Newton versus Descartes on the Exactness of Mathematics

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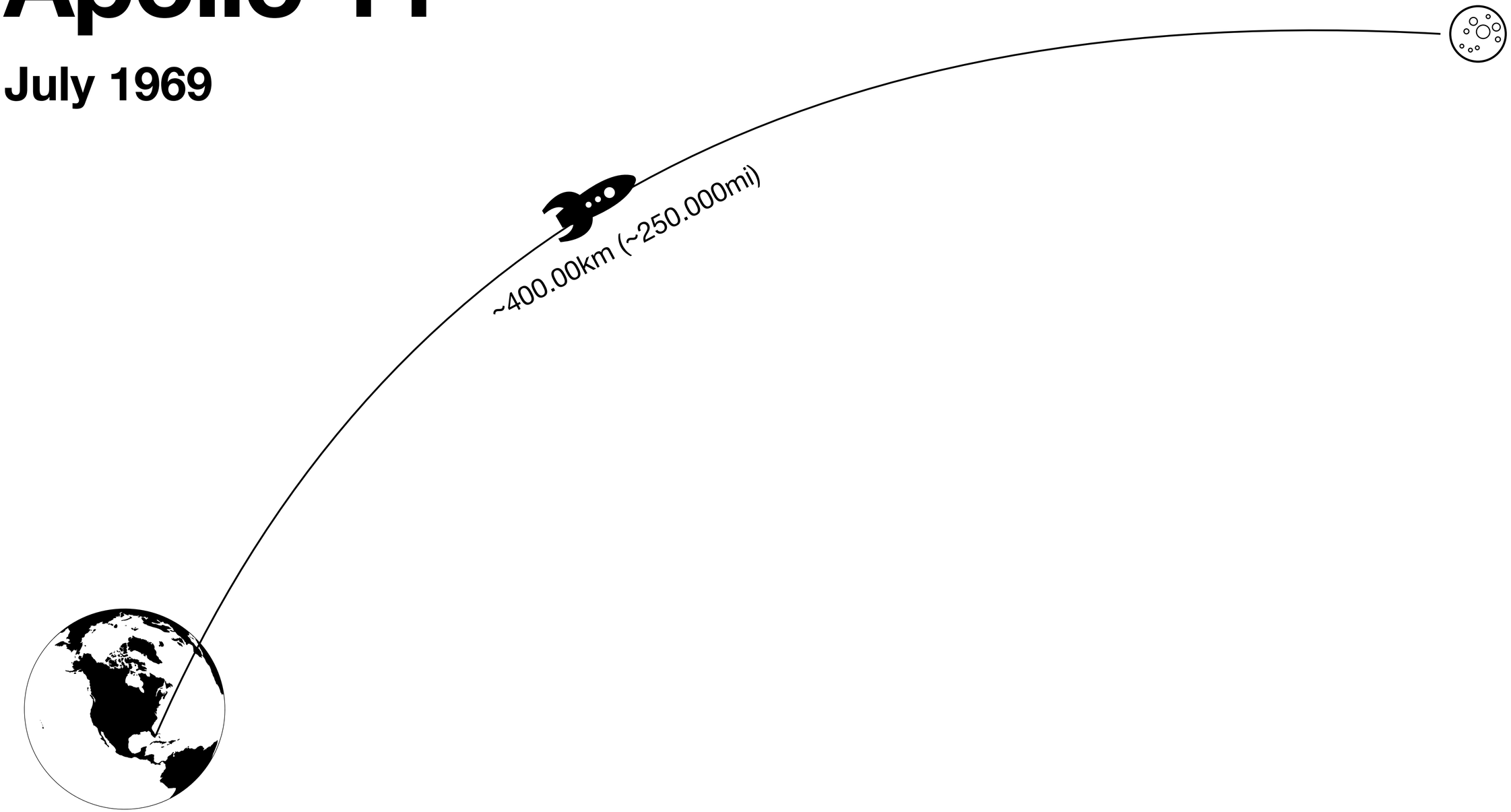
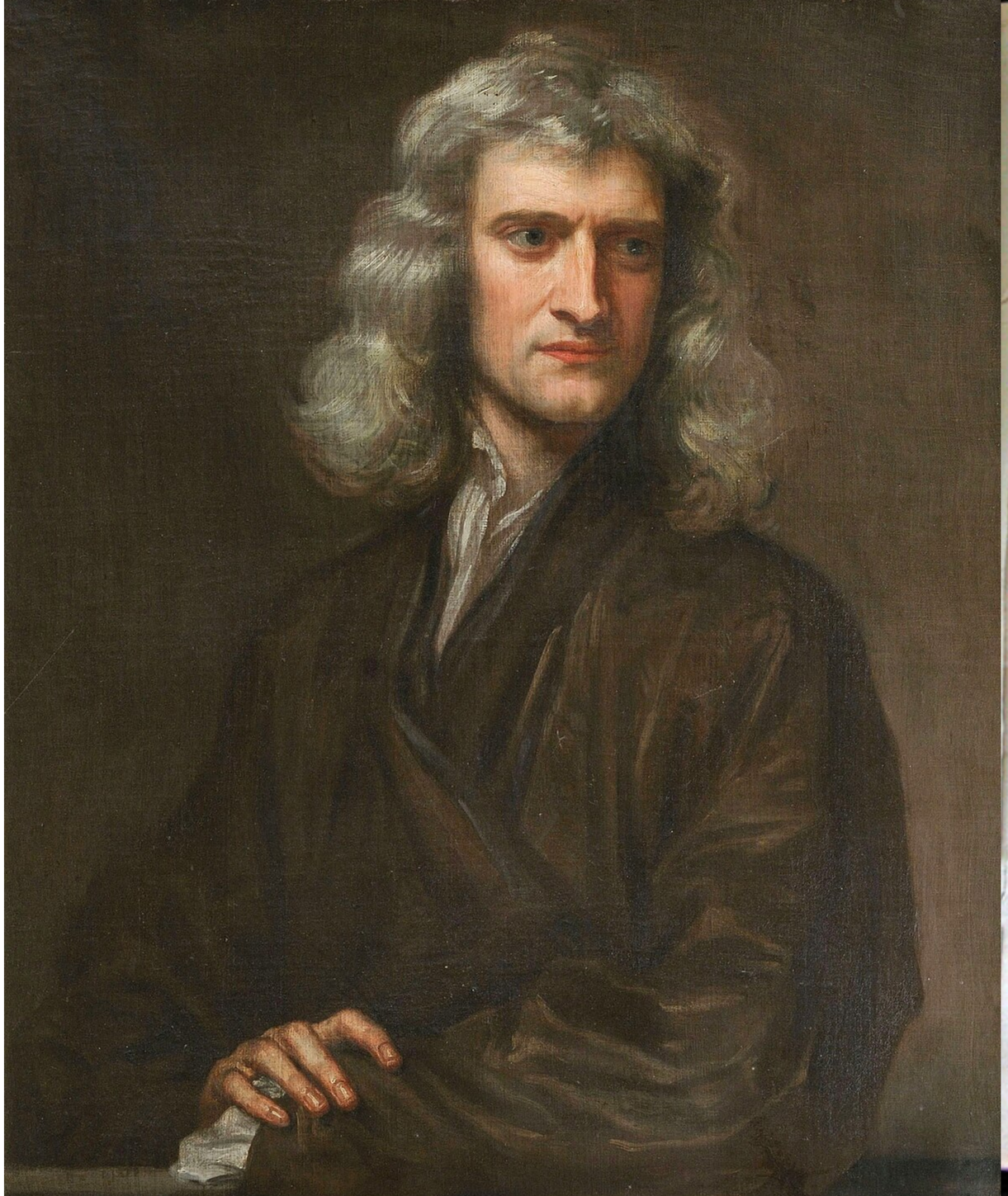
Apollo 11

