert in perilous wave
That to a steadfast star his course hath bent,
When foggy mists or cloudy tempests have
The faithful light of that fair lamp yblent,
And covered heaven with hideous dreriment;
Upon his card and compas firms his eye,
The maysters of his long experiment,
And to them does the steddy helm apply,
Bidding his winged vessel fairly forward fly.

SPENSER, *Faerie Queen*, b. ii. c. 7.

BOOK VI.

THE MECHANICAL SCIENCES.

HISTORY OF MECHANICS,

INCLUDING

FLUID MECHANICS.

ΚΡΑΤΟΣ ΒΙΑ ΤΕ, σφῷν μὲν ἐντολὴ Διὸς
Ἔχει τέλος δὴ, κ' οὐδὲν ἐμποδὼν ἔτι.

ÆSCHYLUS. *Prom. Vinct.* 13.

You, FORCE and POWER, have done your destined task;
And nought impedes the work of other hands.

INTRODUCTION.

WE enter now upon a new region of the human mind. In passing from Astronomy to Mechanics we make a transition from the *formal* to the *physical* sciences;—from time and space to force and matter;—from *phenomena* to *causes*. Hitherto we have been concerned only with the paths and orbits, the periods and cycles, the angles and distances, of the objects to which our sciences applied; namely, the heavenly bodies. How these motions are produced;—by what agencies, impulses, powers, they are determined to be what they are;—of what nature are the objects themselves;—are speculations which we have hitherto not dwelt upon. The history of such speculations now comes before us; but, in the first place, we must consider the history of speculations concerning motion in general, terrestrial as well as celestial. We must first attend to Mechanics, and afterwards return to Physical Astronomy.

In the same way in which the developement of pure mathematics, which began with the Greeks, was a necessary condition of the progress of formal astronomy, the creation of the science of mechanics now became necessary to the formation and progress of physical astronomy. Geometry and mechanics

were cultivated for their own sakes; but they supplied ideas, language, and reasoning to other sciences. If the Greeks had not cultivated Conic Sections, Kepler could not have superseded Ptolemy; if the Greeks had cultivated Dynamics, Kepler might have anticipated Newton.