

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

MT 2021 Week 2

Johannes Kepler (1571–1630)

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

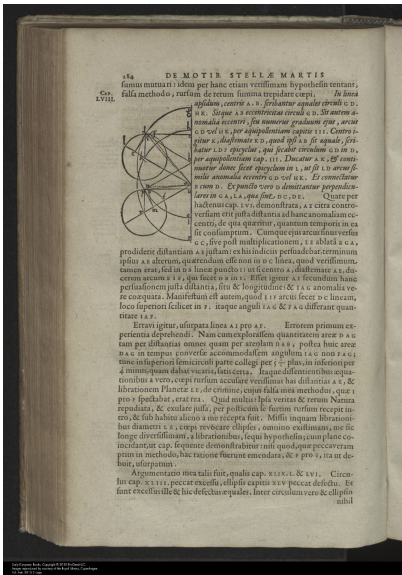
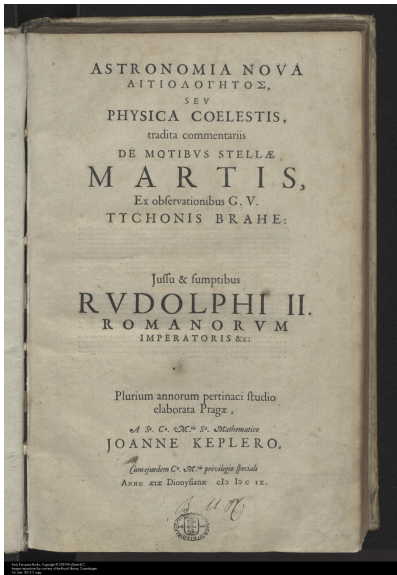
Major works:

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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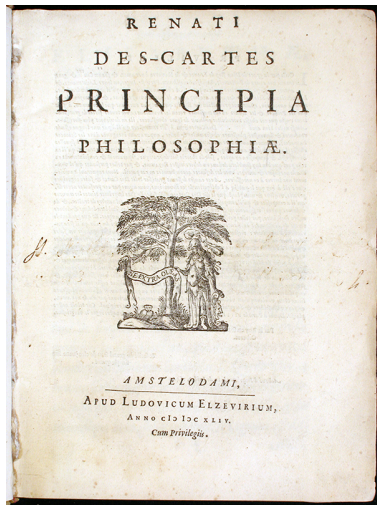
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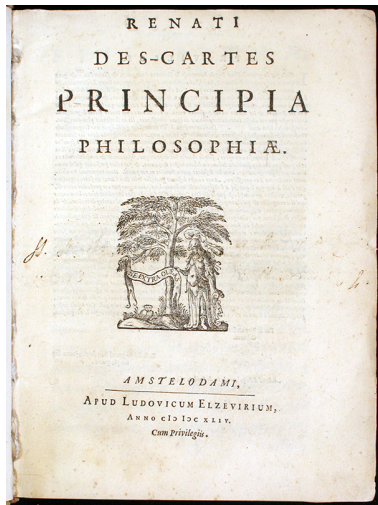
All from empirical evidence

Descartes' theory

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



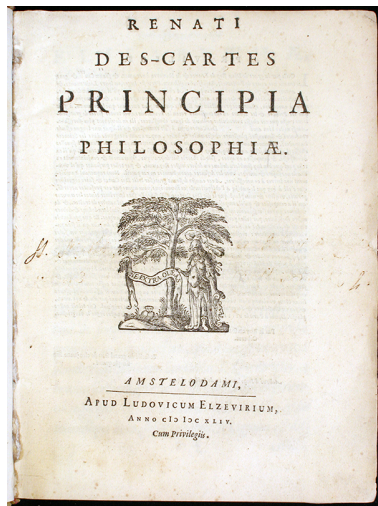
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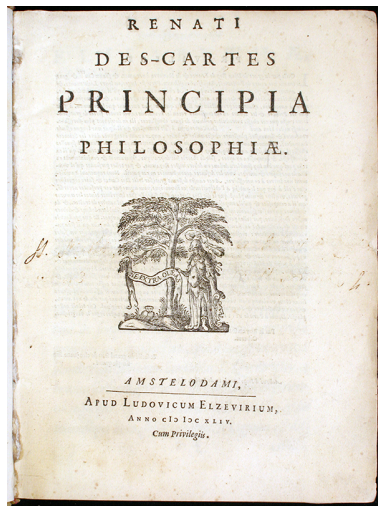
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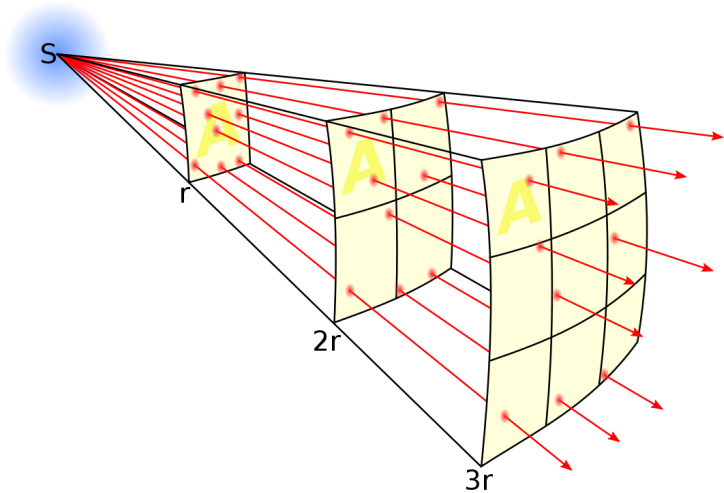
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- ▶ the sun is one star among many
- ▶ asserted that planets are carried round their suns by vortices of the surrounding 'ether'
- ▶ claimed that theory could also explain magnetism and static electricity

An inverse square law?



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Speculations and calculations on an inverse square law of gravity:

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

Something a little bit different...

Volker Remmert, *Picturing the Scientific Revolution*,
Find it on Solo.