July 1969





PHILOSOPHIÆ NATURALIS PRINCIPIA MATHEMATICA.

Autore *J. S. NEWTONO* Trin. Coll. Cantab. Soc. Matheseos Professore *Lucasiano*, & Societatis Regalis Sodali.

IMPRIMATUR.
S. PEPYS, *Reg. Soc.* PRÆSES.
Julii 5. 1686.

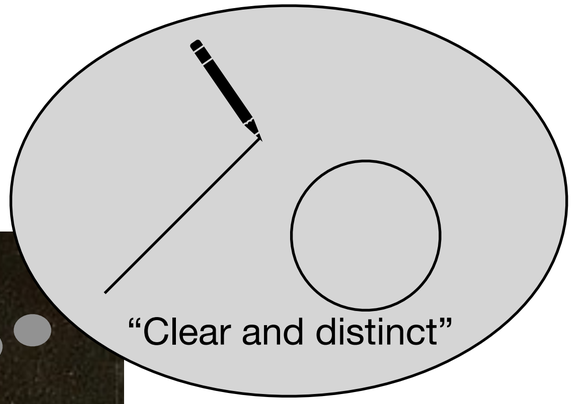
LONDINI,

Jussu *Societatis Regiæ* ac Typis *Josephi Streater*. Prostat apud plures Bibliopolas. *Anno* MDCLXXXVII.

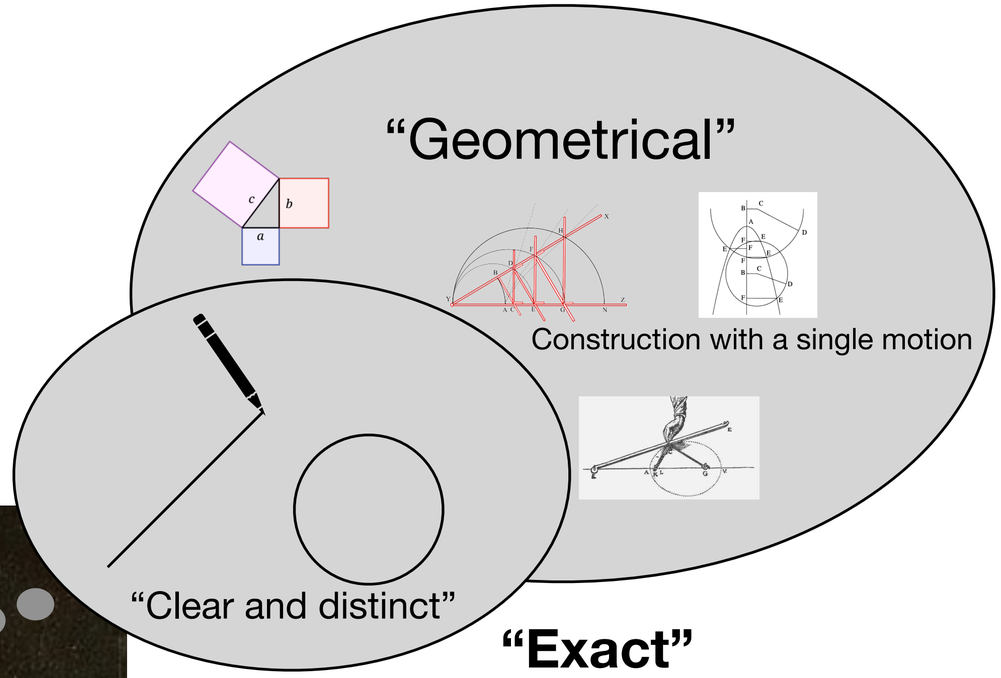
Descartes

“… if we make the usual assumption that geometry is precise and exact, while mechanics is not, ….” *(Descartes, La Géométrie)*

Descartes



Descartes

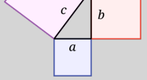

“Geometrical”
c
b
a
Construction with a single motion
“Clear and distinct”
“Exact”

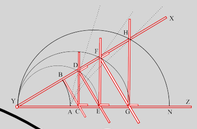
Descartes

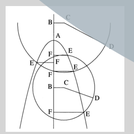
“Clear and distinct”

“Exact”

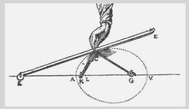
“Geometrical”



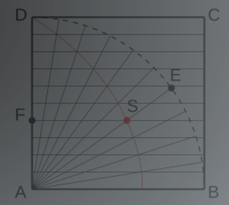




Construction with a single motion



“Mechanical”



Construction with multiple motions

“Inexact”

Inexactness

Newton

Newton

“Geometry and mechanics are distinguished not inasmuch as they are more and less exact, but in the use and end of their disciplines. The purpose of mechanics is to form and move magnitudes in appointed figures and motions: that of geometry is neither to form nor move magnitudes, but merely to measure them. Geometry forms nothing except modes of measuring.”

