THE PRINCIPLES OF MECHANICS: DESIGNED FOR THE USE OF STUDENTS IN THE UNIVERSITY

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JAMES WOOD

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Trieste

THE PRINCIPLES

OF

MECHANICS:

DESIGNED FOR THE USE OF STUDENTS
IN THE UNIVERSITY.

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CONTENTS.

	Page
ON Matter and Motion	3
On the Laws of Motion	19
On the Composition and Resolution of Motion	33
On the Mechanical Powers	49
On the Center of Gravity	95
On the Collision of Bodies	113
On accelerated and retarded Motion	134
On the Oscillation of Bodies	156
On Projectiles	183
APPENDIX. *Action of Bodies on Machines in Motion*	200

THE PRINCIPLES

OF

MECHANICS.

THE term *Mechanics* has at different times, and by different writers, been applied to branches of science essentially distinct from each other. It was originally confined to the doctrine of equilibrium, or the investigation of the proportion of powers when they balance each other.

Later writers, adapting the term to their discoveries, have used it to denote that science which treats of the nature, production, and alteration of motion; giving to the former branch, by way of contra-distinction, the name of Statics.

Others, giving the term a still more comprehensive meaning, have applied it to both these sciences.

None of these definitions will exactly suit our present purpose; the first being too contracted; and the others much too extensive, for a treatise which is intended to be an introduction only, to the higher

branches of philosophy. Our system of Mechanics will comprise the doctrine of equilibrium, and so much of the science of motion as is necessary to explain the effects of impact and gravity.

SECTION I.

ON MATTER AND MOTION.

DEFINITIONS.

ART. (1.) *MATTER* is a substance, the object of our senses, in which are always united the following properties; *extension*, *figure*, *solidity*, *mobility*, *divisibility*, *gravity*, and *inactivity*.

(2.) *Extension* may be considered in three points of view: 1st. As simply denoting the part of space which lies between two points, in which case it is called *distance*. 2d. As implying both length and breadth, when it is denominated *surface* or *area*. 3d. As comprising three dimensions, length, breadth, and thickness; in which case it may be called *bulk*, *capacity*, or *content*. It is used in the last of these senses when it is said to be a property of matter.

(3.) *Figure* is the boundary of extension. The portions of matter, from which we receive our ideas of this substance, are bounded; that is, they have figure.

(4.) *Solidity* is that property of matter by which it fills space; or, by which any portion of matter

excludes every other portion from that part of space which it occupies; and thus it is capable of resistance and protrusion. "There is no idea which we receive more constantly from sensation than *solidity*. Whether we move or rest, in what posture soever we are, we always feel something under us that supports us, and hinders our farther sinking downwards; and the bodies which we daily handle make us perceive that, whilst they remain between them, they do by an insurmountable force hinder the approach of the parts of our hands that press them *."

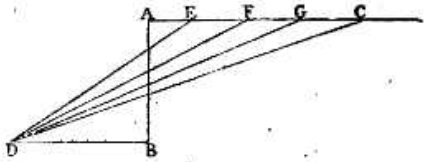
(5.) *Mobility*, or a capacity of being transferred from one place to another, is a quality found to belong to all bodies upon which we can make suitable experiments; and hence we conclude that it belongs to all matter.

(6.) *Divisibility* signifies a capacity of being separated into parts. That matter is thus divisible, our daily experience assures us. How far the division can actually be carried, is not so easily seen. We know that many bodies may be reduced to a very fine powder by trituration; by chemical solution, the parts of a body may be so far divided as not to be sensible to the sight; and by the help of the microscope we discover myriads of organized bodies, totally unknown before such instruments were invented. These and similar considerations, lead us to conclude, that the division of matter is carried to a degree of minuteness far exceeding the bounds of our faculties; and it seems not unreasonable to suppose, that this capacity of division is without limit; especially, as we can

* Locke's Essay, B. II. Ch. IV.

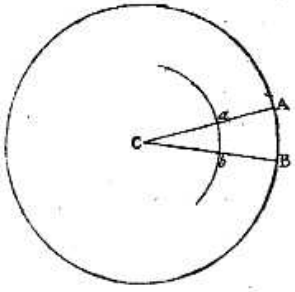
prove, theoretically, that any portion of extension is divisible into parts less and less without end*.

From the extremities of the line *AB*, draw *AC*, *BD*, parallel to each other, and in opposite directions; in *AC* take any number of points *E*, *F*, *G*, &c. and



join *DE*, *DF*, *DG*, &c. these lines will cut *AB* in different points; and since, in the indefinite line *AC*, an unlimited number of points may be taken, the number of parts into which *AB* is divisible, is indefinite.

This property of extension may also be proved



ex absurdo. If possible, let *AB* be the least portion

* Porro corporum partes divisas et sibi mutuò contiguas ab invicem separari posse ex phænominis novimus, et partes indivisas in partes minores ratione distingui posse ex mathematicâ certum est.