UNIVERSITY OF LIVERPOOL

Introduction to Philosophy of Physics (Methaphysics and Epistemology)

Philosophy for physicists
Lecture II

16/02/2026

Paolo Beltrame

A methodological introduction

- Each history underneath a bias

- Looking for the steel-men, not the straw-men

Science and Philosophy differentiation

Lawrence Sklar, *Introduction: Philosophy and the Physical Sciences*

- Long and gradual process in the Western history
  - In the past unified access
    1. **Metaphysical (ontological) questions**
    2. **Scientific questions**

  - Pre-Socratic
  - Aristotles

What role for philosophy

- Amazing successes of the sciences
- What is the role of philosophy?
  1. Producing open questions
  2. At the service of the science

- Discipline ⇒ able to justify itself
  Specific questions and methods

Producing conceptual guidance

- Foundation of physics w/o experimental foundation

- Leibniz, Kant (idealism)
  1. Sufficient reason: causality
  2. Indiscernible identity: object with the same properties

  - Theoretical physics:
    mathematical consistency, more and more stringent

Ancillary roles

- Critics of the scientific reasoning

⇒ Logical structure of the scientific work

- Not simply descriptive but fundamentally prescriptive
- We wonder what science is (sociology)

Physics and Philosophy share a blurred boundary

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Physics composed by multiple disciplines

Philosophy

Physics research

- Clashes with its own methodological presuppositions

1. Cosmology
   - causality

2. Relativity and Quantum Mechanics
   - empiricism and realism
   a. Relativity: space-time concept (simultaneity)
   b. Quantum Mechanics: causality and objectivity

The philosophical questions

- Question so banal and obvious that none has ever asked to ask before

  - Earthquake in physics: destroying the paradigms (Kuhn: normal & revolutionary science)

  - Philosophy also before the crisis and accompanies the revolutions

Crisis of physics

Lee Smolin

A. Until ‘900: classical/European approach
   - accompanied by philosophical reflections

B. After Relativity and Quantum Mechanics
   - less philosophical thinking
   - Particle accelerators, massive experimental efforts ⇒ hard works

Physics requires a radical examination of the concepts usually taken for granted

Philosophy

MINO

- Metaphysics In, Metaphysics Out

When a physics theory determines a metaphysical position

⇒ am I assuming some ontological assumptions that have been included in the physical theory

Gaining scientific knowledge

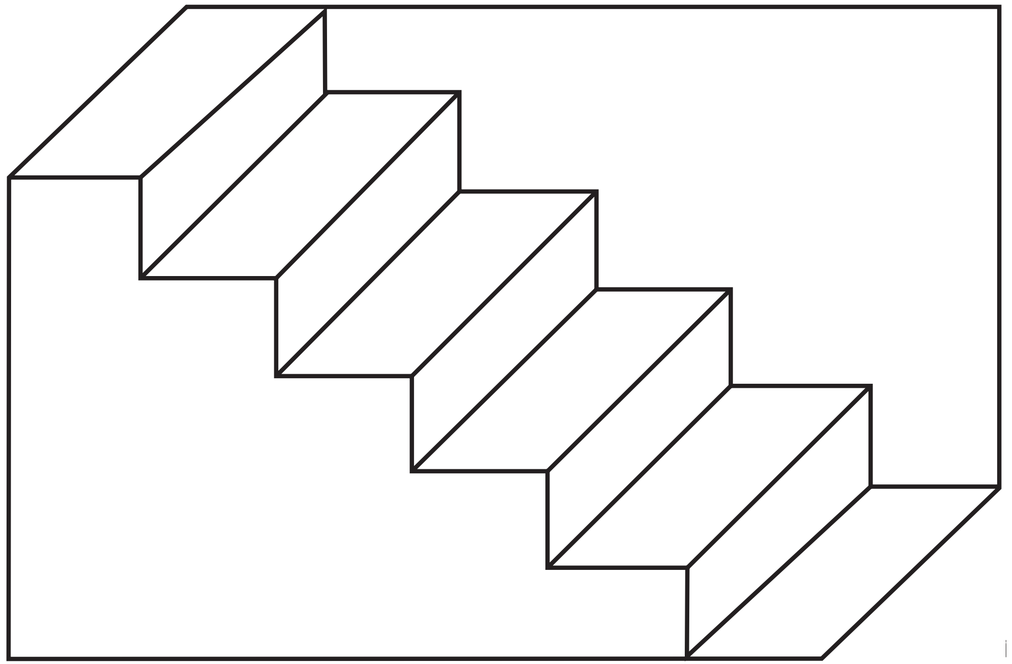
- Seeing

  1. Direct access to knowledge of facts

  2. Two observers viewing the same object (from the same place)

  => ‘see’ the same thing

Not necessarily identical visual experiences, even if images on their respective retinas virtually identical



First steps into Science

1. Learn to be a competent observer in science
2. The only things with which an observer has direct and immediate contact are his or her experiences

- Real nature of the observed phenomena (conceptual framework is a must)
- Our search for relevant facts needs to be guided by our current state of knowledge

For the next seminar

- Carlo Rovelli. Physics needs philosophy. Philosophy needs physics

  Link on Wisp: https://wisp.ph.liv.ac.uk/index.php/s/fgXXpjLD6QYGQJp (Lecture 3)

End of the second seminar