(Newton, Geometry: the first Book, Math Papers 7 p.291)

Newton

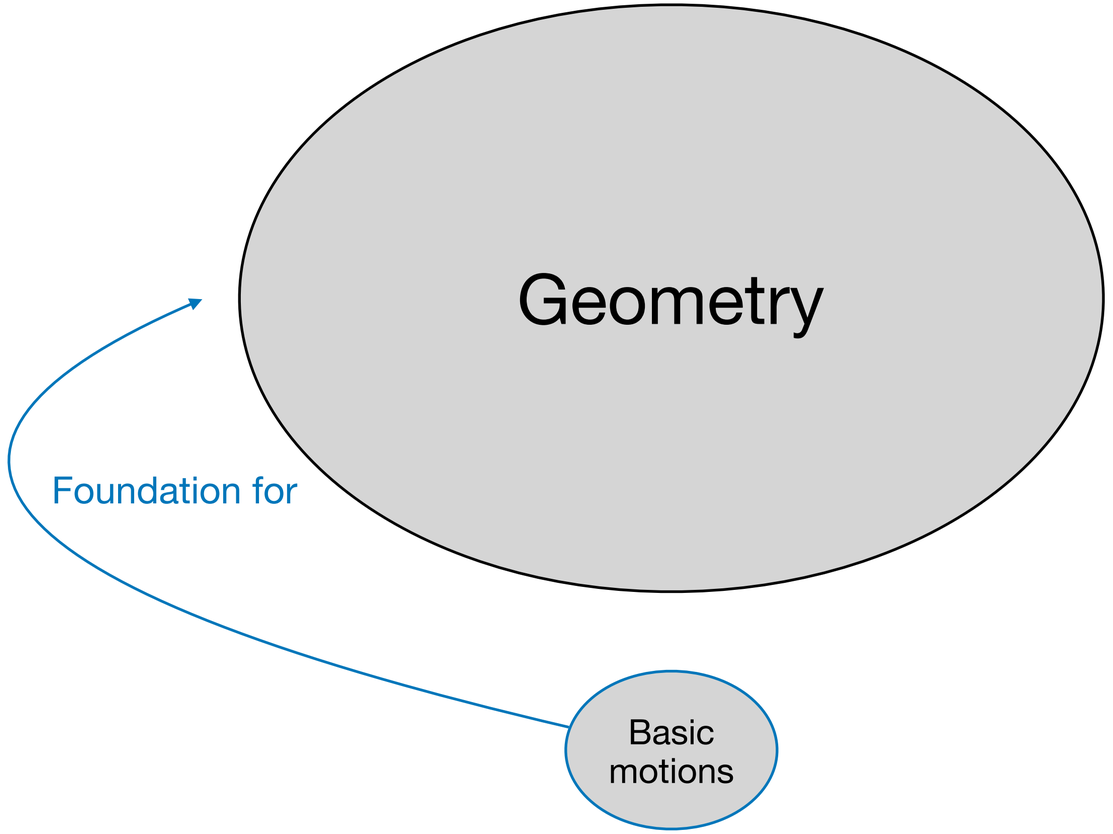
- Descartes: geometry is the foundation for mechanics
- Newton: mechanical operations are the foundation for geometry

