

Tutorial 4 Newton

What is scientific understanding?

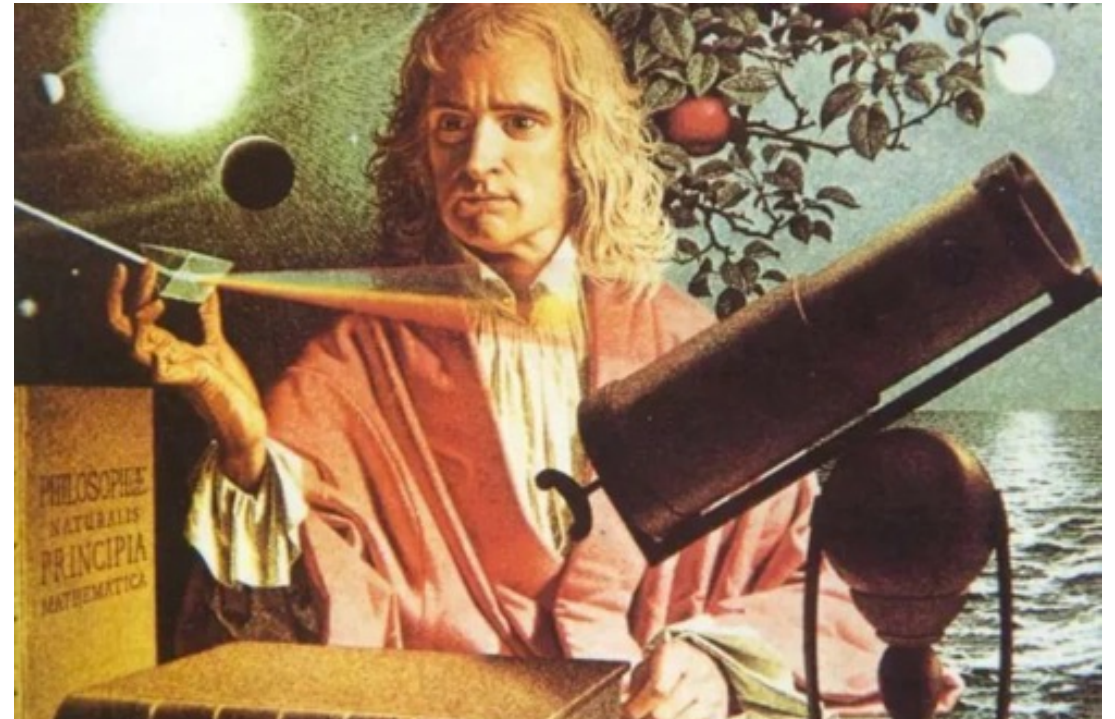
GFN1000 In Dialogue with Nature

Mid-term Quiz

- Coverage: Plato, Aristotle, Euclid, Newton
- Out of the four provided short-answer questions, you have the option to select and respond to any three.
- Time: Mar 8 Friday, 1:30-2:00 PM
- Venue: Teaching Complex A402

Content

- Newtonian Physics
- Methodology
- Individual Genius vs. Collective Intelligence
- Science and Religion
- Debate



Newtonian Physics

- How does Newton interpret basic concepts including “quantity of matter,” “quantity of motion,” “inherent force of matter,” “impressed force,” and “centripetal force”? ①
 - How do Newton and Aristotle understand force ②, terrestrial motion ③, and celestial motion ④⑤ differently?
1. If a body is at rest or moving at a constant speed in a straight line, it will remain at rest or keep moving in a straight line at constant speed unless it is acted upon by a force.
 2. The time rate of change of the momentum of a body is equal in both magnitude and direction to the force imposed on it.
 3. When two bodies interact, they apply forces to one another that are equal in magnitude and opposite in direction.

Methodology

- According to text 3a, what are the differences between Galileo's and Newton's approaches to nature? ②
- How do Newton and other key figures in the scientific revolution investigate nature differently compared with Aristotle? ③④
- Both the Ptolemaic and Copernican systems could be used to accurately predict planetary motion, but neither of them is a realistic representation of the solar system. Do you think scientific theory is instrumental, or does it have to be the truth about nature? ⑤
- Do you think Newton discovered the laws or invented the laws? ①

Individual Genius vs. Collective Intelligence

- According to the author, why is Newton a genius? ③
- Which disciplines do you think depend more on individual genius, and which ones depend more on collective intelligence? ④
- Why is today's scientific research increasingly dependent on collaboration? ⑤①
- Is Newton's breakthrough an inevitable outcome of scientific progress at a certain point, or nobody else would achieve it without him? ②

Science and Religion

- How does Newton “prove” the existence of God with the inertial component of motion? (p.61) and why does he argue that “The universe could not be explained in terms of matter alone?” ④
- Can a scientist be religious? Can a scientist simultaneously believe in science and religion? ⑤①
- If all natural phenomena can be described and predicted through science and mathematics, does it imply that everything in the world is predetermined and bound by fate? ②③

Debate

- Topic: Science has become the religion of our time.
- Make arguments to defend your position and counter the opposing viewpoint.
 - Affirmative ②③
 - Negative ④⑤

