

2103 Lecture Notes 4
Newton
SBM, pp. 133-158

Brief Biography

- Life (1642-127)
- Age of 19 attended Trinity College at Cambridge University, studied mathematics and natural philosophy (physics of Galileo, etc.) for 4 years.
- 1665-1667 Plague hits Cambridge; Newton goes home to Woolsthorpe
 - The *annu mirabilis*: theory of light, calculus, and gravity
- 1667 returns to Cambridge, publishes on math (infinite series), and appointed Lucasian Professorship
- 1670s Alchemy and heterodox theological views (e.g., about the trinity)
- Invents reflecting telescope to correct chromatic aberrations; elected to Royal Society
- Discussions with Halley about inverse square law, results in publication of *the Mathematical Principles of Natural Philosophy* (1686).
- Mental breakdown, recovers as Warden of the Mint in London
- Publishes *Optiks* (1704) after death of Hooke, a disputant on these issues
- Dies 1727, buried in Westminster Abby

Rational Mechanics (*how to conceptualize nature to describe its motions*)

- Three Laws of Motion (mechanics of mass, force, lines of force, etc.)
 - Law 1: inertia
 - Law 2: change in motion equals force ($F = ma$)
 - Law 3: equal and opposite reactions
- Theory of Gravity:
 - inverse square law: force equals sum of masses inversely proportional to the square of the distance between those masses.
 - gravity as an attractive force (not a mechanical force, no obvious physical connection; speculations about aether or other intervening mechanical-like forces.)
- Great Synthesis:
 - Unifies Kepler and Galileo, Heaven and Earth
- Rules of Reasoning and Method
 - Rules: essentially parsimony (see SBM)
 - Method: Analysis and Synthesis

Closing Thoughts

- Gravity: what is gravity if it is not a mechanical force? Can Newton explain this? Why is this an issue?
- Synthesis = unification of terrestrial and celestial mechanics, what do you think will be the cultural impact?