Newton

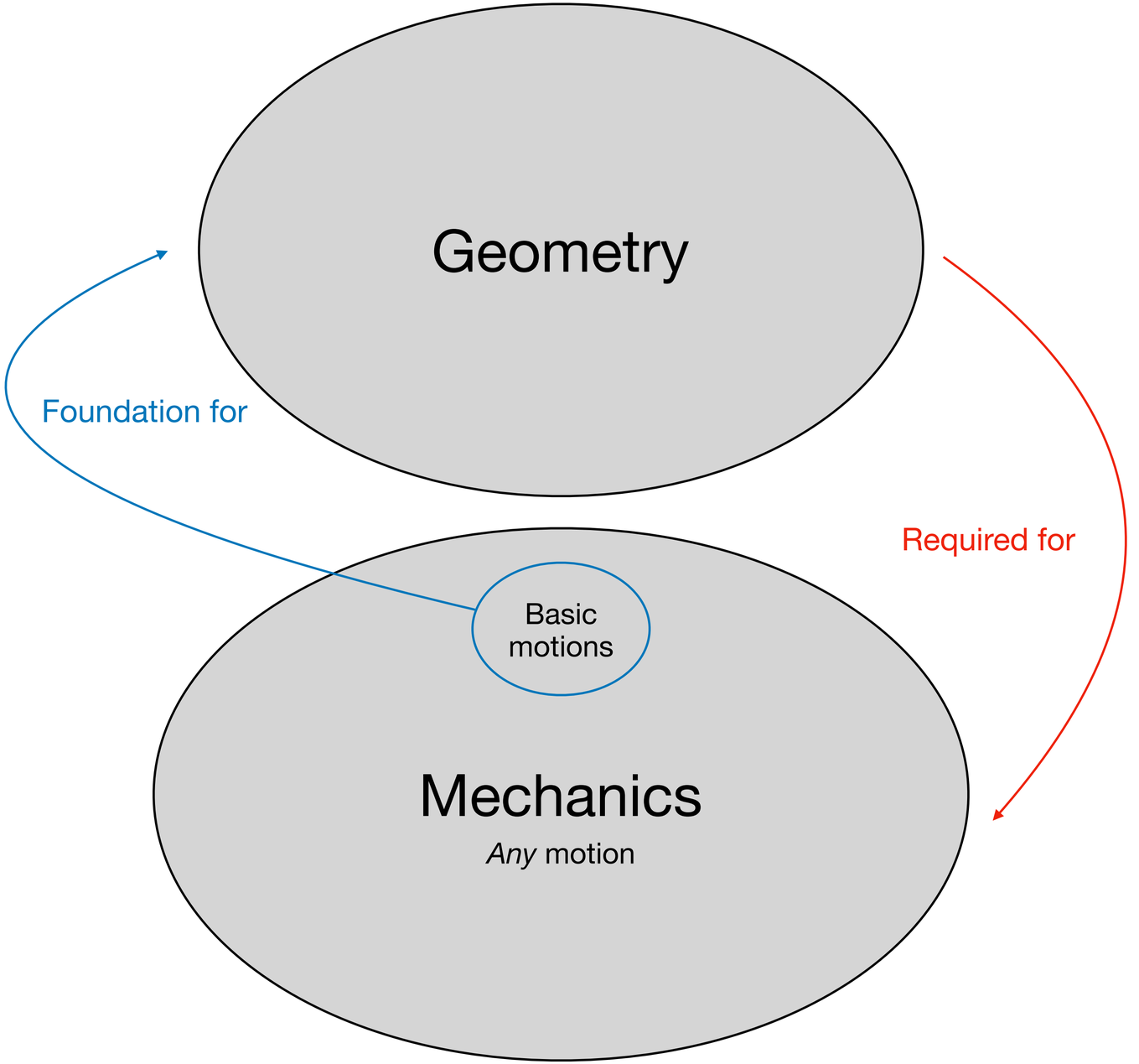
- Descartes: geometry is the foundation for mechanics
- Newton: mechanical operations are the foundation for geometry

"For the description of straight lines and circles, which is the foundation of *geometry*, appertains to *mechanics*. *Geometry* does not teach how to describe these straight lines and circles, but postulates such a description … And *geometry* can boast that with so few principles obtained from other fields, it can do so much." *(Newton, Principia Preface)*

