BO1 History of Mathematics
Lecture V
Newton's *Principia*
Part 2: The mechanics of the universe

MT 2020 Week 3

# Johannes Kepler (1571–1630)



Engaged to sift through the astronomical data gathered by the Danish astronomer Tycho Brahe (1546–1601)
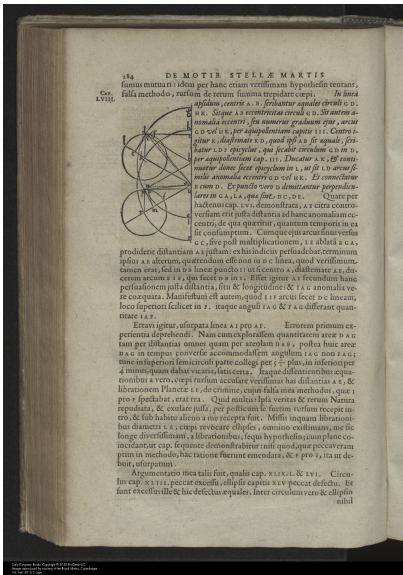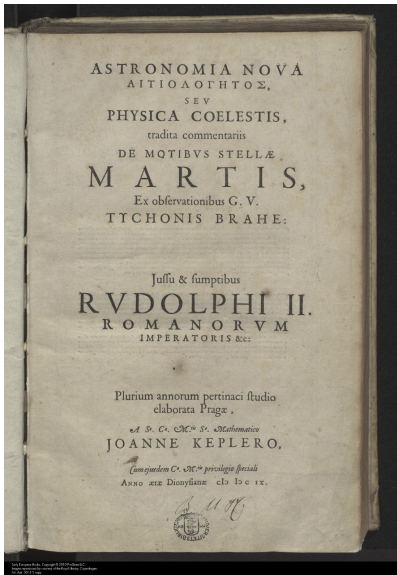
Major works:

*Astronomia nova* (1609)

*Harmonices mundi* (1619)

# Kepler: *Astronomia nova* (1609)

# Kepler's laws

Kepler's laws of planetary motion (1609, 1619):

1. Planets move in elliptical orbits with the sun as focus

2. Planets sweep out equal areas in equal times

3. $T^2$ is proportional to $R^3$ (where $T$ is time of one revolution, $R$ is mean distance to sun)
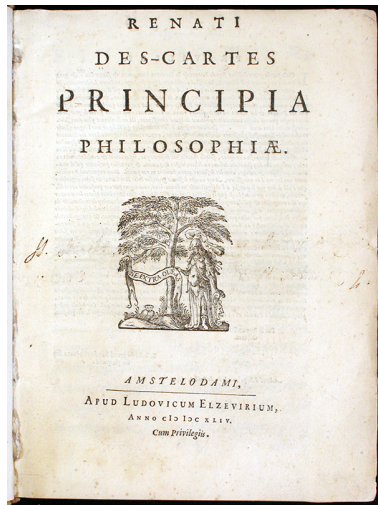
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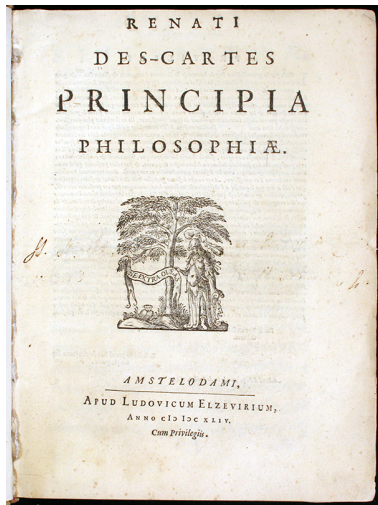
All from empirical evidence

# Descartes' theory



Descartes' views of planetary motion in *Principia philosophiae* (1644):
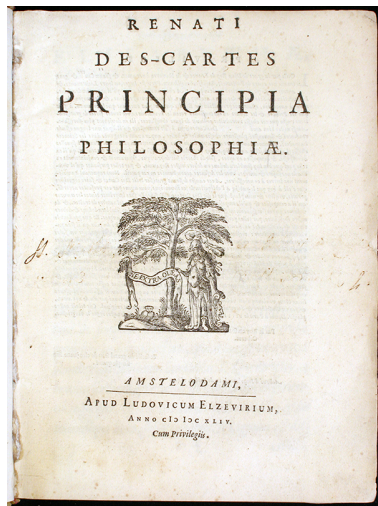
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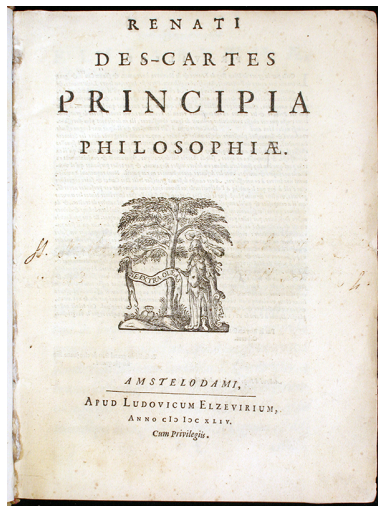
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▶ asserted that planets are carried round their suns by vortices of the surrounding 'ether'

# Descartes' theory



RENATI
DES-CARTES
PRINCIPIA
PHILOSOPHIÆ.

AMSTELODAMI,
APUD LUDOVICUM ELZEVIRIUM,
ANNO cIↃ IↃc XLIV.
Cum Privilegiis.

Descartes' views of planetary motion in *Principia philosophiae* (1644):

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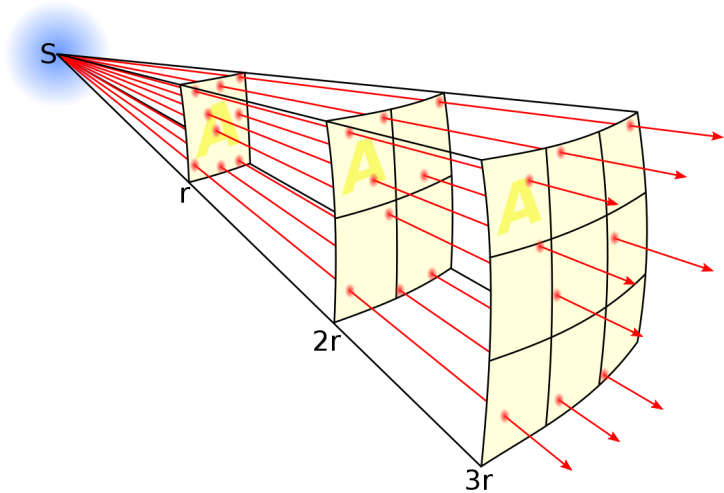- ▶ asserted that planets are carried round their suns by vortices of the surrounding 'ether'

- ▶ claimed that theory could also explain magnetism and static electricity

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1687     Publication of Newton's *Principia* at Halley's expense