

Introduction to Philosophy of Physics

John Dougherty

WiSe 2023/2024

Meeting:	Tuesdays, 14:00–16:00 (c.t.) Edmund-Rumpler-Straße 9 / A 119
Office Hours:	Thursdays, 14:00–16:00 (c.t.) Ludwigstr. 31, Room 126
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Overview

Description Philosophy of physics is a branch of philosophy concerned with the physical sciences. Some of the questions it investigates are questions about the physical sciences themselves: what counts as a good physical theory or a good explanation of a physical phenomenon? What is the precise relationship between physical theories and evidence? Which parts of a given theory—say, quantum mechanics—could be changed without “breaking” the theory? Other questions concern traditional philosophical matters in the light of particular physical theories: what is the world like, assuming that Newtonian mechanics is a good theory? What can we know about the unobservable things described by physics, like space, time, and the fundamental constituents of matter?

This course introduces some of the central questions in philosophy of physics in their historical contexts. In the first three meetings, we will study the background against which Newton developed his theories of mechanics and gravitation. The next six meetings are concerned with the development and reception of Newtonian physics and the philosophical questions it raises—many of which remain today in modified form. In the last six meetings, we look at how these questions were transformed in the twentieth century with the rise of quantum mechanics and relativity.

Objectives By the end of the course, you should be able to (i) state one or more traditional philosophical problems concerning motion and (ii) explain why they are problems. Exhibiting ability (i) means giving a statement, in academic writing and in your own words, of an argument about motion. Exhibiting ability (ii) means explaining why the argument poses a problem: why someone might want to believe the premises but not the conclusion.

Materials

All materials for this course will be available on LSF.

Assessment

The evaluation for this course will be by means of a term paper submitted at the end of the semester. If you would like to submit a term paper, you must register through LSF during the registration period (15.01–26.01.2024) and submit it to me by email by the term paper deadline (TBD). Please note that extensions of this deadline are not up to me; if you need an extension, please contact Fabian Widerna (f.widerna@lmu.de) at the Prüfungsamt für Geistes- und Sozialwissenschaften (PAGS).

Your paper should be on a topic related to those we discuss in the course. I will distribute a list of suggested questions and grading criteria before the registration period. You may write your paper on topic not on that list; if you do, then I recommend speaking to me before writing the paper, so that I can advise on the topic and scope of your planned alternative. The term paper should be 3000 words for BA students and 6000 words for MA students. In either case, it should be written in 12pt font, with 1.5 spacing, 3cm margins on the left and right, and a standard academic typeface (Computer Modern, Palatino, Times New Roman, Calibri, etc.).

Resources

Questions about the administration of philosophy teaching at LMU should be directed to Thomas Wyrwich (thomas.wyrwich@lrz.uni-muenchen.de). The Erasmus coordinator for philosophy at LMU is Peter Adamson (<https://www.philosophie.uni-muenchen.de/studium/auslandstudium/index.html>). The list of women's representatives (Frauenbeauftragte) for the Philosophy Faculty can be found on the Faculty's webpage (<https://www.philosophie.uni-muenchen.de/fakultaet/frauenbeauftragte/index.html>).

Issues regarding the economic, social, and cultural aspects of student life—including studying with a child or studying with a disability—are the responsibility of the Munich Student Union (<https://www.studentenwerk-muenchen.de>).

Schedule and readings

17.10 Problems of change and motion

- Aristotle, excerpts from *Categories* and *Physics*

24.10 Theories of motion

- Bradwardine, excerpt from *On the Ratios of Velocities in Motions*

31.10 Cartesian physics

- Descartes, excerpts from *Principles of Philosophy*

07.11 Newton against Descartes

- Newton, excerpts from *On the Gravity and Equilibrium of Fluids* and *Mathematical Principles of Natural Philosophy*

14.11 Newton's methods

- Newton, excerpts from *Mathematical Principles of Natural Philosophy*

21.11 The Leibniz–Caroline–Clarke correspondence

- Excerpt from the Leibniz–Caroline–Clarke correspondence

28.11 The *vis viva* controversy

- Du Châtelet, excerpts from *Foundations of Physics*

05.12 Geometry and experience

- Kant, excerpts from *Critique of Pure Reason*

12.12 [RESCHEDULE]

19.12 Berkeley/Mach

- Berkeley, excerpt from *On Motion*
- Mach, excerpt from *The Science of Mechanics*

26.12 [HOLIDAY]

02.01 [HOLIDAY]

09.01 Quantum mechanics: introduction

- Albert, excerpt from *Quantum Mechanics and Experience*

16.01 Causality in QM

- Hermann, “Natural-Philosophical Foundations of Quantum Mechanics”

*18.01 [ONLINE] Locality in QM

- Bell, “The Theory of Local Beables”

23.01 Relativity: introduction

- Geroch, excerpts from *General Relativity from A to B*

30.01 Spacetime in relativity

- Greaves, “In Search of (Spacetime) Structuralism”

06.02 Time Travel

- Ismael, “Closed causal loops and the bilking argument”