Newton



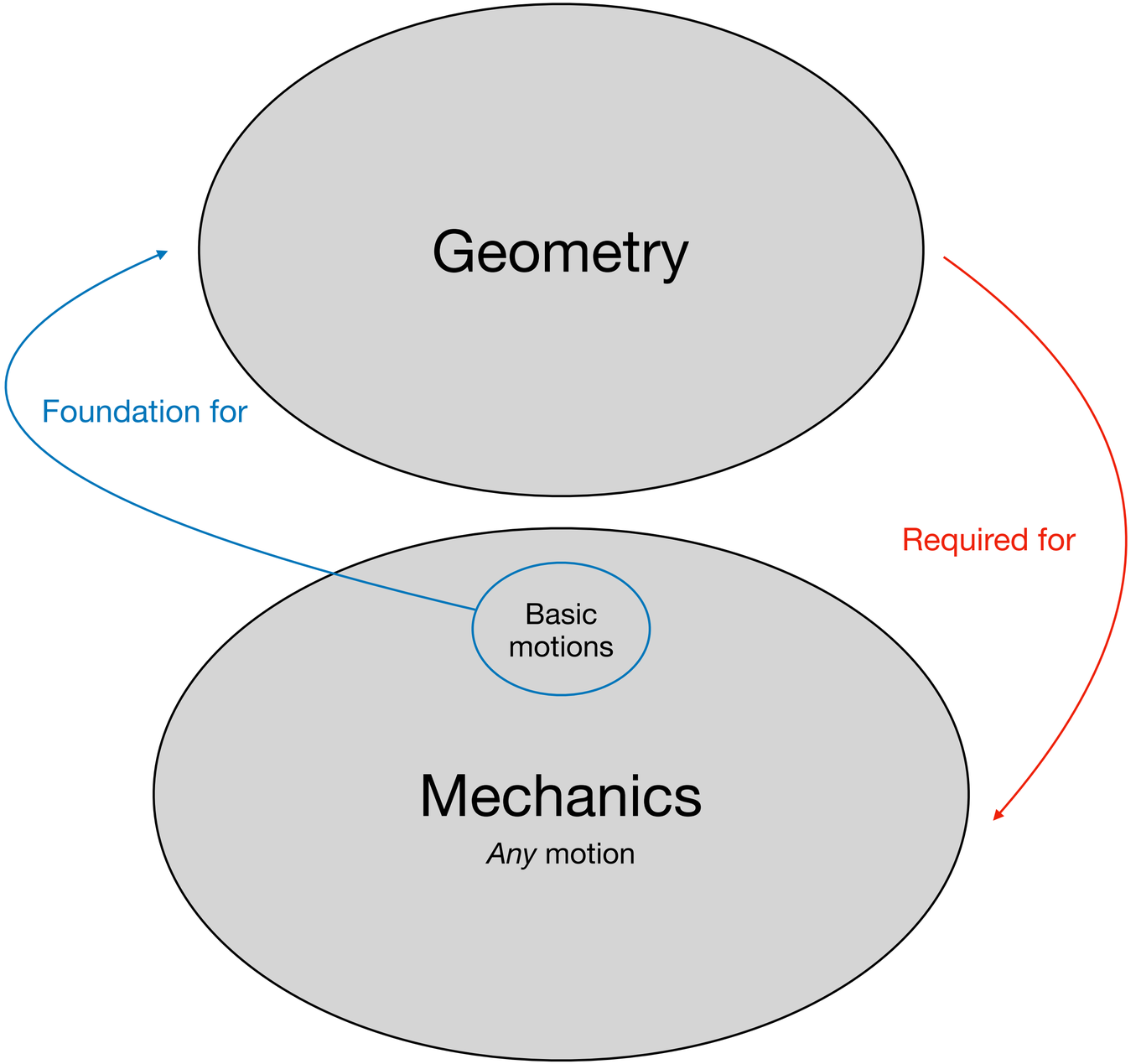
Newton

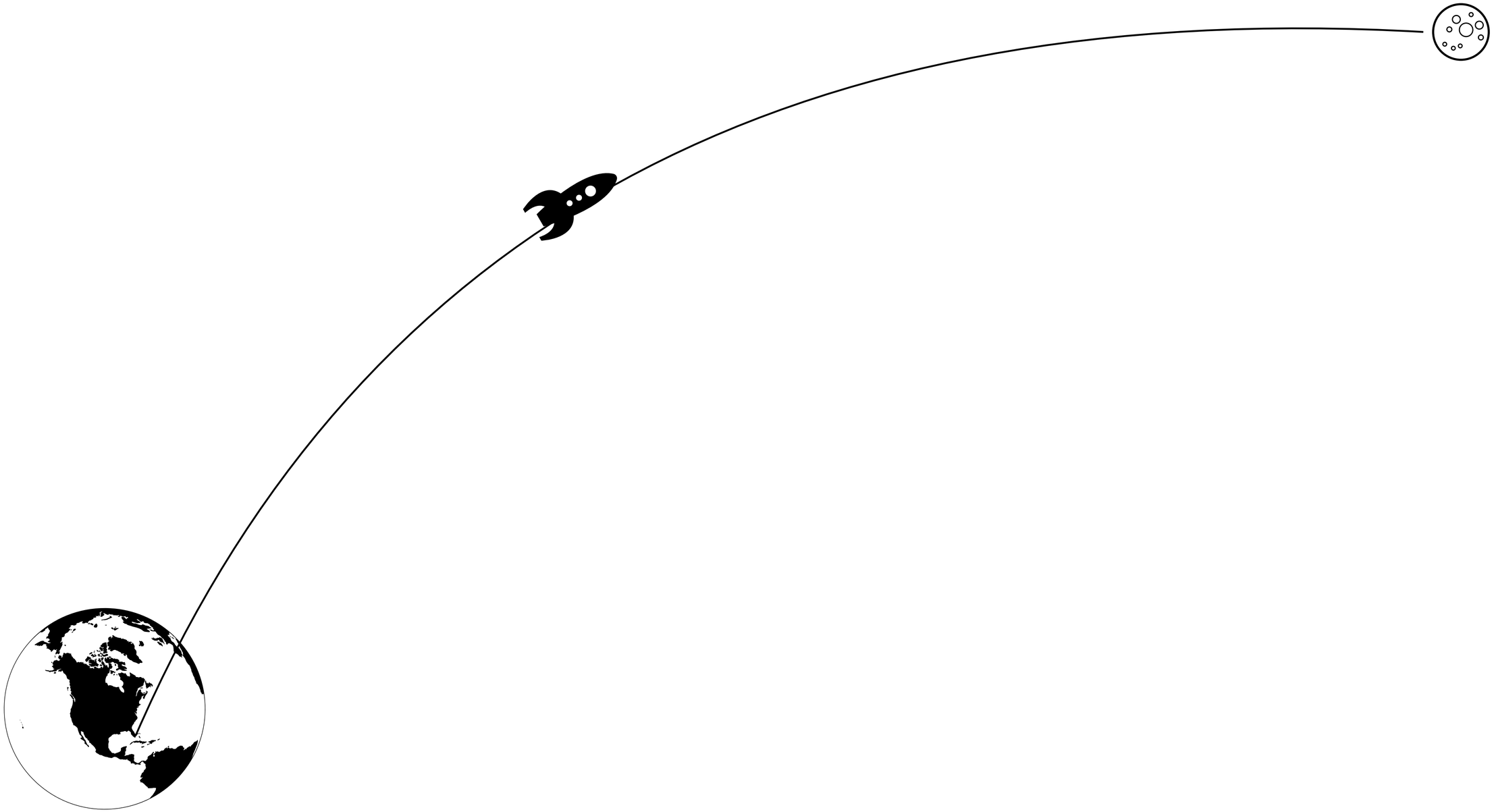

Geometry
Foundation for
Required for
Basic
motions
Mechanics
Any motion

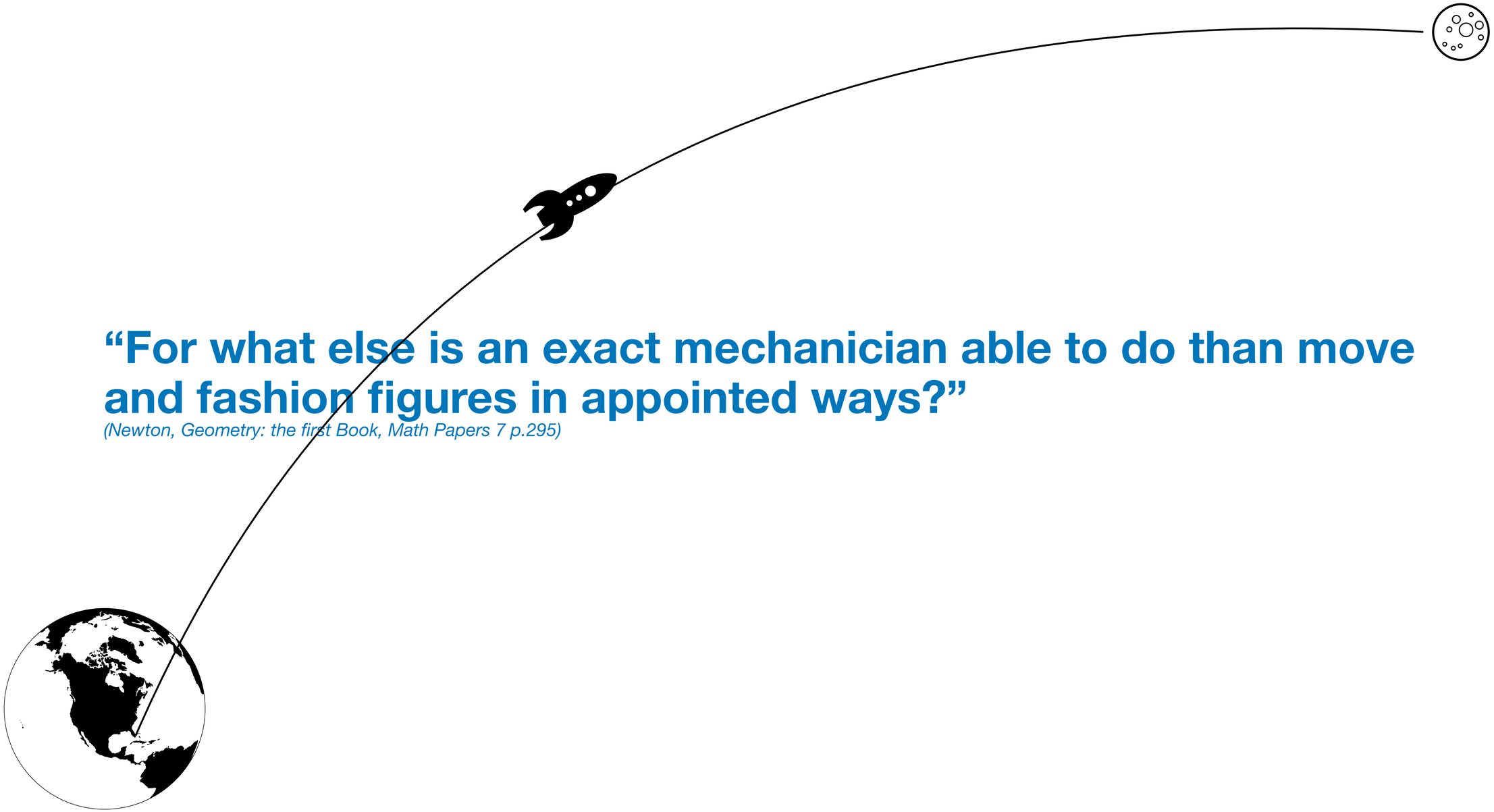
Newton

"Geometry is required for [requiritur] Mechanics, and, in turn, Geometry is founded upon [fundatur] Mechanical operations."

(Newton, Geometry: the first Book, Math Papers 7 p.338)







“For what else is an exact mechanician able to do than move and fashion figures in appointed ways?”

(Newton, Geometry: the first Book, Math Papers 7 p.295)